# Determination of Causality between Remittance and Import: Evidence from Bangladesh

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**ABSTRACT**

*This study investigates the relationship between remittance and import for the economy of Bangladesh. The study used different econometric techniques of measuring the long and short term relationship between variables. The Johansen Cointegration test is used to determine the existence of a long term relationships between study variables. The normalized Cointegrating coefficients are found statistically significant and show a stable and positive relationship between study variables. Our Granger causality analysis suggests the existence of a unidirectional causality running from import to remittance. This confirms that remittances have no significant impact on the demand for imported goods rather import exerts a positive shock on the remittance of Bangladesh.*

**Keywords:** Remittance, Import, Bangladesh, Cointegration, Granger Causality

## 1.0 INTRODUCTION

The economy of Bangladesh might overtake western countries by 2050. Bangladesh has been assisted by remittances sent home from expatriates working overseas which helped to sustain strong growth rate (The Guardian, 2012). Remittance is one of the key locomotives of economic growth and poverty reduction in Bangladesh. Remittances are considered an important mechanism of transferring resources from developed to developing countries. The inflow of remittances not only affects growth to the receiving economies through savings and investment but also it has short run effects on aggregate demand and output all the way through consumption (Solimano, 2003). Remittance constitutes a major portion of country's foreign exchange reserve which is crucial for its Balance of Payment condition. During the last two decades of the 20th century, the remittance inflow had a positive impact on the national foreign currency reserve (Afsar et al., 2000). Country's higher import dependency relative to export builds deficit situation in its Balance of Trade position where remittance can play an imperative role to reduce this deficit of foreign earnings. As macroeconomic variables remittance and import both have significant role in economic development of the country. In the development process we need to import capital items from abroad. Asia and Latin American as well as other less developed countries show an increasingly stronger link between urban industrialization and foreign remittance (Byerlee et al, 2005). Moreover, if the domestic production is less than demand then this mismatch between demand and supply condition is handled by availing import policy. But its foreign currency reserve is very small and its earning sources are also limited. In this situation, there is an increasing demand on remittance. A rise in imports will cause depreciation in the exchange rate. This tends to increase inflationary pressure through make import costly. On the other hand, the more money recipient families get from remittances, the more they will spend which leads to increase of demand of goods and services and subsequently increase in the domestic price level. This may result more import decision. Besides, remittances cause increase of supply of foreign currency that means appreciation of local currency or depreciation of foreign currency which will make import cheaper and export expensive. As import becomes cheaper so country may avail import policy at a greater extent which will effect on

the remittance. Remittance income is considered as an injection of resources into the economy but imports being an increasing function of income become leakage (Khan et al, 2007). So, it is required to investigate the nature of relationship between import and remittance of the country.

In 1976, the remittance flow in Bangladesh was $18.76 million (equivalent to 0.19 percent of GDP in that period) which has grown to a $10.85 billion in 2010, equivalent to 10.81 percent of GDP. And between 1976 and 2010 import increased from $1.78 billion to $25.11 billion in Bangladesh. (Source: World Development Indicators, World Bank). Bangladesh economy has observed an increasing trend in emigration of labor after independence, which contributed to the significant inflow of remittances. In 1993, number of persons left for abroad on employment was 1, 92,263 and in 2010 it stood at 4, 34,442. (Source: Monthly Economic Trends, Bangladesh Bank).

