

Does Remittance in Nepal Cause Gross Domestic Product? An Empirical Evidence Using Vector Error Correction Model

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Abstract This study aims to investigate short and long run causality between the variable gross domestic product and remittance. The study is based on the estimation of vector error correction model. Testing the unit root and the co-integration is the basic requirement for the estimation of vector error correction model. Further, it also has estimated remittance elasticity using ordinary least square method. The finding reveals that the contribution of remittance in gross domestic product is only 0.07%. It means a 1% change in remittance will change the gross domestic product by only 0.07%. It indicates that the remittance what Nepal received from its migrants is being consumed, not saved and invested in the productive sector that can create gainful employment to the generation to come. Evidence has not support the hypothesis of remittance causes gross domestic product in the long run but there is strong evidence about the short run causality running from remittance to gross domestic product. But opposite is true in reverse order. Gross domestic product causes remittance in both short and long run.

Keywords: *short and long run, causality, remittance, co-integration, stationary*

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1. Background

Foreign workers contribute remittances - transfer of funds by workers (remitters) living and working in developed countries, typically to their families in their home countries. Examples from past history include Middle Easterners living in Europe, Latin Americans in the United States, and Koreans, Filipinos in Japan and Nepalese in India. Remittances constitute a significant amount of national income. Although the use of remittances varies from country to country, the recipients of remittances commonly rely on them for living costs, education and investments (Carrasco and Ro).

For the purpose of survival particularly after the First World War, Nepalese youths have continually migrated to foreign countries. The growth of migration has rapidly been accelerated since the last two decades after Nepal underwent policy changes conducive to open and liberal economy. In the beginning, the thrust of these economic policies was to either privatize or dismantle public enterprises. Policy failures have continued because of the inability of the private sector to operate such enterprises. Actions have not stopped in spite of the negative implications on the economy in the short as well as in the long run. It created chronic unemployment. Obviously, economic transformation did not produce significant positive change but started to decline over time. In

addition, since the late 1990s Nepal experienced a decade long armed conflict. It is estimated that the conflict cost the nation around 2.5% of GDP growth per annum since 2000 (Shakya 2009).

A significant number of Nepalese youth, over two million, work in different countries of the world India, East Asia, Middle East are particularly popular countries for employment. Over 1500 Nepalese leave the country every day in search of greener pastures. The outflow of people in search of opportunities in foreign countries has increased over the years. It seems employment to potential Nepalese workers depends on the need of foreign countries. These youth send remittances to their families. The number of youths migrated from Nepal and remittances they send back to home have amazingly increased over the years and it is believed that remittance plays a significant role in providing livelihood to the majority of people who live in rural areas. The bulk of inflow of remittance in Nepal has been increasing over the years. Nepal received around US \$ 4.6 billion remittances in 2012 which jumped from US\$ 2.9 billion in 2009, an increase of 58.6%. Remittance contributed 18% share to the total GNP of Nepal in 2006, the highest among the South Asian countries (Dhungel, 2008). In 2004 remittances covered 14.2 % of GDP which skipped to nearly 25 percent in 2012. These data reveal that the dependency of Nepalese economy on remittance has been increasing over the years and this trend looks to continue for the days to come. The expenditure trend of the

remittance received indicates that it may have significant role in reducing poverty. Out of total remittances, 78.9% is spent on daily consumption followed by repaying loans (7.1%), household property (4.5%) and education (3.5%). This pattern of use of remittance indicates that there is a big implication on the livelihood of the people as major portion of remittance is spent on consumption. Merely 2.4 % of remittance is spent on capital formation (CBS, 2011). Lack of employment generation due to the unproductive use of remittance will definitely hit the economy hard in the long run as the country is deep in the remittance trap.

For many developing countries, the remittances that their citizens send from abroad constitute a larger source of foreign exchange than international trade, aid, or foreign investment (Turnell, et al.). It seems true for Nepal. Remittance total was four times greater than export earning, 81 times greater than FDI, 8 times greater than the earning from tourism and nine times greater than grants in 2009 (Dhungel, 2012). Tourism is a promising sector in Nepal. Income from tourism seems to fluctuate, indicating fluctuation in the employment opportunities. Export and tourism earning as percent of GDP were 11% and 5% respectively in 2009. This indicates that the progress of domestic sector that earn foreign exchange is not as encouraging as remittance. This, of course, has a significant impact on the Nepalese economy. There is a need to assess the relationship between remittance and economic growth in the Nepalese economy. In this context, the present article attempts to assess this relationship by applying some standard econometric tests.

