CHAPTER SEVEN

IMPACT OF REMITTANCES ON THE ECONOMY OF BANGLADESH

7.1 Introduction

Chenery and Bruno (1962) consider LDC's suffer from foreign exchange, chronic deficit in balance of trade, ineffectiveness of foreign aid and the difficulties of borrowing. In these countries migrant workers' remittances can substitute for the scarcity of the other sources of foreign exchange.

Glytsos (1998) argues against that remittances are mostly spent on consumption, housing and land, and are not used for productive investment that would contribute to long-run development. He claims that the "productive use" of remittances may be served in a variety of other ways: management of remittances (e.g. by banks); extension of investment credit allowed by the increase in the liquidity of banks from remittance deposits; liberalization of other resources from consumption; investment in human capital in the form of spending on certain consumption items (e.g. education, health); purchase of more investment goods from abroad, made possible by remittances; growth of investment as a result of the multiplier effects of spending on consumption.

When a country receives remittances her disposable income increases by that amount of remittances. So there are great possibilities of impact of this income on macroeconomic variables like savings, investment, consumption, imports and growth because these income will be spend on consumption purposes or saving purposes. This income may spend on imported goods also.

Main purpose of this study is to investigate the impact of remittance inflow on the Bangladesh economy in both the short and the long run. More specifically, we investigate the dynamic effects of remittances on some important macroeconomic variables like aggregate household consumption, investment, imports, and GDP in both the short and the long run. Actually we try to show how these remittances are distributed or contributed across different national income components. In other word the ultimate goal of this study is to provide an answer to the question of whether past and current remittance inflows to the Bangladesh economy contribute to current and future economic growth.

Our main objective is to estimate the effects remittances on certain macroeconomic variables, that are related to short-run economic changes and to determine how these changes move the economy to long-run growth and development.

7.2 Data, Variables and Methodology

The study is based on secondary data collected covering 1977-2014 from Bangladesh Bank (BB) and World Development Indicator (WDI), World Bank (WB). Data on the remittances (R_t) are collected from Bangladesh Bank and all other variables are collected from World Development Indicator (WDI), World Bank (WB).

We use the following variables in our model:
Wage Earners' Remittance inflows (Remittances,R_t), Gross Domestic Product (GDP_t), General Government Final Consumption Expenditure (G_t), Gross Capital Formation (Investment, I_t), Capital Stocks (K_t), Household Final Consumption Expenditure, etc (C_t), Exports of Goods and Services (X_t), Imports of Goods and Services (M_t). Definition of variables, data sources on details are given in the annexure.

Gujarati et al. (2012) warned that the regression of a nonstationary time series on another nonstationary time series may produce a spurious regression. But if they are I (1); that is, they contain a stochastic trend there may not be impossible that they share the same common trend so that the regression of one on the other will not be necessarily spurious. In other words, if the series are I (1) individually but their linear combination become as I (0) then the variables are cointegreted. Economically speaking, two variables will be cointegreted if they have a long-term, or equilibrium, relationship between them. Economic theory is often expressed in equilibrium terms.

Following Glytsos (2002) we employ a Keynesian-type econometric model with dynamic perspective as the theoretical basis of the effects of remittances on macroeconomic activities. The structural simultaneous equation model is estimated by using the two-stage least square (TSLS) technique. Then we calculate reduced form equation on the basis of TSLS estimates to link remittances to the endogenous key macroeconomic variables and economic growth in both the short and the long run. Moreover, the distribution of remittance effects on the key macroeconomic variables over time is calculated. That is, we provide estimates of remittance impact, dynamic, and cumulative multipliers.

7.3 The Theoretical Framework

The study is based on Nicholas P. Glytsos (2002). Glytsos (2002) model has been used in many countries in different time like in Kyrgyzstan by Aitymbetov, S. (2006), in Pakistan by Muhammad and Ahmed (2009), in Turkey by Tansel and Yasar (2010), in Pakistan by Muhammad and Ahmed (2009), in Moldova and Albania by Blouchoutzi and Nikas (2014), in Palestine by Saad (2015).

Remittances are directly added to the national disposable income. He uses remittances in his model as a component of the national disposable income. That is, a one dollar increase in remittances will immediately increase disposable income by one dollar, ceteris paribus. It is through the remittances-generated demand and the multiplier effects that the response to the disposable income of a unit change in remittances will deviate from one. Conceptually, the impact of a unit increase in remittances on the disposable income could be greater or less than one depending on how the remittances are used in the economy. We are interested in the impact of remittances on private consumption, imports, investment, and disposable income; therefore, our model consists of three behavioral equations describing the theoretical specification of the endogenous variables, private consumption (C), imports (M), and investment (I), and an identity equation describing the market clearing condition.

The model of Glytsos (2002) is Keynesian-type econometric model with dynamic perspective. Remittance flows are modeled as exogenous to macroeconomic performance in Bangladesh. Structural model has an advantage of imposing theoretical restrictions on the parameters of the model. We can find reduced form representation of the relationship between remittances and the prime macroeconomic variables from the structural model which may not found theoretically.

7.4 The Model

For our study we adopt a very simple linear macro econometric model on the lines of a Keynesian basis, but with a dynamic perspective. It consists of three behavioral equations, namely, a consumption function, an investment function and an imports function, and a national income identity.

Our objective to adopt this type of dynamic model is to find out the short-run effects of an exogenous shock of remittances on four endogenous variables (consumptions,

investments, imports and income).Then to find out the long-run path, through which remittances move the economy ahead.

7.4.1 The Structure of the Model

In developing countries like our country Bangladesh there are lots of uncertainties present in the economy and considerable fluctuation in income observable especially due to the flow of remittance component. To produce estimates of short- and long-run effects of income on consumption we use dynamic long-run consumption equation. The dynamic Household Final Consumption (Consumption) function can be derived either from partial adjustment or an adaptive expectation hypothesis. Current consumption is a function of current income level and previous consumption level.

That is,

$C_t = f(Y_t, C_{t-1})$, where, C_t=Consumption at the time t, Y_t= Gross Domestic Product (GDP) + Wage Earners' Remittance inflows (Remittances,R_t) = Income at the time t, that is, the total income is an approximate of the national disposable income, C_{t-1}=Consumption at the time t-1.In particular,

$$C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1} + \varepsilon_{1,t} \qquad (7.1)$$

Where $\varepsilon_{1,t}$ is the stochastic disturbance for the consumption equation and we expect the coefficients of Y_t and C_{t-1} both are expected to be positive: $\alpha_1 > 0$ and $\alpha_2 > 0$. This equation seems to satisfy our criterion for a model suitable for Bangladesh.

We assume that Gross Capital Formulation (Investment) is correlated with business profits and that profits are positively related to national income and negatively related to the stock of capital, in the sense that there is some desired stock of capital toward which businessmen are orienting their investment activity. Hence we can write Gross Capital Formulation (Investment) is a function of level of Income and Previous Capital Stocks. That is,$I_t = f(Y_t, K_{t-1})$ where, I_t= Investment at the time of t, Y_t= Income at the time of t and K_{t-1}=Capital Stock at the time of t-1. Due to lack of data on Capital Stock in Bangladesh we take proxy variable by the cumulative Gross Capital Formation (Investment) approximately,

$$K_t = \sum_{i=1977}^{i=t} I_i$$

More specifically,

$$I_t = \beta_0 + \beta_1 Y_t + \beta_2 K_{t-1} + \varepsilon_{2,t} \quad (7.2)$$

Where, $\varepsilon_{2,t}$ is the stochastic disturbance for the Investment equation and we expect the coefficient of Y_t is positive and coefficient of K_{t-1} is negative, allowing some time for investment to adjust to that stock, that is, $\beta_1 > 0$ and $\beta_2 < 0$.