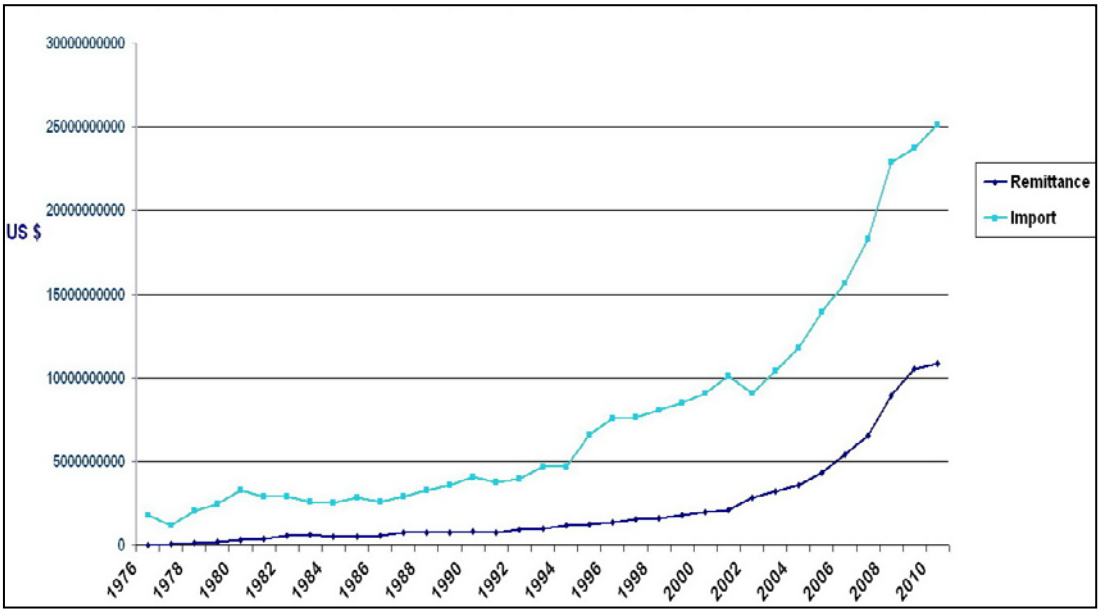


**Fig 1: Trend of Remittance and Import in Bangladesh**

In the economies of Bangladesh, remittances from migrant workers have become increasingly important as a source of foreign exchange earnings. On the other hand, higher import dependency exerts a negative impact on our overall Balance of Payment condition. It is believed that there is a correlation between imports and remittance income. So, it is imperative to determine the nature of such relationship between these two variables. In this regard, this paper attempts to analyze the relationship of remittance with import of Bangladesh.

## 2.0 LITERATURE REVIEW

A number of literatures show the relationship between remittance and import. Remittances sent by the migrants have grown over time in the economy of Bangladesh with the increasing external demand for its manpower. The remittances contribute to the GDP as well as foreign exchange earnings of developing countries at a greater extent. According to a World Bank report, workers remittances provide valuable financial resources to developing countries, particularly the poorest (Source: World Development Finance, World Bank 2005). Remittance plays a vital role toward economic development of any country especially for the developing nations. With remittances, an economy can spend more than it produces, import more than it exports or invest more than it saves, and this might even be more relevant for small economies (Connell and Conway 2000). Remittances play a potentially important role in the import demand functions both at the aggregate and disaggregated levels, particularly where there is a foreign exchange problem (Zaman and Imrani, 2005). Bangladesh's import is higher than export which results negative Balance of Trade situation and this gap can be fulfilled by improving foreign exchange reserve through remittance earnings. Remittances are considered a major source of foreign exchange for labour exporting countries used to pay import liabilities (Azad, 2005). Besides making payment of import,

remittances are also used for productive investment by the government (Salim, 1990). The marginal propensity of imports and remittances are found to be positively related with imports (Khan et al, 2007).

The remittances play a significant role for the families of migrants and also for the balance of payment of their home country. As household income of migrant families increases due to receipt of remittance, so they may have propensity to consume more which will increase the demand of goods. The propensity to import out of remittances will be lower than out of ordinary income because remittances usually go to the subsistence of low-income groups, which have limited taste for foreign articles of consumption (Kindleberger, 1965). On the other hand, Paine (1974) argue that the propensity to import out of remittances will be high as recipient families now have taste of foreign goods and living standards which is intense in case of after returning of migrant worker to their home. Durand and Massey (1992) find that most of income of migrant households from remittances is used for consumption rather productive investments. Zaman and lmrani (2005) found that remittances have no impact on the demand for imported consumer goods where remittances have a positive impact on import of capital goods and raw materials. Adams (2006) finds that a smaller share of income of remittance-recipient households is used for food and other non-durable goods consumption where larger share for housing, education and healthcare financing. Glytsos (2005) analyzes the effect of remittances on investment, consumption, imports and output and finds that the effect of reducing remittances would be greater than the effect of raising them. If remittance is used for productive investment then the increased output will help to reduce the upward pressure of demand. Barua et al (2007) found a negative correlation between remittance inflow and inflation. In the development process Bangladesh may need to import capital items on the larger scale which will affect to its Balance of Payment (BOP) situation. Though in the short run this will create a negative effect on the BOP condition but after using those capital items for the productive purposes it will be able to enhance domestic production which will result a positive impact in the long run.

## 3.0 DATA & METHODOLOGIES

The study attempts to determine the relationship between remittance and import in Bangladesh. The data set comprises of monthly time series data for Bangladesh over the sample periods of January, 2005 to December, 2011. The sources of import data is Global Economic Monitor and the sources of remittance data is Migration and Remittances Fact book which are released by the World Bank. Import of goods and services and remittance both data are measured in terms of U.S. millions dollars. The summary statistics of the study variables are reported in Table 1.