2. A Brief Survey of Literature

In a poor country like Nepal at which poverty and unemployment are rampant, remittance is expected to help not only in providing employment opportunities and in turn in reducing poverty but also in correcting balance of payment. Trends of migration on which the remittance is based is being increased over the years. It in turn increases the volume of remittance. This trend is not limited to a particular country of the world. It is a global phenomenon. It particularly creates a question how remittance impacts the global economy in general and economy of individual country in particular. Global researchers have conducted various studies with an aim to investigate the impact of remittance on economic growth. They have tried to establish a relationship between remittance and economic growth using either single country model or the model of a group of countries. These studies have implied co-integration test, error correction model, vector error correction model to investigate the impact of remittance on economic growth. Most of the findings of these studies are based on the Vector Error Correction Model (VECM). These studies can be categorized into three major parts on the basis of their findings-negative impact, positive impact and both. These studies undertaken by individual have produced mixed results: a number of researchers in their separate studies have found no causality, only short run causality, only long run causality and both short run and long run causality between the variables remittance and gross domestic product (GDP) among other things. The brief description of some of these studies is given below.

2.1. Positive Impacts

The conventional belief on remittance is that it can help the economy to grow. It helps to increase the saving. In a well-organized economy saving automatically turns into investment which finally enable to create employment opportunities and to increase income of the great majority of people. In line with this, researchers around the globe have found positive impact of remittance on economic growth (Fayissa and Nsiah 2008; Pradhan et al., 2008; Loxley and Sackey, 2008; Giuliano and Ruiz-Arranz, 2009; Ziesemer, 2006). In addition to this, there are other studies supporting the hypothesis of positive impact of remittance on economic growth. In Ghana remittances positively impact economic growth and reduce poverty. Some argues that institutional environment can affect the volume and efficiency of investment with marginal effect on growth. (Quartey, 2005; Natalia et al., 2006; Rao and Hassan, 2009; Kumar, 2010).

2.2. Negative Impacts

The conventional wisdom of the positive impact of remittance on economic growth, however, has been criticized as the major portion of remittance has been spent on consumption. It means studies under taken by a number of researchers do not support the hypothesis of positive impact of remittance on economic growth. Migrant's remittances have negative impact on growth as a significant proportion of earning is spent on consumption. The rest part of remittance or what is left over from consumption has been spent in housing, land and jewelry. Investment in these sectors as they are considered unproductive does not create employment opportunities and hence does not help to increase the income of the people. The growth effects of remittances are generally small, at times even negative and largely insignificant. The role of workers' remittances and its contribution/effect on economic growth and development to find that workers' remittances are seldom utilized into productive and investment uses in the Philippines. There are strong anecdotal evidences that show that most of these resources are used to fund conspicuous consumption (Barajas et al. 2009, Rajan and Subramaniam 2005, Chami et al. 2003 and Ang 2007).

2.3. Both Positive and Negative Impact

There are other studies which support both the positive and negative hypothesis of the impact of remittances on economic growth. Some relevant studies in Nepal has investigated short and long run equilibrium between electricity consumption and economic growth and foreign aid using error correction model. A unidirectional causality running from per capita energy consumption to per capita real GDP was found. It has significant implications from the point of view of energy conservation, greenhouse gas emission reduction and economic development. While workers' remittances have a significant impact on poverty reduction through increasing income, smoothing consumption and easing capital constraints of the poor, they have marginal impact on growth through domestic investment and human capital development. Remittances are typically spent on investment in physical assets as well as investment on

human capital such as education and health, which promotes growth. A study to analyze the relationship between remittance and economic growth in the context of South and South East Asian economies by using simultaneous equations model under the concept of panel data least-squares dummy variable regression model. Their results shows an inverse relationship between remittances and real GDP in Thailand, Sri Lanka, India and Indonesia, while found positive impact of remittances on real investment for Bangladesh, Pakistan and the Philippines. One reason for the similarity in results is the use of different research techniques in both papers, as we used time series co-integration technique in individual country case assessments in which country shocks are absorbed and data are refined accordingly (Dhungle 2008, 2014, Jongwanich 2007, Cattaneo 2005, Habib and Nourin 2006).

