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MACRO ECONOMIC SHOCKS AND REMITTANCE INFLOWS : THE CASE OF INDIA

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ABSTRACT

International remittances to India have grown steadily over the years, making it the leading recipient of remittances in the World. Given the magnitude of remittance receipts and impact on the receiving country, a better understanding of what causes volatility in remittances is warranted. The paper estimates a Vector Error Correction (VEC) Model for India to determine the responsiveness of remittance inflows to macroeconomic shocks in both home and host countries using time series data over a 30 year period. The study finds that remittance inflows to India are procyclical, indicating the limited use of remittances in absorbing income shocks. On the other hand, remittances effectively safeguard the country against shocks in oil prices and exchange rates. Also, the procyclicality of remittances reflect the investment orientation of migrant remittances to India.

Key words: *Remittances, Macroeconomic Shock, Cointegration, Vector Error Correction Model, India*

1. Introduction

In many developing countries, international remittances are an important source of income for millions of families and of foreign exchange earnings. In 2015, the total flow of workers' remittances amounted to US$582 Billion and this represented almost a 6 fold increase since 1996. Of this, developing countries received $440 Billion, more than four times the development aid from all sources (World Bank, 2016). Official international remittances sent back home by migrants represent the second largest source of net financial flows to developing countries, outpacing the Official Development Assistance and more stable than Private Capital Flows, according to a recent World Bank Report (World Bank, 2016).

This holds true for India where workers' remittances have remained an almost stable and reliable source of external financing over the last three decades. Remittance inflows to India were relatively resilient to domestic and external shocks, even during periods of crisis. India has remained the World's largest recipient of remittances for several years, with remittance inflows often surpassing all official and private capital flows. The developmental impact of remittance inflows in any context would ultimately depend on the end use of transfers, but the sheer magnitude and stability of remittance inflows have led to the general perception that they have positively contributed to the overall development of the Indian economy. At the macro level, remittances have undoubtedly been the most stable component in India's Balance of Payments and the increase in it has helped to reduce the current account deficit to a considerable extent.

However, remittance inflows to developing countries is showing signs of slowing down against the backdrop of low oil prices and weak economic growth in oil exporting countries. In addition to these cyclical factors, exchange controls imposed by remittance receiving countries due to weakening exports and falling international reserves might have dampened remittance flows especially through formal channels. With the oil prices falling for the second consecutive year, the officially recorded remittances to developing countries also saw a decline of over 2.4% from $440 billion in 2015 to $429 billion in 2016. India, while retaining the top slot among remittance receiving countries, led the decline with remittance flows amounting to $62.7 billion last year, a significant decrease of 8.9% over $68.9 billion in 2015 (World Bank, 2017). The NRI deposits of banks, which in a way forms part of remittances slowed down as well.

The volatility of remittances in recent years is a pointer to the possibility that inward remittances to India are sensitive to movements in macro economic variables. Though the country has been able to withstand the fall in remittances with the benefits of low import bills, it can be quite challenging in the long run since a prolonged dip in remittances would result in a corresponding drain in rupee resources. In this context, the need for analyzing the impact of macroeconomic shocks on remittance receipts assumes greater significance. The paper is an attempt to understand the macro economic factors that are possibly linked to remittance inflows in the long run and also to determine the response of remittance receipts to shocks in macro economic variables.

The rest of the paper is organized as follows: Section II discusses the literature on the possible determinants of remittances, the magnitude and trend of remittances is discussed in Section III, Section IV presents the econometric analysis and results; Section V concludes.

II. Previous literature

Existing theoretical literature on the determinants of international remittances mainly focus on the altruistic and investment motives behind migrants' decision to remit. The results of majority of these studies suggest that workers' remittances are motivated to a great extent by altruistic motives rather than investment considerations.

According to Lucas and Stark (1985), if remittances were negatively correlated with the household income back home, altruistic motives would be considered dominant, while migrants could be motivated by self interest if remittances were positively related to household income. Many researchers have tried to test these assumptions at the macroeconomic level using aggregate data and generally concluded that remittances would be countercyclical if altruistic motives prompted migrants' decision to remit. Alternatively, investment motives could be dominant, in which case, remittances would be procyclical and would respond to interest rate differentials between home and host countries. These studies typically found that other macroeconomic variables like exchange rates, inflation in the home country and political and investment climate in the home and host countries are all likely to have an impact on international remittances received by countries.