**Table 1: Summary statistics of the study variables**

| | Mean | Max | Min | Std. Dev. | Skew-ness | Kurtosis | Jarque-Bera | Prob | No. of Obs |
|---|---|---|---|---|---|---|---|---|---|
| **Remittance** | 704.55 | 1147.22 | 311.75 | 243.21 | -0.11 | 1.65 | 6.53 | 0.03 | 84 |
| **Import** | 1695.77 | 2843.31 | 951.80 | 548.19 | 0.68 | 2.40 | 7.69 | 0.021 | 84 |

To check for non-stationarity property, the data are subjected to Augmented Dickey and Fuller (ADF) test. ADF is performed by adding the lagged values of the dependent variable $\Delta Y_t$. The following regression is for ADF test purpose:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \Sigma \Delta Y_{t-i} + \varepsilon_t$$

Where $\varepsilon_t$ is a 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. Using Schwarz Information Criterion (SIC) the lag length is selected automatically by E-views software. The null hypothesis of ADF test states that a variable is non-stationary and the null hypothesis of non-stationary is rejected if the calculated ADF statistics is less than the critical value.

Our next step is to determine whether the variables have a stable and non-spurious cointegrating relationship among themselves. For the purpose of testing Cointegration we have chosen the Johansen procedure. The null

hypothesis of Cointegration test states that variables are not cointegrated. If calculated Trace statistic or Max Eigen Value exceeds the critical value then we can reject the null hypothesis of no Cointegration.

If there is at least one cointegrating relationship among the variables, then the causal relationship among these variables can be determined by estimating the Vector Error Correction Model (VECM). Though Cointegration 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 adjustments towards long run relationship between the variables. It provides information about the speed of adjustment to long run equilibrium and avoids the spurious regression problem (Engle and Granger, 1987). After VECM model is estimated, then we employ Variance Decompositions and Impulse Response Function to investigate the behavior of an error shock to each variable on its own future dynamics as well as on the future dynamics of the other variables in the VECM system.

If there is a co-integration vector between study variables, there must be causality among variables at least in one direction (Granger, 1986). The final step of our analysis is to test for causality between the variables. Granger causality is a technique for determining whether one time series is useful in forecasting another. A variable (X) is said to Granger-cause another (Y) if the present value of Y can be predicted with greater accuracy by using past values of X. If X Granger-causes Y, then the causality from X to Y and If Y Granger-causes X, then the causality from Y to X. In both cases the causality is unidirectional. But when both variables Granger-cause each other, then it is called a bi-directional causality.

## 4.0 EMPIRICAL FINDINGS

### 4.1 STATIONARITY TEST

The Table 2 shows ADF test statistic used to examine the null of a unit root in the remittance and import data.

**Table 2: Results of ADF test**

| Variables | ADF Test Statistic | |
|---|---|---|
| | Level | First difference |
| Remittance | -0.886594 | -19.40836 *** |
| Import | -2.581174 | -2.810322 * |

**Note:** *** and * indicate statistically significant at the 1% and 10% level respectively

The results in Table 2 clearly indicate that ADF tests fail to reject the null of non-stationary for remittance and import both at level. After first differencing the result shows that remittance and import became stationary at the 1% and 10 % significant level respectively, implying that these variables are integrated of order 1 that is I(1). The figure 2 shows stationarity trend after first differencing the variables.