3. The Data, Variables and Their Characteristics and Model

3.1. Data and Variables

The variables included for analysis are real per capita gross domestic model (PCGDP) and per capita remittance (PCREM). Data for real GDP in 2000/01 prices in million rupees during the period 1974-2012 is collected from the Economic Survey, a yearly publication of Ministry of Finance, the Government of Nepal. Population data is taken from Asian Development Bank. The data for remittance in million rupees during the period 1974-2012 is taken from the publication of Nepal Rastra Bank, a central bank of the government of Nepal. The data of these variables are expressed in per capita terms to incorporate the effect of population growth.

3.2. The Model

A typical model as below is estimated in order to determine the contribution of explanatory variable under consideration to growth (GDP).

$$LPCGDP_t = b_0 + b_1 LPCREM_t + b_2 LPCGDP_{t-1} + U_t \quad (1)$$

Where,

$LPCGDP_t$ = Per capita gross domestic product,

$LPCREM_t$ = per capita remittance, U_t = error term

L= logarithm and

b_0, b_1 and b_2 are the parameters to be estimated and b_1 represents the remittance elasticity coefficient.

3.3. Short and Long Run Causality

While investigating the cause and effect between the variables under consideration there are a number of issues associated with the time series data to be addressed. Unit root test is conducted to determine the order of the variables. Prevalence of non-stationarity is the common character of time series data. To check out this property, the data are subjected to Augmented Dickey and Fuller (ADF) test. ADF is performed by adding the lagged values of the dependent variable ΔY_t , here Y_t refers to PCGDP and PCREM. The following regression is for ADF purpose.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum \Delta Y_{t-i} + \mu_t \quad (2)$$

Where μ_t refers to the white noise error term and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$ and so on are the number of lagged difference term which is empirically determined. Akaike lag selection criteria is used to select a number of lags. The null hypothesis of ADF test states that a variable is non-stationary is rejected if the calculated ADF test is less than the critical value.

Once variables have been classified as integrated of the same order, it is possible to set up models that lead to stationary relations and when standard inference is possible. The necessary criteria for stationarity among non-stationary variables is called co-integration. Testing for co-integration test is necessary step to check empirically meaningful relationships. Engle and Granger (1987) proposed co-integration test for examining the hypothesis is non-co-integration. The test of co-integration is based on testing stationary of the error term U_t from equation (1). The equation to be tested is given by:

$$\Delta U_t = \gamma_0 + \gamma_1 U_{t-1} + \gamma_2 T + \sum \varphi_i \Delta U_{t-i} + \varepsilon \quad (3)$$

Where γ and Ψ are the estimated parameters and ε is the error term.

If there is one co-integrating relationship, then the causal relationship among the variables can be determined by estimating the Vector Error Correction Model (VECM). Though co-integration affirms a stable long run relationship between the variables but in the short run this equilibrium may not exist. The error correction mechanism explains short run adjustment towards long run relationship between the variables. It provides the information about the speed of adjustment to long run equilibrium and avoid the spurious regression problem.

Finally, VECM has been followed to examine the short and long run causality between PCGDP and PCREM. Lags are chosen on the basis of akaike criteria. For this, following models are estimated.

$$\begin{aligned} D(PCGDP)_t &= b_0 + b_1 ECT + b_2 D(PCGDP)_{t-1} + b_3 D(PCGDP)_{t-2} \\ &+ b_4 D(PCREM)_{t-1} + b_5 D(PCREM)_{t-2} + \varepsilon_t \end{aligned} \quad (4)$$

$$\begin{aligned} D(PCREM)_t &= c_0 + c_1 ECT + c_2 D(PCREM)_{t-1} + c_3 D(PCREM)_{t-2} \\ &+ c_4 D(PCGDP)_{t-1} + c_5 D(PCGDP)_{t-2} + \varepsilon_t \end{aligned} \quad (5)$$

Where,

$D(PCGDP)$, and $D(PCREM)$ are the dependent variable in equation (4) and (5) respectively.