Straubhaar (1986), in an attempt to establish correlations between macroeconomic variables and remittance inflows to Turkey, found that Turkish inward remittances were positively correlated to wages and employment in Germany.

El-Sakka and McNaab (1999) tried to explain the remittance behaviour in Egypt using the real income levels in the host and home countries, domestic inflation variable, interest rate differentials, and the black market premium for foreign exchange as regressors. The study found that remittances increased with Egyptian inflation and income abroad and tend to decline with black market premium.

Using cointegration techniques, Bougha-Hagbe (2004) developed a model to explain remittance inflows to Morocco. The findings indicated that remittance transfers to Morocco are negatively correlated with real GDP in Morocco and positively correlated with wages in the host country.

For Sri Lanka, Lueth and Ruiz-Arranz (2007) estimated a Vector Error Correction (VEC) Model to determine the response of remittance inflows to macro economic shocks. The analysis revealed that remittances increased with increase in oil prices and declined with the weakening of domestic currency. The study also found evidence to show that remittance flows to Sri Lanka are procyclical which indicates the investment orientation of migrant remittances.

Lueth and Luiz-Arranz (2007) , tried to understand the determinants of remittances using a novel dataset of bilateral remittance flows within a gravity framework. The study found that although the evidence on the motives to remit was mixed, altruism maybe less of a factor, contrary to the popular belief. Also, the regression results show that remittance receipts are procyclical and decline when export weakens and GDP growth slows, indicating the limited use of remittances as a hedge against macroeconomic shocks. This is further confirmed by the positive correlation between exchange rates and remittances.

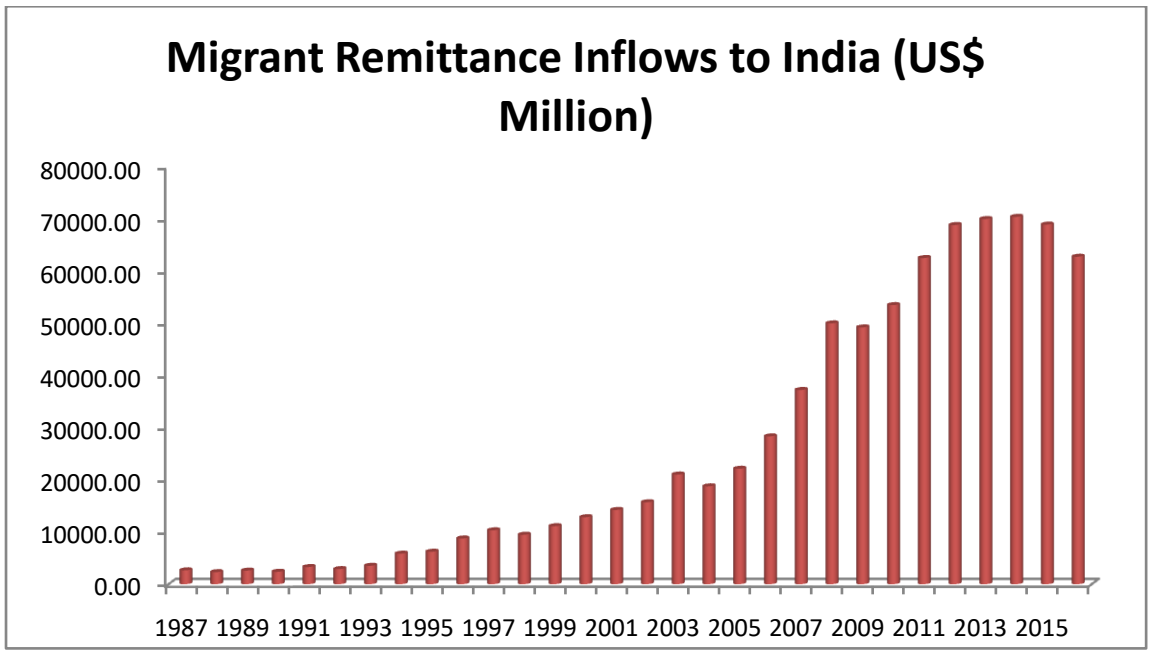
In the Indian context, Gupta (2005) analyzed the macroeconomic determinants of remittance inflows to India and observed that many macroeconomic factors, especially those associated with the source country like return on domestic stock market and exchange rate changes are not significant in explaining the behaviour of remittances over time. However, indicators of economic activity in the host countries like the US employment rate were found to affect the remittance inflows. The analysis also found remittances to be somewhat countercyclical, that is, higher during periods of low economic growth.