We assume that a large amount of remittances in Bangladesh goes to meet the import bills; we take import equation in the system based on a life-cycle hypothesis, incorporating both the current income and the wealth so the lag income is introduced.

So we take Import of Goods and Services (Imports) as a function of current and previous income and lag import. That is, $M_t = f(Y_t, M_{t-1})$, where, M_t= Imports at the time of t, Y_t=Income at the time of t, M_{t-1} = Imports at the time of t-1. More specifically,

$$M_t = \lambda_0 + \lambda_1 Y_t + \lambda_2 M_{t-1} + \varepsilon_{3,t} \quad (7.3)$$

Where, $\varepsilon_{3,t}$ is the stochastic disturbance for the Imports equation and we expect $\lambda_1 > 0$, $\lambda_2 \lesseqgtr 0$.

Lastly, we take Income Identity as follows;

$$Y_t = C_t + I_t + G_t + X_t - M_t + R_t \quad (7.4)$$

Where, Y_t=Income at the time of t,C_t =Consumption at the time of t, I_t= Investment at the time of t, G_t= General Government Final Consumption Expenditure (Government Expenditure) at the time of t, X_t= Exports of Goods and Services (Exports) at the time of t, M_t= Imports of Goods and Services (Imports) at the time of t, R_t= Remittances at the time of t.

Although Exports (X_t) and Government Expenditures (G_t) may be related to the endogenous variables namely; Consumption(C_t), Investment(I_t) and Imports (M_t), but since there is no obvious relationship between Remittances and Exports(X_t) and

Government Expenditures(G_t) we consider Government Expenditure (G_t), Exports (X_t) as exogenous to Remittances (R_t) in this model. It may be better to consider exports and government expenditures as endogenous variables in the model due to possibilities of impacts of remittances on exports and government expenditure indirectly through the consumptions, investments and imports to capture the full impact of remittances on the economy. But we believe that impact of remittances on exports is negligible in the economy of Bangladesh as the majority of exports are made up of traditional sectors and the export destinations are almost unchanged.

Again government expenditures are directly related with foreign aid and political factors. Remittances are not included with foreign aid. So we can consider remittances as exogenous variable in the model. In fact, once government expenditure is modeled as exogenous variable, the model is able to isolate the effects of remittances from the impact of foreign aid on the economy.

Our structural model consists of equations (1), (2) and (3), and an income identity, which also includes remittances.

$$C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1} + \varepsilon_{1,t} \quad (7.1)$$

$$I_t = \beta_0 + \beta_1 Y_t + \beta_2 K_{t-1} + \varepsilon_{2,t} \quad (7.2)$$

$$M_t = \lambda_0 + \lambda_1 Y_t + \lambda_2 M_{t-1} + \varepsilon_{3,t} \quad (7.3)$$

$$Y_t = C_t + I_t + G_t + X_t - M_t + R_t \quad (7.4)$$

So our model includes;

1. Four endogenous variables: Consumption (C_t), Investment (I_t) Imports (M_t) and Income ($Y_t = GDP_t + R_t$)
2. Four exogenous variables: cumulative Investment(K_{t-1}), Exports (X_t), Remittances (R_t) and Government Expenditure (G_t)
3. Predetermined variables: Lag Consumptions (C_{t-1}), Lag Imports (M_{t-1})

Now we are interested to measure the following seven parameters from the model;

1. α_1 = marginal propensity to consume
2. α_2 = the marginal impact of previous consumption on current consumption
3. β_1 = the marginal propensity to invest
4. β_2 = the marginal impact of capital stock on investment
5. λ_1= the marginal propensity to import
6. λ_2 = the marginal impact of previous imports on the current imports.

Impact Multiplier or Short-Run Multiplier

Ignoring the error term, we make necessary substitution in equations (7.1), (7.2) and (7.3) we derive the following reduced form equations for consumption, investment and import (following Muhammad and Ahmed, 2009):

$$ZC_t = C_0 + \alpha_1 X_t + \alpha_1 G_t + \alpha_1 R_t + \alpha_2(1 - \beta_1 + \lambda_1)C_{t-1} + \alpha_1\beta_2 K_{t-1} - \alpha_1\lambda_2 M_{t-1} + E_t^C \quad (7.5)$$

$$where\ , C_0 = \alpha_0(1 - \beta_1 + \lambda_1) + \alpha_1(\beta_0 - \lambda_0)\ and\ E_t^C = Z\varepsilon_{1,t} + \alpha_1(\varepsilon_{1,t} + \varepsilon_{2,t} - \varepsilon_{3,t})$$

$$ZI_t = I_0 + \beta_1 X_t + \beta_1 G_t + \beta_1 R_t + \alpha_2\beta_1 C_{t-1} + \beta_2(1 - \alpha_1 + \lambda_1)K_{t-1} - \beta_1\lambda_2 M_{t-1} + E_t^I \quad (7.6)$$

$$where\ , I_0 = \beta_0(1 - \alpha_1 + \lambda_1) + \beta_1(\alpha_0 - \lambda_0)\ and\ \ E_t^I = Z\varepsilon_{2t} + \beta_1(\varepsilon_{1,t} + \varepsilon_{2,t} - \varepsilon_{3,t})$$

$$ZM_t = M_0 + \lambda_1 X_t + \lambda_1 G_t + \lambda_1 R_t + \alpha_2\lambda_1 C_{t-1} + \beta_2\lambda_1 K_{t-1} + \lambda_2(1 - \alpha_1 - \beta_1)M_{t-1} + E_t^M \quad (7.7)$$

$$where, M_0 = \lambda_0(1 - \alpha_1 + \beta_1) + \lambda_1(\alpha_0 - \beta_0)\ and\ E_t^M = Z\varepsilon_{3,t} + \lambda_1(\varepsilon_{1,t} + \varepsilon_{2,t} - \varepsilon_{3,t})$$

Where $\frac{\alpha_1}{Z}, \frac{\beta_1}{Z}\ and\ \frac{\lambda_1}{Z}$ represent impact multipliers for consumption, investment and import respectively and $Z = (1 - \alpha_1 - \beta_1 + \lambda_1)$.

Now we can find the reduced form equation of income as follows:

$$Y_t = \varphi + \left(\frac{\alpha_1+\beta_1-\lambda_1}{Z} + 1\right)X_t + \left(\frac{\alpha_1+\beta_1-\lambda_1}{Z} + 1\right)G_t + \left(\frac{\alpha_1+\beta_1-\lambda_1}{Z} + 1\right)R_t + \left(\frac{\alpha_2}{Z}\right)C_{t-1} + \left(\frac{\beta_2}{Z}\right)K_{t-1} + \left(\frac{\lambda_2}{Z}\right)M_{t-1} + E_t^Y \quad (7.8)$$

$$\text{where}\ , \varphi = \frac{\alpha_0 - \beta_0 + \lambda_0}{Z}\ \text{and}\ E_t^Y = \frac{(\varepsilon_{1,t} + \varepsilon_{2,t} - \varepsilon_{3,t})}{Z}$$

The short-run or impact multiplier for the income $\left(\frac{\alpha_1+\beta_1-\lambda_1}{Z} + 1\right)$ is equal to impact multiplier for consumption $\frac{\alpha_1}{Z}$ plus impact multiplier for investment $\frac{\beta_1}{Z}$ minus impact multiplier for imports $\frac{\lambda_1}{Z}$ and plus one.