$D(PCGDP)$ = First difference of per capita GDP

$D(PCREM)$ = First difference of per capita remittance

ECT is the error correction term

b_0, b_1, b_2, b_3, b_4 and b_5 are the parameters to be estimated.

b_1 and c_1 of model (4) and (5) respectively should be negative and significant which represents long run causality between the variables under consideration. But the short run causality to happen further assumptions are needed. For this purpose, following hypothesis are assumed to examine the short run causality (Table 1).

Table 1. Null hypothesis

Equation	Null hypothesis	Test statistic	Implication
4	$b_4 = b_5 = 0$	Wald	GDP causes remittance
5	$c_4 = c_5 = 0$	Wald	Remittance causes GDP

4. Empirical results

4.1. Descriptive Statistics

Before applying the higher econometric methods to the data of selected variables, it would be suitable to give the descriptive statistics. Table 2 shows the average values of the variables (mean and median), range, and standard deviation (the dispersion of data around their mean). Kurtosis is a measure of whether the data are peaked or flat relative to a normal distribution. Skewness is a measure of symmetry, or more precisely, the lack of symmetry. Similarly, Jarque-Bera statistics is used to test the normality of the given distribution under consideration.

Table 2. Descriptive statistics

Statistics	Variable	
	PCGDP	PCREM
Mean	16704.08	2039.597
Median	15991.50	40.10000
Maximum	24980.80	16185.50
Minimum	12389.90	9.900000
Std. Dev.	3435.592	3959.709
Skewness	0.719814	2.177783
Kurtosis	2.602725	6.932611
Jarque-Bera	3.624329	55.95912
Probability	0.163300	0.000000
Sum	651459.3	79544.30
Sum Sq. Dev.	4.49E+08	5.96E+08
Observations	39	39

4.2. OLS Results

Table 3 presents results (equation 1) from the ordinary least squares estimation on the relationship between PCGDP and PCREM in level. The overall fit of the model is robust as indicated by the F-statistics (1290.9) and has a strong explanatory power (R-squared is 0.98). The individual coefficients are statistically significant. LM test (0.48) with probability (0.7829) and DW statistic is nearer to 2 have shown enough evidence that the estimation is

free serial correlation. It appears from these results that the variables PCGDP and PCREM are positively correlated over the time period of 1974 to 2012. The growth elasticity of remittances in that time period is 0.07. It indicates that a 1% change in remittance will change the GDP by 0.07%. The elasticity coefficient of remittance is less than 1 indicating a less proportional change in GDP associated with the change in remittance. It implies that change in GDP is less sensitive with the corresponding change in remittance. This obviously raise the question why Nepalese economy experiences such insensitivity in the change in GDP due to change in remittance when the remittance inflow in Nepal has been alarmingly increasing over the years at the annual average growth rate of 22.2% during 2001-2011. Among other things, the most probable answer of this question is the overuse of remittance in unproductive sector like consumption meaning that the country is unable to divert its available resources into productive sector.

Table 3. Results of OLS parameter estimation

Dependent variable LPCGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Intercept	9.338469*	0.028173	331.4680	0.0000
LPCREM	0.072111*	0.004925	14.64026	0.0000
LPCGDP(-1)	0.0976391*	0.067294	14.50937	0.0000
F-statistic	1290.870		probability	0.0000
LM test (Observed R-squared)	0.478318**		Probability	0.78290
R-squared	0.98			
Durbin-Watson stat	1.77			

(*) significant at 1% level.

(**) rejection of null hypothesis at 5% level.

4.3. Unit Root Test

Generally, the nature of time series data is non-stationary. They contain unit root. Data with unit root, if used to examine the relationship, may give a biased result. Standard tests are needed for the non-stationary data to arrive at stationary. One way of conducting unit root taste as shown in equation 2 is the Augmented Dickey-Fuller (ADF) test. It is one of the widely used tests to investigate unit root in time series data. But the given data if they are non-stationary has been automatically converted into stationary in VECM. Thus, separate test is not needed to determine the order of the variable. However, Figure 1 and Figure 2 give the insight view on non-stationary and stationary of the data of PCGDP and PCREM respectively.