III. Magnitude and trend of remittances to India

Remittances to India have grown steadily over the years and is broadly in line with the general trend in remittance flows to developing countries. But the rise has been somewhat dramatic for India in the last 10 years. Earnings by expatriate Indians have always been the most stable component of India's Balance of Payment and have played a vital role in offsetting the current account deficits to a large extent. In the year 2016, workers' remittances accounted for 2.8 per cent of GDP (World Bank, 2016) , which may seem insignificant in a large economy like India. But, when compared to other forms of foreign financing, Official Development Assistance, Foreign Direct Investment and Portfolio Investment, remittances appear to be relatively important.

Migrant remittances to India picked up in the 90s after remaining flat till the end of 80s. Between 2000 and 2004, remittances almost doubled. The last decade, the period between 2007 and 2016 saw a remarkable growth in remittances, with remittance inflows reaching an all time high of $70 billion in 2014 before dropping slightly in the following year. 2016 saw a significant decline of about 9% in remittances. Despite the drop, India still remains the World's largest recipient of remittances, closely followed by China.

Figure 1: Trend in migrant remittance inflows to India (1987-2016)



Source: Derived from World Bank Data

Of the total remittance inflows to India, roughly around 52 % are accounted for by expats staying in Gulf countries (World Bank, 2016). According to Ministry of External Affairs, 65% of the total NRI population are concentrated in oil rich Gulf countries (MEA, 2016) whose economic activities are closely related to oil prices, which in turn makes inward remittances sensitive to swings in oil prices.

IV. Econometric Analysis and Results

The dataset for the study covers the period from 1987 - 2016 on a yearly basis. For economic environment in the home country, the variables chosen were Nominal Domestic GDP in US Dollars, Domestic Inflation Index and Exchange Rate.

Movements in Oil Prices was chosen as proxy for representing the economic conditions in the host countries. Crude oil price fluctuations are closely followed by countries across the globe on account of the significant impact they have on their economies. The impact is relatively high for India as it is one of the largest importers of oil in the world. Also, a vast majority of overseas remittances, India's most stable source of revenue generation, come from workers staying in the oil exporting Gulf countries. Thus, in any study relating to remittances in the Indian context, oil price may be a good proxy for the economic activity in the host countries.

The data used in the analysis were drawn mostly from the IMF Database and World Bank Data. Remittances in current millions of US dollars is taken from the World Bank's World Development Indicators and represent the sum total of private transfers from migrants and compensation of employees. Nominal GDP of India in millions of US dollars, Domestic inflation index based on average consumer prices and World crude oil prices are taken from IMF World Economic Outlook database. Crude oil prices represent a simple average of three spot prices; Dated Brent, West Texas Intermediate and Dubai Fateh in US dollars. The period average of nominal exchange rate of rupee against dollar is sourced from IMF International Financial Statistics database.