7.4.2 Dynamic Features of the Model

Our model is dynamic in nature as we have included lagged endogenous variables into the system. Now we can convert our equations of our system into the reduced form expression as follows:

$$C_t = \pi_{10} + \pi_{11}X_t + \pi_{12}G_t + \pi_{13}R_t + \pi_{14}C_{t-1} + \pi_{15}K_{t-1} + \pi_{16}M_{t-1} + \frac{E_t^C}{Z} \tag{7.9}$$

$$I_t = \pi_{20} + \pi_{21}X_t + \pi_{22}G_t + \pi_{23}R_t + \pi_{24}C_{t-1} + \pi_{25}K_{t-1} + \pi_{26}M_{t-1} + \frac{E_t^I}{Z} \tag{7.10}$$

$$M_t = \pi_{30} + \pi_{31}X_t + \pi_{32}G_t + \pi_{33}R_t + \pi_{34}C_{t-1} + \pi_{35}K_{t-1} + \pi_{36}M_{t-1} + \frac{E_t^M}{Z} \tag{7.11}$$

$$Y_t = \pi_{40} + \pi_{41}X_t + \pi_{42}G_t + \pi_{43}R_t + \pi_{44}C_{t-1} + \pi_{45}K_{t-1} + \pi_{46}M_{t-1} + \frac{E_t^Y}{Z} \tag{7.12}$$

Now suppose V_t denoted any of our endogenous variables C_t, I_t, M_t and Y_t then we can write the above reduced form equation system as follows:

$$V_{it} = \pi_{ij} + \pi_{ij}X_t + \pi_{ij}R_t + \pi_{ij}G_t + \pi_{ij}C_{t-1} + \pi_{ij}K_{t-1} + \pi_{ij}M_{t-1} + \frac{E_t^{V_i}}{Z} \tag{7.13}$$

The partial derivatives of the endogenous variable V_{it} with respect to any predetermined variable, $Z_j(X_t\ , G_t, R_t C_{t-1}, K_{t-1}, and\ M_{t-1})$ are $\pi_{ij}'s$ (the parameters). Symbolically,

$$\frac{\partial V_{it}}{\partial Z_{ij}} = \pi_{ij}$$

Estimates of the $\pi_{ij}'s$ may be obtained either directly by OLS from equation (7.9), or by solving the TSLS expressions of $\pi_{ij}'s$ in terms of the estimated structural parameters.

According to Koutsoyiannis (2001) the reduced-form parameters($\pi_{ij}'s$) measure the total effect, direct and indirect, of a change in the predetermined variable on the endogenous variables, after taking account of the interdependences among the jointly dependent endogenous variables.

Again in discrete variable notation, the partial derivatives of equation (7.9) are equivalent to $\Delta V = \pi\ \Delta Z$, which tells that $\pi_{ij}'s$ as a multiplier, called "impact multiplier", that represents the magnitudes of direct and indirect effects of a unit change in any predetermined variable Z on any endogenous variable V of the system, in the first year of the change in Z. Subsequent effects during the years 2, 3, ..., n come as a result of the dynamic nature of the model, through the lagged dependent variables in the form of time distributed interim multipliers, moving the system forward towards long-term equilibrium if certain conditions of convergence exist. The sum of interim multipliers gives therefore the opportunity of evaluating the overall exogenous effects of remittances on the three endogenous variables of the model. For example a change in remittances by one unit in year 1 with no further increase in the following years 2, 3 ….n, the dynamic multipliers can be obtained. From the reduced form equation (7.5), consumption function for the following period can be written as:

$$ZC_{t+1} = C_0 + \alpha_1 X_{t+1} + \alpha_1 G_{t+1} + \alpha_1 R_{t+1} + \alpha_2(1 - \beta_1 + \lambda_1)C_t + \alpha_1\beta_2 K_t - \alpha_1\lambda_2 M_t + E_{t+1}^C \tag{7.14}$$

$where, E_{t+1}^C = Z\varepsilon_{1,t+1} + \alpha_1(\varepsilon_{1,t+1} + \varepsilon_{2,t+1} - \varepsilon_{3,t+1})$

Now substituting (7.5) into (7.14) we get,

$$C_{t+1} = \frac{C_0}{Z} + \left(\frac{\alpha_1}{Z}\right)X_{t+1} + \left(\frac{\alpha_1}{Z}\right)G_{t+1} + \left(\frac{\alpha_1}{Z}\right)R_{t+1} + \left(\frac{\alpha_1\beta_2}{Z}\right)K_t - \left(\frac{\alpha_1\lambda_2}{Z}\right)M_t + \left(\frac{\alpha_2(1-\beta_1+\lambda_1)}{Z}\right) \times \left(\frac{C_0}{Z} + \left(\frac{\alpha_1}{Z}\right)X_t + \left(\frac{\alpha_1}{Z}\right)G_t + \left(\frac{\alpha_1}{Z}\right)R_t + \left(\frac{\alpha_2(1-\beta_1+\lambda_1)}{Z}\right)C_{t-1} + \left(\frac{\alpha_1\beta_2}{Z}\right)K_{t-1} - \left(\frac{\alpha_1\lambda_2}{Z}\right)M_{t-1} + \frac{E_t^C}{Z}\right) + \frac{E_{t+1}^C}{Z} \tag{7.15}$$

It can be observed from equation (7.15) that any change of remittances in the current year has the following effects on private consumption in the following period as:

$$\frac{\partial C_{t+1}}{\partial R_t} = A \times \left(\frac{\alpha_1}{Z}\right) \ , where\ A = \left(\frac{\alpha_2(1-\beta_1+\lambda_1)}{Z}\right)$$

By continuing the process of iteration the dynamic multipliers can be found for the next years as follows:

$$\frac{\partial C_{t+2}}{\partial R_t} = A^2 \times \left(\frac{\alpha_1}{Z}\right), \frac{\partial C_{t+3}}{\partial R_t} = A^3 \times \left(\frac{\alpha_1}{Z}\right), \frac{\partial C_{t+4}}{\partial R_t} = A^4 \times \left(\frac{\alpha_1}{Z}\right), \dots, \frac{\partial C_{t+n}}{\partial R_t}$$
$$= A^n \times \left(\frac{\alpha_1}{Z}\right)$$

Again, from the reduced form equation (7.6), investment function for the following period can be written as:

$$ZI_{t+1} = I_0 + \beta_1 X_{t+1} + \beta_1 G_{t+1} + \beta_1 R_{t+1} + \alpha_2\beta_1 C_t + \beta_2(1-\alpha_1+\lambda_1)K_t - \beta_1\lambda_2 M_t + E^I_{t+1}$$

(7.16)

$where, E^I_{t+1} = Z\varepsilon_{2,t+1} + \beta_1(\varepsilon_{1,t+1} + \varepsilon_{2,t+1} - \varepsilon_{3,t+1})$

Now let, $K_t = K_{t-1} + I_t$

Now substituting (7.6) into (7.16) we get,

$$I_{t+1} = \frac{I_0}{Z} + \left(\frac{\beta_1}{Z}\right)X_{t+1} + \left(\frac{\beta_1}{Z}\right)G_{t+1} + \left(\frac{\beta_1}{Z}\right)R_{t+1} + \left(\frac{\alpha_2\beta_2}{Z}\right)C_t - \left(\frac{\beta_1\lambda_2}{Z}\right)M_t + \left(\frac{\beta_2(1-\alpha_1+\lambda_1)}{Z}\right)K_{t-1} + \left(\frac{\beta_2(1-\alpha_1+\lambda_1)}{Z}\right) \times \left(\frac{I_0}{Z} + \left(\frac{\beta_1}{Z}\right)X_t + \left(\frac{\beta_1}{Z}\right)G_t + \left(\frac{\beta_1}{Z}\right)R_t + \left(\frac{\alpha_2\beta_1}{Z}\right)C_{t-1} + \left(\frac{\beta_2(1-\alpha_1+\lambda_1)}{Z}\right)K_{t-1} - \left(\frac{\beta_1\lambda_2}{Z}\right)M_{t-1} + \frac{E^I_t}{Z}\right) + \frac{E^I_{t+1}}{Z}$$

(7.17)