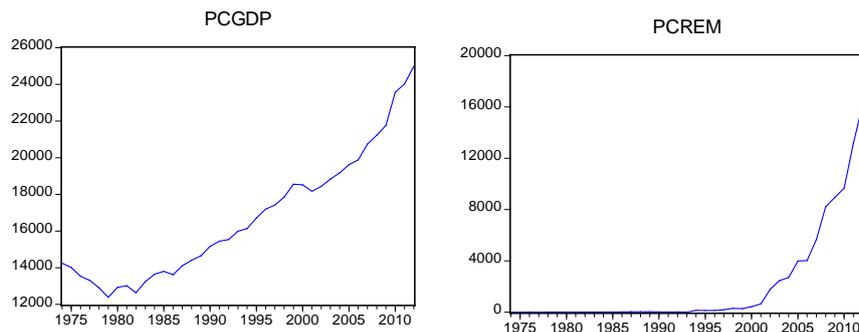


Figure 1. Non stationary data at their level

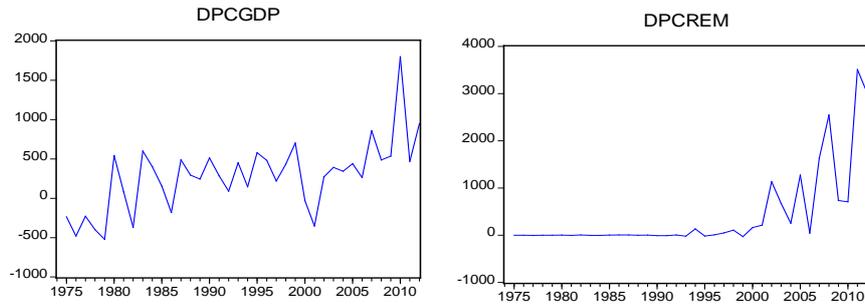


Figure 2. Data become stationary at first difference

4.4. Johansen Co-integration Test

The purpose of the co-integration test is to identify the number of co-integrating equations in the system on the one and to determine the long run relationship between the variables PCGDP and PCREM. Table 4 represents the

results of Johansen co-integration test procedure estimated using equation 3. Results of co-integration test show that there is 1 co-integrating equation which obviously proved that there is long run co-movement between the variables under investigation. This suggests that there is at least one long run meaningful relationship between these variables.

Table 4. Unrestricted Co-integration Test

H0	H1	Trace statistics			Max. Eigen Value stat		
(Null hypothesis)	(Alternative hypothesis)	Value	5% critical value	Prob	Value	5% critical value	Prob
r=0	r=1	29.88486*	15.49471	0.0002	29.88401*	14.26460	0.0001
r=1	r=2	0.000849	3.841466	0.9777	0.000849	3.841466	0.9777

(*) indicates rejection of hypothesis at 5% level
Both trace and eigen value indicate 1 co-integrating equation at the 0.05 Series PCGDP, PCREM.

5. Vector Autoregressive (VAR) Estimation

VECM, to be applied requires long run relationship between the variables PCGDP and PCREM. The results of co-integration test as presented in Table 4 have met this

requirement. Equation 4 and 5 as provided in the methodology are the VAR models. They are estimated using the data of the variables during the period 1974-2012. The lag order is 2 selected from Akaike criteria. The estimated results of these equations are presented in Table 5.

Table 5. Estimated results

Independent variable	Equation 4: dependent variable D(GDP)				Equation 5: dependent variable D(REM)			
	Coefficient	Std.error	t-stat	Prob	Coefficient	Std.error	t-stat	Prob
ECT	0.009554	0.014055	0.679766	0.5019	-0.407178	0.048414	8.410348	0.0000
D(GDP)-1	0.035172	0.178057	0.197534	0.8447	-0.183903	0.186174	-0.987801	0.3312
D(GDP)-2	0.005568	0.170443	0.032668	0.9742	-0.349625	0.178213	-1.961837	0.0591
D(REM)-1	-0.067189	0.164811	-0.40767	0.6864	-0.621109	0.172325	-3.604299	0.0011
D(rem)-2	0.359105	10.17404	2.063247	0.0478	-1.010300	0.181983	-5.551621	0.0000
Constant	234.9525	143.6602	1.635474	0.1124	1088.661	150.2092	7.247631	0.0000
R-square	0.45				0.85			
DW	2.04				2.1			