Figure 2: Correlations of Remittances and Macroeconomic Variables

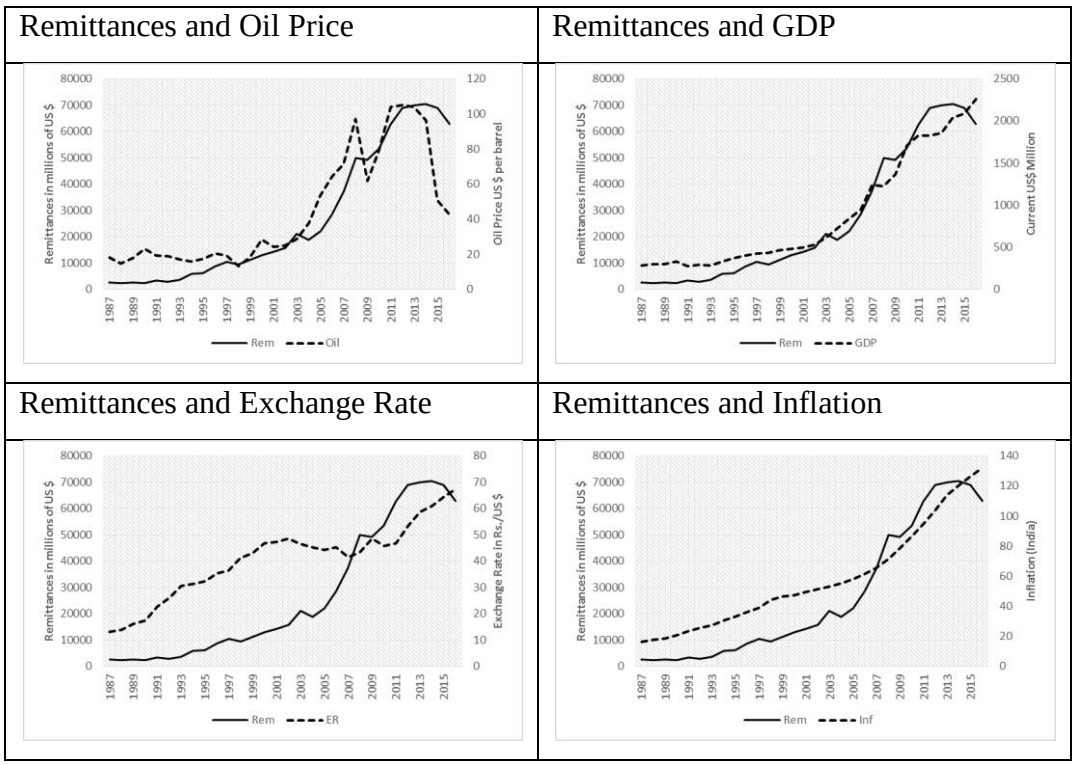


Table. 1: Descriptive Statistics of the study variables

	Mean	Std. Deviation	Minimum	Maximum
Migrant Remittance Inflows to India (US$ Million)	26589.5	25160.8	2317.0	70389.0
Annual Avg Price of Crude Oil ($/bbl)	43.6	31.9	13.1	105.0
GDP India (Current US$ Million)	884.4	668.0	274.8	2263.8
Exchange Rate (Rupee/US Dollar)	40.5	14.4	13.0	67.2
Inflation (India)	58.2	34.5	16.5	132.0

The first step was to test the stationary of the macroeconomic series using the Augmented Dickey Fuller Test. The results indicated that all series were integrated of order one. As shown in Table 1, the t statistics of all variables were not significant in levels which meant

that the data series had unit roots and were non stationary in levels, while in the first differences, the data series were found to be stationary .

Table 2: Augmented Dickey Fuller Test (Sample: 1987 - 2016)

	Level		First difference		
	t-Statistics	Model	t-Statistics		Model
Remittance	0.329	3	-2.539	***	3
Oil Price	1.503	2	-4.898	***	2
GDP India	1.026	2	-5.280	***	2
Exchange Rate	-1.390	2	-4.196	***	2
Inflation (India)	1.365	2	-5.038	***	2

Next, a co integration analysis was performed using the Johansens approach (Johansen, 1991) to test the existence of a co integration vector to find out whether macro economic variables affect remittances in the long run. The study used one lag to preserve sufficient degrees of freedom. Both the Trace statistic and Eigen value statistic confirmed the presence of a co integration relationship between remittances, nominal GDP, oil prices, exchange rate and inflation index.

Table 3: Co integration Test for REM, GDP, INF, ER, OIL

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eigen Statistic
None *	0.793194	90.9222 ***	44.12725* **
At most 1	0.489375	46.7949 6	18.81937
At most 2	0.464847	27.9755 9	17.50565
At most 3	0.311291	10.4699 4	10.44222
At most 4	0.000990	0.02772 1	0.027721

The movement of remittance receipts with the other macro economic variables over the long run can be identified from the following cointegrating equation (*the values given in parenthesis are t-statistic*).

$$REM = -29013.42 - \underset{(6.886)}{2127.42} \times INF + \underset{(7.443)}{1853.71} \times ER + \underset{(7.943)}{102.98} \times GDP + \underset{(5.356)}{301.04} \times OIL$$

Over the long run, remittance receipts increase with increase in Indian economic activity, increase as the currency depreciates (exchange rate increases), increase with rise in oil prices and decline as the domestic price level increases.

Since the variables were stationary in the first differences and there existed a co integration relationship between them, Vector Error Correction Model (VECM) could be developed to study the effect of macro-economic variables on remittances in the short run. The estimates of the model are presented in Table 4. The coefficient of error correction model was negative

and statistically significant representing a speed of adjustment of about 50 % to adjust any disequilibrium towards long term equilibrium state.