It can be observed from equation (7.17) that any change of remittances in the current year has the following effects on investment in the subsequent period as:

$$\frac{\partial I_{t+1}}{\partial R_t} = B \times \left(\frac{\beta_1}{Z}\right) \ , where\ B = \left(\frac{\beta_2(1-\alpha_1+\lambda_1)}{Z}\right)$$

By continuing the process of iteration the dynamic multipliers can be found for the next years as follows:

$$\frac{\partial I_{t+1}}{\partial R_t} = B \times \left(\frac{\beta_1}{Z}\right), \frac{\partial I_{t+2}}{\partial R_t} = B^2 \times \left(\frac{\beta_1}{Z}\right), \frac{\partial I_{t+3}}{\partial R_t} = B^3 \times \left(\frac{\beta_1}{Z}\right), \ldots, \frac{\partial I_{t+n}}{\partial R_t} = B^n \times \left(\frac{\beta_1}{Z}\right)$$

Lastly, from the reduced form equation (7.7), import function for the following period can be written as:

$$ZM_{t+1} = M_0 + \lambda_1 X_{t+1} + \lambda_1 G_{t+1} + \lambda_1 R_{t+1} + \alpha_2 \lambda_1 C_t + \beta_2 \lambda_1 K_t + \lambda_2 (1 - \alpha_1 - \beta_1) M_t + E_{t+1}^M \tag{7.18}$$

$$where, E_{t+1}^M = Z\varepsilon_{3,t+1} + \lambda_1 (\varepsilon_{1,t+1} + \varepsilon_{2,t+1} - \varepsilon_{3,t+1})$$

Now substituting (7) into (18) we get,

$$M_{t+1} = \frac{M_0}{Z} + \left(\frac{\lambda_1}{Z}\right) X_{t+1} + \left(\frac{\lambda_1}{Z}\right) G_{t+1} + \left(\frac{\lambda_1}{Z}\right) R_{t+1} + \left(\frac{\alpha_2 \lambda_1}{Z}\right) C_t + \left(\frac{\beta_2 \lambda_1}{Z}\right) K_t + \left(\frac{\lambda_2 (1 - \alpha_1 - \beta_1)}{Z}\right) \times \left(\frac{M_0}{Z} + \left(\frac{\lambda_1}{Z}\right) X_t + \left(\frac{\lambda_1}{Z}\right) G_t + \left(\frac{\lambda_1}{Z}\right) R_t + \left(\frac{\alpha_2 \lambda_1}{Z}\right) C_{t-1} + \left(\frac{\beta_2 \lambda_1}{Z}\right) K_{t-1} + \left(\frac{\lambda_2 (1 - \alpha_1 - \beta_1)}{Z}\right) M_{t-1} + \frac{E_t^M}{Z}\right) + \frac{E_{t+1}^M}{Z} \tag{7.19}$$

It can be observed from equation (7.17) that any change of remittances in the current year has the following effects on investment in the subsequent period as:

$$\frac{\partial M_{t+1}}{\partial R_t} = C \times \left(\frac{\lambda_1}{Z}\right), where, C = \left(\frac{\lambda_2 (1 - \alpha_1 + \beta_1}{Z}\right)$$

By continuing the process of iteration the dynamic multipliers can be found for the next years as follows:

$$\frac{\partial M_{t+1}}{\partial R_t} = C \times \left(\frac{\lambda_1}{Z}\right), \frac{\partial M_{t+2}}{\partial R_t} = C^2 \times \left(\frac{\lambda_1}{Z}\right), \frac{\partial M_{t+3}}{\partial R_t} = C^3 \times \left(\frac{\lambda_1}{Z}\right), , \ldots, \frac{\partial M_{t+n}}{\partial R_t} = C^n \times \left(\frac{\lambda_1}{Z}\right).$$

For the income identity, dynamic multipliers can be calculated by summing the multipliers for consumption and investment and then subtracting multiplier for imports from their sum.

$$\text{Dynamic Multiplier for Income Identity}(Y_n) = \frac{\partial C_{t+n}}{\partial R_t} + \frac{\partial I_{t+n}}{\partial R_t} - \frac{\partial M_{t+n}}{\partial R_t}$$

$$= A^n \times \left(\frac{\alpha_1}{Z}\right) + B^n \times \left(\frac{\beta_1}{Z}\right) - C^n \times \left(\frac{\lambda_1}{Z}\right)$$

Again, we can find out the short-run marginal propensities to consume (MPC_{SR}) and the long-run marginal propensities to consume (MPC_{LR}) are expressed respectively by

$$MPC_{SR} = \frac{\partial C_t}{\partial Y_t} \text{ and } MPC_{LR} = \frac{\partial \overline{C_t}}{\partial Y_t} = \frac{\partial C_t}{\partial Y_t}\left(\frac{1}{1 - \frac{\partial C_t}{\partial C_{t-1}}}\right)$$

Where indicating the long-run equilibrium of consumption ($C_t = C_{t-1}$). Similarly the short-run marginal propensities to import (MPM_{SR}) and the long-run marginal propensities to import (MPM_{LR}) are expressed respectively by

$$MPM_{SR} = \frac{\partial S_t}{\partial Y_t} \text{ and } MPM_{LR} = \frac{\partial \overline{M_t}}{\partial Y_t} = \frac{\partial M_t}{\partial Y_t}\left(\frac{1}{1 - \frac{\partial M_t}{\partial M_{t-1}}}\right)$$

Where $\overline{M_t}$ indicating the long-run equilibrium of import ($M_t = M_{t-1}$).

Again, we can find out the short-run marginal propensities to consume (MPC_{SR}) and the short-run marginal propensities to import (MPM_{SR}) are expressed respectively by

$$MPC_{SR} = \frac{\partial C_t}{\partial Y_t} \text{ and } MPM_{SR} = \frac{\partial M_t}{\partial Y_t}$$

7.4.3 Remittance Multiplier

Under the assumption of a change of remittances by one unit ΔR = 1, sustained for subsequent years, that is, with no further increase (ΔR = 0) in years 2, 3,...., n, all other predetermined variables in the equation remaining unchanged for t = 1, 2, ..., n years, the calculated interim multipliers are for most cases declining towards zero 7 years after the flow of remittances.

7.4.4 Impact of Remittances on Macroeconomic Variables

We are interested to measure the effects of current and past remittances on current year's value of the variables concerned, as well as the overall impact of a current change of remittances on current and future variables, over a number of years.

The effects of current and past remittances on current year's value of the variables concerned may be written as follows:

$$\Delta V_t = \sum_{j=0}^{j=n} \frac{\partial V_t}{\partial R_{t-j}} \times \Delta R_{t-j}$$

For calculating the distributed quantitative effects on consumption, investment, imports and output, we apply the estimated interim multipliers to the actual annual changes of remittances.

For example, the effects of remittances for 7 years time distribution on the endogenous variables the following specific formula can be applied:

$$\begin{aligned} V_t - V_{t-1} = \Delta V_t \\ &= \frac{\partial V_t}{\partial R_t} \times dR_t + \frac{\partial V_t}{\partial R_{t-1}} \times dR_{t-1} + \frac{\partial V_t}{\partial R_{t-2}} \times dR_{t-2} + \frac{\partial V_t}{\partial R_{t-3}} \times dR_{t-3} \\ &+ \frac{\partial V_t}{\partial R_{t-4}} \times dR_{t-4} + \frac{\partial V_t}{\partial R_{t-5}} \times dR_{t-5} + \frac{\partial V_t}{\partial R_{t-6}} \times dR_{t-6} \end{aligned}$$

where,

$\frac{\partial V_t}{\partial R_{t-j}} = \pi_j$ *the multiplier of year* j,

ΔR_{t-j} = *the actual change of remittances between year* $(t-j)$ *and* $\{(t-j) - 1\}$,

V_t = *any of our endogeneous variables* : C, I, M *and* Y,

j = 0, 1, 2… n the number of years over which the effects of remittances are distributed, converging to zero,

t=time,

Δ = the difference over two consecutive years.