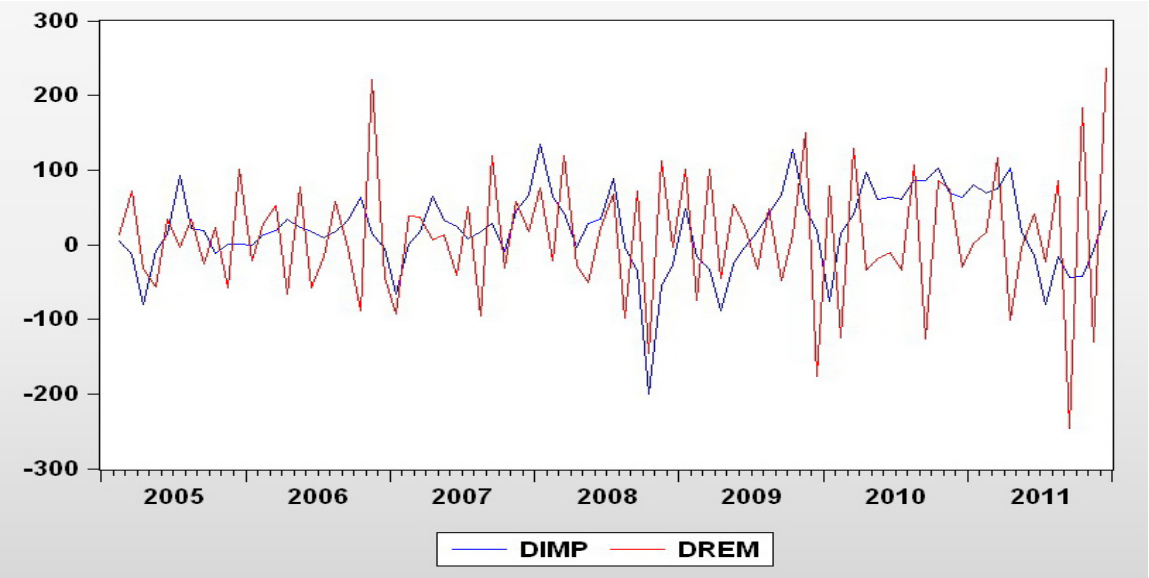


**Fig 2: Trend with stationary**

**4.2 TESTING COINTEGRATION**

Since the variables are considered to be I(1), the Cointegration method is appropriate to estimate the long run relationship between variables. To explore the number of cointegrating vectors, Maximal Eigenvalue and Trace statistics both have been used. The results of Trace statistics and Maximum Eigenvalue are shown in Table 3 and Table 4 respectively.

**Table 3: Unrestricted Cointegration Rank Test (Trace)**

| **Hypothesized** | | | **0.05** | |
|---|---|---|---|---|
| **No. of CE(s)** | **Eigenvalue** | **Trace Statistic** | **Critical Value** | **Prob.**** |
| None * | 0.196460 | 20.05384 | 18.39771 | 0.0291 |
| At most 1 | 0.028438 | 2.336882 | 3.841466 | 0.1263 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

**Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)**

| **Hypothesized** | | | **0.05** | |
|---|---|---|---|---|
| **No. of CE(s)** | **Eigenvalue** | **Max-Eigen Statistic** | **Critical Value** | **Prob.**** |
| None * | 0.196460 | 17.71696 | 17.14769 | 0.0413 |
| At most 1 | 0.028438 | 2.336882 | 3.841466 | 0.1263 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The Trace statistic and Maximum Eigen statistic both identified one cointegrating vector. The presence of Cointegration implies the existence of a stable long run relationship between remittance and import. The normalized Cointegrating coefficients are estimated as reported in Table 5. The significant sign of coefficient implies that in the long run the relationship between remittance and import is positive.

**Table 5: Cointegrating Equation**

| **Cointegrating Equation** | **CointEq1** |
|---|---|
| | |
| IMPORT (-1) | 1.000000 |
| REMITTANCE(-1) | -2.605062 ** (0.76902)<br>[-3.38751] |
| C | 1.489646 |

**Note:** Standard errors in ( ) & t-statistics in [ ]
** indicates statistically significant at the 5% level

**4.3 VECTOR ERROR CORRECTION MODEL**

As we find cointegrating relationship between study variables so we will proceed with Vector Error Correction Model (VECM). The results of VECM were shown in Table 6.

**Table 6: Error Correction Model**

| Vector Error Correction Estimates<br>Sample (adjusted): 2005M04 2011M12<br>Included observations:81 after adjustments | | |
|---|---|---|
| **Error Correction:** | **Δ IMPORT** | **Δ REMITTANCE** |
| $ECM_{t-1}$ | -0.017158<br>[-0.96685] | 0.025528<br>[1.02208] |
| | | |
| Δ IMPORT(-1) | 0.604482<br>[5.16035] | 0.295045<br>[1.78959] |
| | | |
| Δ REMITTANCE(-1) | -0.081893<br>[-0.92229] | -0.817826<br>[-6.54407] |
| | | |
| **C** | 9.843753<br>[1.80625] | 13.88134<br>[1.80974] |

**Note:** Figures in parenthesis represent the t-statistics

The estimated error correction coefficient indicates that about 1.7 percent deviation of the import from its long run equilibrium level is corrected each period in the short run, while the gaps in the remittance close by about 2.6 percent.

Before making any further conclusions we test the residuals for serial correlation. Here we will test the null hypothesis of $H_0$=No Autocorrelation against $H_1$= Autocorrelation. Based on the LM test from Table 7 we do not reject the null hypothesis of no serial correlation on the 5% level of significance after the third period.