Table 4. Coefficients of Vector Error Correction Model

Error Correction:	D(REM)	D(OIL)	D(GDP)	D(ER)	D(INF)
CointEq1	-0.505941	-0.001757	-0.007036	0.000136	-0.000119
	(0.10475)	(0.00070)	(0.00460)	(0.00014)	(5.6E-05)
	[-4.82985]	[-2.52449]	[-1.53087]	[0.99867]	[-2.13525]
D(REM(-1))	-0.287033	-0.002118	-0.001296	7.57E-05	0.000120
	(0.18061)	(0.00120)	(0.00792)	(0.00023)	(9.6E-05)
	[-1.58928]	[-1.76483]	[-0.16359]	[0.32340]	[1.24608]
D(OIL(-1))	-14.09601	-0.403693	-4.210636	0.066080	-0.041035
	(43.3636)	(0.28813)	(1.90273)	(0.05619)	(0.02309)
	[-0.32507]	[-1.40110]	[-2.21294]	[1.17596]	[-1.77707]
D(GDP(-1))	-3.259912	-0.085083	-0.416929	-0.008267	-0.007405
	(12.6342)	(0.08395)	(0.55437)	(0.01637)	(0.00673)
	[-0.25802]	[-1.01353]	[-0.75207]	[-0.50494]	[-1.10059]
D(ER(-1))	-38.56643	-3.011963	-7.961949	-0.216439	-0.184088
	(344.758)	(2.29072)	(15.1275)	(0.44675)	(0.18358)
	[-0.11187]	[-1.31485]	[-0.52632]	[-0.48447]	[-1.00274]
D(INF(-1))	64.64898	0.720933	15.56706	0.456546	0.874050
	(273.656)	(1.81829)	(12.0077)	(0.35461)	(0.14572)
	[0.23624]	[0.39649]	[1.29643]	[1.28744]	[5.99802]

C	2880.776	14.64899	58.48443	0.784402	1.233222
	(1014.09)	(6.73807)	(44.4969)	(1.31410)	(0.54001)
	[2.84074]	[2.17406]	[1.31435]	[0.59691]	[2.28371]
R-squared	0.816480	0.432697	0.353813	0.301617	0.885713
Adj. R-squared	0.764046	0.270610	0.169189	0.102079	0.853059
Sum sq. resids	73942648	3264.457	142364.0	124.1643	20.96717
S.E. equation	1876.454	12.46797	82.33613	2.431581	0.999218
F-statistic	15.57154	2.669539	1.916391	1.511579	27.12457
Log likelihood	-246.7426	-106.3513	-159.2054	-60.58190	-35.68083
Akaike AIC	18.12447	8.096521	11.87182	4.827278	3.048630
Schwarz SC	18.45752	8.429572	12.20487	5.160329	3.381682
Mean dependent	2158.143	1.002429	70.14811	1.902857	4.084429
S.D. dependent	3862.998	14.59876	90.33150	2.566078	2.606688

Determinant resid covariance (dof adj.)	2.25E+12
Determinant resid covariance	5.35E+11
Log likelihood	-576.7241
Akaike information criterion	44.05172
Schwarz criterion	45.95487

To get a deeper understanding about the short run adjustments of the variables, impulse response functions were applied, the results of which are presented in Figure 3. The impulse response functions illustrate how remittances respond to one standard deviation shock in exchange rate, domestic GDP, inflation and oil prices before they are forced to the long term path. The variables were ordered as listed in the VEC Model. The results are summarized below:

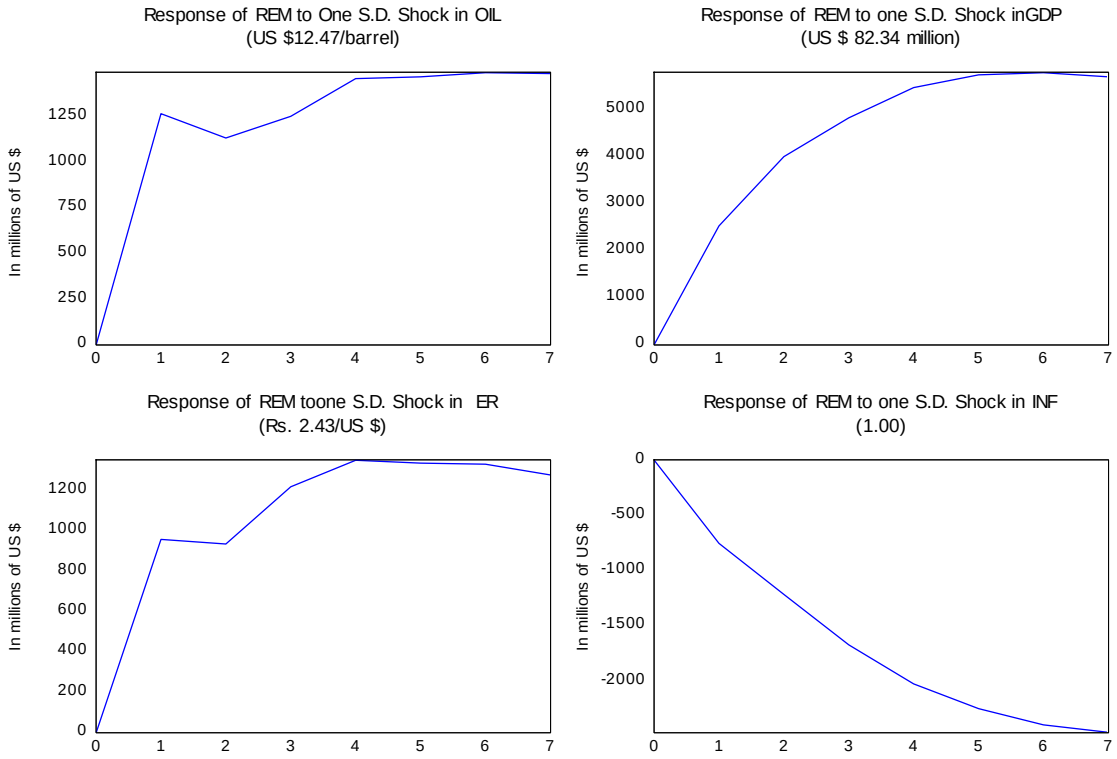
***Remittances are directly related to oil prices*:** An oil price increase of $12.4 per barrel, increase the remittances by about $1250 million in the first year. Though the next year saw a decrease in remittances by an amount of about $200 million , in the subsequent years, remittances increase and from the fourth year onwards it attains a stability at a higher value of about $1400 million. This might be particularly significant for India as a sizeable proportion of India's migrant population are residing in the oil rich Gulf countries and the results suggest that strong economic growth in the host countries allow migrants to earn and remit more.

Remittances increase when exchange rate increases: When the exchange rate increases by Rs. 2.4/US $, remittances increase by about $1000 million in the first year. After a slight decline in the second year, remittances increase to the highest value of about $1400 million in the fourth year. It remains almost stable during the subsequent two years. From the sixth year onwards it shows a declining trend.

The responses of remittances to oil price and exchange rate are almost similar during the first four years. In both cases, the sudden responses of remittances diminish in the second year and attain the highest response in the fourth year.

Remittances are procyclical: Remittances increase with increase in the economic activity of the home country. The response is comparatively smooth and intense. An increase in the GDP by an amount of $ 82.34 million makes an increase of more than $1000 million in the remittances during the first year. During the subsequent years, remittances increase at a uniform diminishing rate and attain the highest level of above $ 5000 million in the sixth year. The result implies that remittances might not be quite useful in safeguarding against GDP shocks. Also, the procyclicality of remittances suggests that remitting decisions are prompted by investment climate in the home country along with altruistic considerations.

Figure 3: Impulse Response Functions of Remittances



Remittances decrease with inflation: An inflation of 1 index in India, make a decrease in the remittance by more than $ 500 million in first year. Due to the effect of the inflation, the remittances further decrease and attain the highest level of response in the seventh year.

V. Conclusion

The paper attempts to determine the responsiveness of remittance inflows to macroeconomic shocks in both home and host countries. The analysis indicate that remittance inflows to India are procyclical and are positively correlated with domestic GDP. Although this finding confirms the investment orientation of remittance inflows, there is no conclusive evidence to project investment considerations as a prime motive since relative rates of return are not considered in this study. Also, the procyclicality of remittances indicate the limited use of remittances as a hedge against income shocks.

However, the paper finds strong evidence that remittance inflows increase when the currency weakens and hence provide insurance against any balance of payment crisis by offsetting the current account deficits. The analysis clearly show that remittances are positively correlated

with oil prices offering a hedge against oil price shocks. This finding has relatively high significance for India as it is one of the largest importers of oil in the world and the country would be able to withstand the pressure of high export bills with increased remittance inflows.

The results suggest that remittances can positively contribute to the overall development of the Indian economy by enhancing investment and absorbing shocks to oil prices and exchange rates. On the other hand, they may be of little help in buffering the GDP shocks. While it is very important to further facilitate the inflow of remittances with favourable policy decisions, remittances should not be seen as a substitute for Government policy and structural reform.

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