Then we can calculate the proportional contribution of remittances in year t on any of the V's as follows $\left(\frac{\Delta V_t}{V_t}\right) \times 100$.

For calculating the distributed quantitative effects on consumption, investment, imports and output, we apply the estimated interim multipliers to the actual annual changes of remittances.

7.5 Estimation

We cannot estimate our above simultaneous equations model by Ordinary Least Square (OLS) method because OLS estimates are biased due to violating the exogeneity assumption of the classical linear regression. To overcome this problem we employ an instrumental variables method. In this regard we use all the exogenous and predetermined variables of our model as strong instruments. Our model is over identified model. So we use Two-Stage Least Squares Method (TSLS).

Also, the identification state of the model is considered with respect to exactly and over identification conditions. If the model is exactly identified, the method of Indirect Least Square is most appropriate for this purpose. If the model is over identified, Indirect Least Square will be biased towards yielding a unique estimate of the structural parameters; in this case a Two Stage Least Square (TSLS) method will be a better alternative, among other methods like Maximum Likelihood method of estimation

7.5.1 Two-Stage Least Squares Method (TSLS)

We use the Two-Stage Least Squares Method (TSLS) method to estimate the structural parameters of our model as in Nicholas P. Glytsos (2002). The model is estimated equation-by-equation where the endogenous variable in each equation (income) is instrumented for using the set of all candidate instruments in the model (i.e., all exogenous variables and predetermined variables).

7.6 Results and Discussion

By using TSLS we find the following results in Table 7.1(the details of the estimates are given in the Table 7.8, Table 7.9 and Table 7.10 in Appendix 7. The short-run marginal propensity to consume (MPC) in Bangladesh is 0.415. That is, when income (including remittances) increases one Taka, the household consumption increases of 0.42 Taka. The short-run MPC of Bangladesh is not so high. Lower MPC indicates higher saving rates. On the other hand long-run MPC of Bangladesh is found to be 0.718. So, long-run MPC in Bangladesh is quite high. The marginal propensity to invest (MPI) in Bangladesh is very low. The MPI is just 0.179. We estimate short-run

and long-run marginal propensity to import (MPM) to be 0.126 and 0.281 respectively in the economy of Bangladesh.

Table7. 1: Two Stage Least Squares (TSLS) Estimates of the Model

Explanatory Variables	Consumption	Investment	Import
Y_t	0.415* (7.615)	0.179* (3.868)	0.126* (4.142)
$C_t(-1)$	0.422* (4.558)	_	_
$K_t(-1)$	_	0.045*** (1.775)	_
$M_t(-1)$	_	_	0.552* (3.936)
Constant	8494.28* (4.964)	-5592.93* (-2.748)	-6747.05** (-2.414)
Adjusted R^2	0.999	0.998	0.989
Durbin-Watson	1.485	0.273	1.567
Number of Observations	37 after adjustments	37 after adjustments	37 after adjustments
Instrumental Variables	$C_t(-1)$, $Y_t(-1)$, $K_t(-1)$, $M_t(-1)$, G_t, R_t, X_t	$C_t(-1)$,$Y_t(-1)$, $K_t(-1)$,$M_t(1)$,G_t, R_t, X_t	$C_t(-1)$,$Y_t(-1)$, $K_t(-1)$, $M_t(-1)$, G_t, R_t, X_t

t-values in the parentheses

*, ** and *** indicate significant at 1% level and 10% level respectively

Source: Author

Table 7.2: Estimated Parameters of Structural Equation

S.No.	Parameters	Definition	Estimated Value
1	α_1	Marginal Propensity to Consume	0.415
2	α_2	The Marginal Impact of Previous Consumption on Current Consumption	0.422
3	β_1	The Marginal Propensity to Invest	0.179
4	β_2	The Marginal Impact of Capital Stock on Investment	0.045
5	λ_1	The Marginal Propensity to Import	0.126
6	λ_2	The Marginal Impact of Previous Imports on Current Imports	0.552

Source: Estimated

Table 7.3: Estimated Short- and Long-run Marginal Propensities to Consume (MPC), and Marginal propensities to Import (MPM) for Bangladesh

Short-Run		Long-Run	
MPC	MPM	MPC	MPM
0.415	0.126	0.718	0.281

Source: Estimates from the Table 1

We estimate the proportional contribution of remittances on consumption, investment, imports and income. We calculate the effects of current and past changes in remittances on current consumption, current investment, current imports and current income by using the estimated multipliers. To find these results we lose five years of time period 1977 to 1981. The impact of remittances is distributed and converges to zero over the seven years. So we have seven years of multipliers. We shall get total impact of current remittances after seven years. Therefore, we present our results in Table 7.4 from the period of 1982 to 2014.

When remittance increases one Taka and sustained over the seven years, we find from the estimated impact multipliers that consumption increases about 0.78 Taka in the first year. Similarly in the next six years through the interim multipliers the consumption increases namely 0.59 Taka, 0.44 Taka, 0.33 Taka, 0.25 Taka, 0.19 Taka and 0.14 Taka respectively. Hence one Taka remittance contributed in total in the economy of Bangladesh about 2.7 Taka as consumption through the consumption multipliers during the seven years of time period.

Again that one Taka remittance contributes in the economy about 0.34 Taka as investment in the first year through the investment multipliers. In the second year it becomes only 0.02 Taka. From the third year there is no any multiplier impact of remittances on investment.

On the other hand, impact multiplier or short-run effects of one Taka increase in remittances on import in the first year is about 0.24 Taka. The contributions of that one taka from the second year are 0.19 Taka, 0.15 Taka, 0.12 Taka, 0.09 Taka, 0.07 Taka and 0.06 Taka respectively. Hence one Taka remittance can increases the import in

total in the economy about of 0.92 Taka through the import multipliers during the seven years of time period.

Finally, we measure the total impact of one Taka on the income by using impact multiplier formula. We find that one Taka of remittances contributes 1.88 Taka in income in the first year. Its impact on the income from the second year become declining gradually. In the second year we find the multiplier as of 0.29 Taka. In the 7th year it become just of 0.08 Taka. Hence, one Taka of remittances contributes 1.27 Taka in income through the dynamic multipliers or interim multipliers from the second year to seventh year. So we can conclude that, one Taka increase in remittances contributes 3.15 Taka in income in Bangladesh through the impact multiplier as well as dynamic multipliers from the first year to seventh year.

Table: 7.4: Impact and Dynamic (Interim) Multiplier (ΔR=1 and sustained over the years)

	Year	**Consumption**	**Investment**	**Imports**	**Income**
Impacts Multipliers (Short-Run Effects	Year 1	0.7801	0.3365	0.2368	1.8798
Dynamic Multipliers (Interim Multipliers)	Year 2	0.5860	0.0202	0.1877	0.4185
	Year 3	0.4402	0.0012	0.1488	0.2926
	Year 4	0.3307	0.0001	0.1180	0.2128
	Year 5	0.2484	0.0000	0.0935	0.1549
	Year 6	0.1866	0.0000	0.0741	0.1125
	Year 7	0.1402	0.0000	0.0587	0.0815
Truncated Total Multipliers (Long-run Effects)	(Sum of the 7 Year)	2.7122	0.3580	0.9176	**3.1526**