**Table 7: The results of the LM Autocorrelation test**

| Lags | LM-Stat | Prob |
|---|---|---|
| 1 | 19.63347 | 0.0006 |
| 2 | 19.54790 | 0.0006 |
| 3 | 30.53561 | 0.0000 |
| 4 | 8.947906 | 0.0624 |
| 5 | 3.296034 | 0.5096 |
| 6 | 9.778407 | 0.0543 |
| 7 | 7.246046 | 0.1234 |
| 8 | 0.360879 | 0.9856 |
| 9 | 2.681848 | 0.6124 |
| 10 | 0.834685 | 0.9337 |
| 11 | 2.777719 | 0.5957 |
| 12 | 8.448172 | 0.0765 |
| Probs from chi-square with 4 df. | | |

Figure 3 shows impulse responses. It shows the impact of a one standard deviation generalized innovation in the import on the remittance and a one standard deviation generalized innovation in the remittance on the import. The effect of a shock to the remittance on the import price was positive throughout 12 month horizon where the effect of a shock to the import on the remittance was positive after 3rd period.

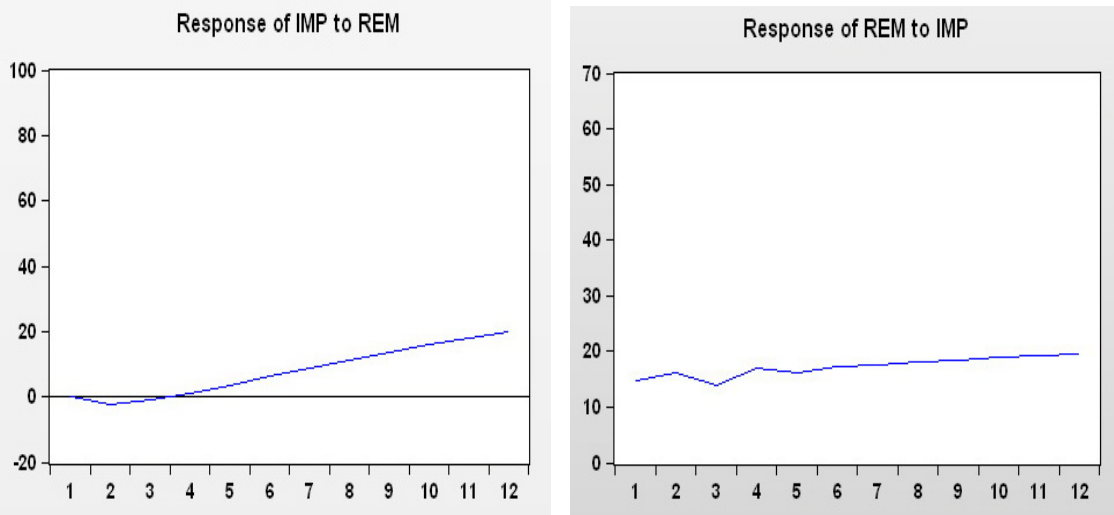


**Fig 3: Impulse Response Function (Response to Cholesky One S.D. Innovations)**

### 4.5 GRANGER CAUSALITY TEST

Our final step of analysis is to test for causality between remittance and import. The results are presented in Table 8.

**Table 8: Granger Causality Test**

| Null Hypothesis | F-Statistic | P-Value | Granger Causality |
|---|---|---|---|
| Import does not Granger Cause Remittance | 2.35371 | 0.0620 * | Yes |
| Remittance does not Granger Cause Import | 0.76620 | 0.5508 | No |

**Note:** * indicates statistically significant at the 10% level

Granger-causality results suggest that the null hypotheses that Import does not Granger cause Remittance is rejected at 10% significant level which states that there is a uni-directional causality running from import to remittance.

## 5.0 CONCLUSIONS

This study attempts to investigate the relationship between remittance and import in Bangladesh using different econometric frameworks. Our empirical result shows a stable, positive and significant relationship between remittance and import. Evidence from Granger causality analysis suggests there is existence of unidirectional causality running from import to remittance.

This means import is not induced by remittance rather import exerts a positive shock on the remittance of Bangladesh.

Bangladesh needs to cut extensive import dependency which is a kind of hinder for achieving economic growth faster. Higher import absorbs a significant portion of remittance income which could be used for productive purpose on the greater extent. Its domestic production level needs to be increased through proper utilization of resources. It also needs to focus on establishment of import substitution industry. At the same time it requires to attract much more remittance. Both policies are vital for achieving desirable growth of the country's GDP.

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