Table 5 represents the results of the proposed models estimated through VECM. All the coefficients (b1, b2, b3, b4, b5 and b0) of equation 4 are not individually significant as indicated by the probability value associated with the corresponding t-statistics. The R-square is 0.45. It indicates that 45% of the variation in dependent variable D(GDP) is jointly explained by the independent variables. Unlike the equation 4, all the coefficients (c1, c3, c4, c5

and c0) except c2 of equation 5 are individually significant as indicated by the probability value associated with the corresponding t-statistics. R-square is 0.85 meaning that 85% of the variation in dependent variable D(REM) is jointly explained by the independent variables. As compared to two equations, equation 5 is robust in terms of explanatory power and individual significant of coefficients than equation 4.

Table 6. short and long run causality

Causality	Equation 4			Equation 5		
	Wald test		ECT (b ₁)	Wald test		ECT (c ₁)
	Chi-square value	Probability		Chi-square value	Probability	
Short run	6.528281*	0.0383		4.789239**	0.0912	
Long run			0.009554			-0.407178

(*) and (**) indicate a significant level at 5% and 10% respectively.

5.1. Short and Long Run Causality

The main thrust of this paper is to find out the short and long run causality between the variables PCGDP and

PCREM. Wald test is applied to test the hypothesis to determine the short run causality as proposed in Table 1. However, the coefficients of ECT of both the equation 4 and 5 of Table 5 represent the long run causality. These coefficients for the short as well as long run are given in Table 6.

5.1.1. Short Run Causality

As the hypothesis set in Table 1, the statistically significant value of Wald test represented by Chi-square of equation 4 reveals that the null hypothesis is rejected at 5%. It implies that remittance causes GDP in the short run. Alternatively, the causality is running from remittance to GDP in the short run not the other way around. The same of equation 5 is not significant at 5% level, however the value is significant at 10% level. It supports the null hypothesis to reject at the significant level of 10%. On the basis of this, it is found that GDP causes remittance in the short run. Alternatively, the causality is running from GDP to remittance in the short run not the other way around.

5.1.2. Long Run Causality

The value of b_1 (error correction term) of equation (4) is 0.009 (Table 4) with probability 0.5019 (Table 3). It indicates that the error correction term is not negative on the one and it is not significant on the other. The implication is that remittance does not cause GDP in the long run. Unlike the situation explained in equation 4, equation 5 is different. The value of c_1 (error correction term) of equation (5) is -0.41 (Table 4) with probability 0.0000 (Table 3). This value is negative on the one and significant even at 1% level on the other. This fulfills the conditionality for long run causality. The implication is that GDP causes remittance in the long run, not the other way around. It also indicates the speed of adjustment of the previous level disequilibrium. The system would correct previous level disequilibrium at the speed of 41% annually.

6. Conclusion

The daily outflow of people hovering over 1500 in number in search of survival to foreign countries at the annual growth rate of 22.2% over the period 2001-2012 has been playing a significant role in supporting Nepalese economy to prosper. Out of their (remitters) earning, no matter about the extent whatever they earn, save and send it in their home constitute a significant amount of remittance. This amount represents over a 25% of the gross domestic product of Nepal. The remittance contribution to GDP is found negligible. A mere 0.07% change in GDP has occurred associated with the 1% change in remittance. It indicates that remittance is being invested in unproductive sector of Nepalese economy. So far as the causality is concerned, evidence does not prove the long run causality running from remittance to GDP. However, there is strong evidence on the causality running from remittance to GDP in the short run. Instead there is a causality running from GDP to remittance in both the period short and long run. It appears from the investigation that Nepal is unable to mobilize its remittance what it received from the foreign employment

to be used in the productive sector. Evidences of this study have supported the researcher's view who advocated that what the economy saved and invested in conspicuous consumption, housing, land and jewelry is not necessarily productive to the economy as a whole. The growth effects of remittances are generally small, at times even negative and largely insignificant.

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