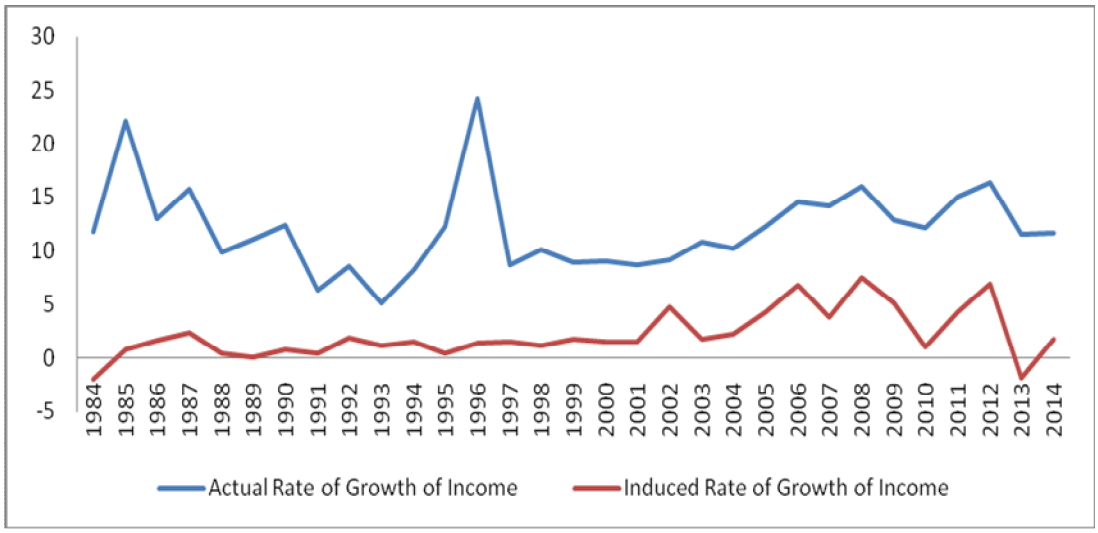
Source: Estimated

Table 7.5: Effects of Current and Past Changes in Remittances on Current Consumption, Investment, Imports and Income

Year	Annual Growth Of Remittances	Induced Growth Rate of Consumption	Actual Growth Rate of Consumption	Induced Growth Rate of Investment	Actual Growth Rate of Investment	Induced Growth Rate of Import	Actual Growth Rate of Import	Induced Growth Rate of Income	Actual Growth Rate of Income
1977									
1978	32.30		41.74		34.78		68.18		34.49
1979	61.21		16.33		14.47		20.39		18.32
1980	84.66		18.01		52.74		34.16		19.26
1981	25.92		12.24		40.01		-6.98		17.98
1982	89.59		13.77		13.56		23.45		13.63
1983	33.30		12.16		7.50		6.76		13.33
1984	-19.33	-1.95	14.28	-1.392	12.52	-4.39	3.09	-1.97	11.89
1985	12.18	0.82	20.26	0.602	17.60	1.90	17.18	0.82	22.19
1986	23.47	1.60	11.08	1.129	15.23	3.96	3.97	1.57	13.03
1987	32.01	2.32	16.40	1.723	10.30	5.84	13.97	2.28	15.75
1988	4.74	0.41	9.88	0.301	11.96	0.99	15.29	0.41	9.93
1989	0.93	0.08	11.48	0.054	14.14	0.17	16.28	0.07	11.11
1990	10.04	0.74	12.09	0.514	14.88	1.66	14.93	0.73	12.46
1991	4.72	0.37	3.7	0.244	9.13	0.86	-0.46	0.35	6.27
1992	24.63	1.90	6.21	1.202	10.78	4.31	9.23	1.78	8.58
1993	13.48	1.25	3.84	0.754	8.76	2.46	19.80	1.15	5.12
1994	16.12	1.58	7.21	0.923	10.75	3.14	6.17	1.45	8.26
1995	4.51	0.45	14.23	0.256	17.02	0.72	40.91	0.42	12.36
1996	17.51	1.49	22.24	0.770	35.02	2.50	17.53	1.37	24.32
1997	18.01	1.72	4.94	0.816	14.14	2.89	4.72	1.52	8.74
1998	11.99	1.25	8.13	0.573	11.70	2.0	12.37	1.08	10.22
1999	18.23	1.95	8.62	0.875	11.57	3.07	12.04	1.69	8.94
2000	14.82	1.75	7.15	0.737	14.13	2.65	11.20	1.49	9.13
2001	13.65	1.70	9.15	0.707	10.17	2.34	19.59	1.45	8.69
2002	42.22	5.65	5.72	2.290	8.62	8.63	-4.54	4.66	9.19
2003	12.15	2.08	11.13	0.833	12.37	3.25	8.62	1.72	10.90
2004	15.16	2.66	9.18	1.047	11.44	4.27	6.55	2.18	10.30
2005	28.27	5.12	11.72	1.953	15.16	6.46	41.86	4.18	12.31
2006	40.52	8.43	11.76	3.141	14.31	9.67	22.85	6.70	14.60
2007	18.17	4.62	14.90	1.734	14.14	5.07	20.21	3.69	14.30
2008	35.84	9.23	16.67	3.532	14.45	9.50	24.39	7.42	15.99
2009	20.12	6.36	10.66	2.401	12.17	6.97	4.02	5.02	12.86
2010	3.59	1.22	12.39	0.455	13.29	1.40	6.40	0.96	12.21
2011	17.75	5.37	15.80	1.939	19.97	4.96	44.99	4.26	15.09
2012	28.34	8.83	14.34	3.070	18.75	7.96	17.11	6.89	16.40
2013	-6.69	-2.38	12.44	-0.815	14.13	-2.22	8.78	-1.87	11.61
2014	7.31	2.20	10.41	0.737	12.82	2.11	6.91	1.71	11.68

Source: Estimated

Figure 7.1: Actual Rates of Growth of Income and Induced (by remittances) Rate of Growth of Income



Source: Table 7.5

Table 7.5 and Figure 7.1 give us brief idea about the growth rates of income in Bangladesh. Actual annual growth rate of income in Bangladesh in 1978 was 34.49%. It becomes 11.89 % in the year 1984.In that year annual growth rate of remittances was negative (-19.33%). In the year 1993 the actual growth rate of income became lowest (5.12 %) and in the year 1996 the actual growth rate of income became highest (24.32 %) except the year 1978. In the year 1997, the actual growth rate of income dropped to 8.74 %. After 1997 the growth rate increases gradually and reached top in the year 2008 with about 16% of growth rate. In that year the induced growth rate of income was highest. The growth rate was 7.42 %.

Income growth induced by remittances remains always positive except in the period of 1984 and 2013.Induced growth rates income remains 1% to 3% during the period of 1986-1987,1992-1994,1996-2001,2003-2004 and 2014. Induced growth rates income remains 3% to 5% during the period of 2002, 2005, 2007 and 2011.The rate was above 5% in the years of 2006,2008,2009,2011and 2012.

In 2001, the growth rate of remittances was 13.65 % but it became 42.22% in the next year. This sharp increase in the growth of remittance indicates the impact of September 11, 2001. In 2008, the growth rate of remittances was 35.84 % and it dropped to 3.59 % in 2010.In this year the induced growth rate was just 0.96 %. Again in 2008 the actual growth rate of income was about 16% and it became 12.2 % in 2010. So it is cleared

from this dropping rate of growths that Bangladesh also could not escape from the global economic slowdown due to financial crisis of 2007-2009. But after 2010 the growth rate of remittances turned to its golden rate and Bangladesh economy also overcome this global financial crisis and stood in standard position.

7.7 Summery and Conclusion

This chapter attempts to examine the dynamic effects of remittances on some important macroeconomic variables like consumption, investment, imports and economic growth in both the short and the long run in Bangladesh covering a period (1977-2014) following Nicholas P. Glytsos (2002) of Keynesian-type econometric model. The study finds using two-stage least square (TSLS) technique that remittances have significant positive impact on the economy.

The marginal propensity to consume (MPC) in Bangladesh is 0.415. The short-run MPC of Bangladesh is not so high. Lower MPC indicates higher saving rates. On the other hand long-run MPC of Bangladesh is found to be 0.718. So, long-run MPC in Bangladesh is quite high. The marginal propensity to invest (MPI) in Bangladesh is very low. The MPI is just 0.179.The marginal propensity to import (MPM) of Bangladesh we estimate to be 0.126.

We find that one Taka of remittances contributes 1.88 Taka in income through the impact multiplier. Its impact on the income from the second year become declining gradually. Again one Taka of remittances contributes 1.27 Taka in income through the dynamic multipliers or interim multipliers. So we can conclude that, one Taka increase in remittances contributes 3.15 Taka in income in Bangladesh through the impact multiplier as well as dynamic multipliers from the first year to seventh year.

There may be impact of September 11, 2001 or global economic slowdown due to financial crisis of 2007-2009 or any other shock in the economy, the Bangladesh grows its own way along with remittances. In Bangladesh there are still no alternatives of remittances for development. It is very essential in Bangladesh.

Appendix 7

Table 7.6: Variables Used in the Model (All Values in Crore Bangladesh Taka)

Year	Remittances	GDP	Y= GDP+REM	Govt. Expenditure	Household Consumption	Investment	Capital Stocks	Exports	Imports
1977	125.16	14930.33	15055.49	759.84	13247.42	1720.45	3209.53	1051.21	1848.59
1978	165.59	20082.03	20247.62	979.11	18776.87	2318.83	5528.36	1116.09	3108.87
1979	266.95	23690.66	23957.61	1488.67	21843.02	2654.27	8182.63	1447.31	3742.61
1980	492.95	28077.70	28570.65	1724.26	25777.64	4054.25	12236.88	1542.67	5021.12
1981	620.74	33088.00	33708.74	1453.00	28931.60	5676.50	17913.38	1697.70	4670.80
1982	1176.84	37124.90	38301.74	1645.50	32915.20	6446.10	24359.48	1884.20	5766.10
1983	1568.76	41839.10	43407.86	1802.90	36917.70	6929.70	31289.18	2344.60	6155.80
1984	1265.49	47302.10	48567.59	2055.10	42188.90	7797.40	39086.58	1606.50	6345.80
1985	1419.61	57923.90	59343.51	2334.70	50736.50	9169.90	48256.48	3118.90	7436.10
1986	1752.85	65322.10	67074.95	2744.30	56356.80	10566.80	58823.28	3385.60	7731.40
1987	2313.94	75323.90	77637.84	3120.80	65600.40	11655.20	70478.48	3758.70	8811.20
1988	2423.59	82926.50	85350.09	3454.20	72079.80	13049.30	83527.78	4501.50	10158.30
1989	2446.00	92389.30	94835.30	3837.80	80351.00	14894.00	98421.78	5118.50	11812.00
1990	2691.63	103958.55	106650.18	4213.70	90067.55	17110.20	115531.98	6142.20	13575.10
1991	2818.65	110518.22	113336.87	4571.40	93423.62	18673.10	134205.08	7363.40	13513.30
1992	3513.26	119542.46	123055.72	5321.10	99225.50	20686.86	154891.94	9069.30	14760.30
1993	3986.97	125369.44	129356.41	6210.60	103036.60	22499.84	177391.78	11304.90	17682.50
1994	4629.63	135412.33	140041.96	6612.40	110465.40	24919.33	202311.11	12189.20	18774.00
1995	4838.31	152517.79	157356.10	7061.40	126178.80	29161.09	231472.20	16570.50	26454.00
1996	5685.30	189933.40	195618.70	8979.10	154236.60	39373.10	270845.30	18435.90	31091.30
1997	6709.15	206003.20	212712.35	10100.30	161847.60	44942.10	315787.40	21672.30	32559.10
1998	7513.23	226929.90	234443.13	11631.70	175004.50	50200.10	365987.50	26680.90	36587.30
1999	8882.74	246508.90	255391.64	12423.10	190082.20	56010.20	421997.70	28986.10	40992.70
2000	10199.12	268503.40	278702.52	13353.00	203664.20	63926.80	485924.50	33144.60	45585.20
2001	11590.79	291337.00	302927.79	14117.20	222304.50	70428.70	556353.20	39000.00	54513.40
2002	16484.53	314280.40	330764.93	15785.20	235029.50	76500.30	632853.50	39002.10	52036.70
2003	18485.12	348320.20	366805.32	17862.90	261198.70	85962.60	718816.10	39817.00	56521.00
2004	21286.52	383294.00	404580.52	19833.10	285166.90	95792.20	814608.30	42723.90	60222.10
2005	27304.34	427074.10	454378.44	22123.40	318599.80	110315.10	924923.40	61468.10	85432.30
2006	38366.56	482336.97	520703.53	26239.51	356064.88	126102.88	1051026.28	78878.80	104949.10
2007	45337.35	549799.70	595137.05	29466.27	409126.63	143929.30	1194955.58	93440.30	126162.80
2008	61587.83	628682.20	690270.03	32554.91	477312.18	164729.02	1359684.60	111018.10	156932.00
2009	73981.46	705071.80	779053.26	35914.56	528188.52	184771.52	1544456.11	119440.10	163242.90
2010	76639.97	797538.70	874178.67	40477.69	593629.07	209327.24	1753783.35	127798.50	173693.80
2011	90240.85	915828.80	1006069.65	46683.89	687405.34	251129.17	2004912.53	182452.10	251841.70
2012	115816.93	1055204.04	1171020.97	53175.35	785979.99	298225.30	2303137.83	212745.90	294922.50
2013	108066.93	1198923.17	1306990.10	61338.49	883785.04	340369.74	2643507.57	234244.10	320814.20
2014	115969.62	1343674.40	1459644.02	71718.90	975767.80	383993.60	3027501.17	255159.20	342965.10

Source: BMET and WDI, World Bank

Table 7.7: Distributed Quantitative Effects of Remittances on Consumption, Investment, Import and Income (All Values in Crore Bangladesh Taka)

Year	Induced Consumption by Remittance (ΔCt)	Induced Investment by Remittance (ΔIt)	Induced Import by Remittance (ΔMt)	Induced Income by Remittance (ΔYt)
1984	-822.53	-108.57	-278.28	-956.09
1985	418.00	55.18	141.42	485.88
1986	903.81	119.30	305.78	1050.57
1987	1521.79	200.87	514.86	1768.89
1988	297.39	39.26	100.62	345.68
1989	60.78	8.02	20.56	70.6
1990	666.20	87.94	225.39	774.37
1991	344.50	45.47	116.55	400.44
1992	1883.92	248.67	637.37	2189.83
1993	1284.80	169.59	434.68	1493.42
1994	1743.02	230.07	589.71	2026.05
1995	565.98	74.71	191.49	657.89
1996	2297.21	303.22	777.20	2670.22
1997	2776.89	366.54	939.49	3227.79
1998	2180.83	287.86	737.82	2534.94
1999	3714.39	490.29	1256.66	4317.52
2000	3570.29	471.26	1207.91	4150.02
2001	3774.49	498.22	1277.00	4387.38
2002	13272.80	1751.96	4490.50	15428.01
2003	5426.00	716.21	1835.74	6307.06
2004	7597.96	1002.90	2570.57	8831.69
2005	16321.53	2154.38	5521.95	18971.78
2006	30002.95	3960.28	10150.69	34874.76
2007	18906.18	2495.54	6396.40	21976.11
2008	44074.55	5817.67	14911.44	51231.26
2009	33614.00	4436.92	11372.40	39072.16
2010	7210.41	951.75	2439.45	8381.22
2011	36888.31	4869.12	12480.17	42878.13
2012	69367.44	9156.24	23468.61	80631.15
2013	-21019.55	-2774.50	-7111.40	-24432.65
2014	21433.68	2829.16	7251.51	24914.02

Source: Estimates of the study

Table 7.8: Estimation of Consumption Equation by TSLS Method

Dependent Variable: CT Method: Two-Stage Least Squares Sample (adjusted): 1978 2014 Included observations: 37 after adjustments				
CT=C(1)+C(2)*YT+ C(3)*CT(-1)				
Instrument list: CT(-1) YT(-1) KT(-1) MT(-1) GT RT XT				
Representation: CT=8494.27+0.415*YT+ 0.422*CT(-1)				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	8494.275	1711.226	4.963852	0.0000
C(2)	0.415160	0.054515	7.615468	0.0000
C(3)	0.422194	0.092630	4.557833	0.0001
R-squared	0.999701	Mean dependent var		244845.1
Adjusted R-squared	0.999684	S.D. dependent var		256383.2
S.E. of regression	4559.051	Sum squared resid		7.07E+08
F-statistic	56897.42	Durbin-Watson stat		1.485484
Prob(F-statistic)	0.000000	Second-Stage SSR		1.14E+09

Source: Author

Table 7.9: Estimation of Investment Equation by TSLS Method

Dependent Variable: IT Method: Two-Stage Least Squares Sample (adjusted): 1978 2014 Included observations: 37 after adjustments				
IT=C(1) +C(2)*YT +C(3)*KT(-1)				
Instrument list: CT(-1) YT(-1) KT(-1) MT(-1) GT RT XT				
Representation : IT=-5592.93 +0.179*YT +0.045*KT(-1)				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-5592.930	2035.165	-2.748146	0.0095
C(2)	0.178929	0.046262	3.867715	0.0005
C(3)	0.044804	0.025238	1.775232	0.0848
R-squared	0.998210	Mean dependent var		81737.61
Adjusted R-squared	0.998104	S.D. dependent var		100921.3
S.E. of regression	4394.078	Sum squared resid		6.56E+08
F-statistic	9477.472	Durbin-Watson stat		0.272580
Prob(F-statistic)	0.000000	Second-Stage SSR		6.83E+08

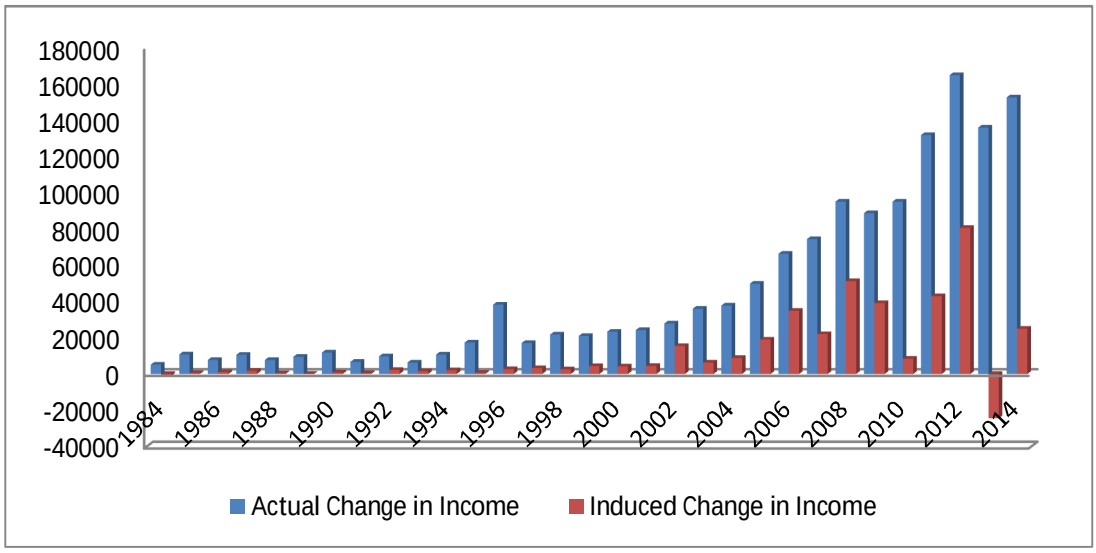
Source: Author

Table 7.10: Estimation of Import Equation by TSLS Method

Dependent Variable: MT Method: Two-Stage Least Squares Sample (adjusted): 1978 2014 Included observations: 37 after adjustments				
MT=C(1) +C(2)*YT +C(3)*MT(-1)				
Instrument list: CT(-1) KT(-1) YT(-1) MT(-1) GT RT XT				
Representation : MT=-6747.05 +0.126*YT +0.552*MT(-1)				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-6747.050	2794.624	-2.414296	0.0213
C(2)	0.125550	0.030313	4.141819	0.0002
C(3)	0.551708	0.140166	3.936116	0.0004
R-squared	0.990224	Mean dependent var		70718.50
Adjusted R-squared	0.989649	S.D. dependent var		94835.64
S.E. of regression	9648.679	Sum squared resid		3.17E+09
F-statistic	1721.770	Durbin-Watson stat		1.566723
Prob(F-statistic)	0.000000	Second-Stage SSR		3.19E+09

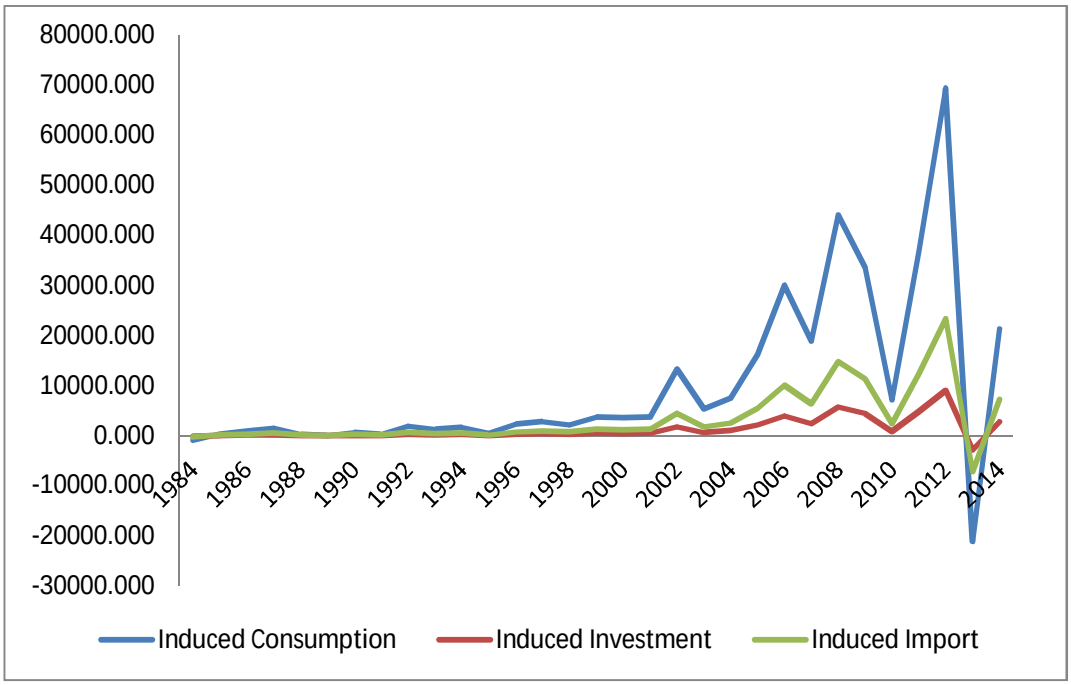
Source: Author

Figure 7.2: Comparison Induced Change in Income with Actual Change in Income (Both the values in Crore Bangladesh Taka)



Source: Estimated

Figure 7.3: Distributed Quantitative Effects of Remittances on Consumption, Investment, Import and Income (All Values in Crore Bangladesh Taka)



Source: Table 7.7 (Appendix 7)