

MACROECONOMIC DETERMINANTS OF PRIVATE TRANSFERS TO INDIA

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Abstract

After the implementation of economic reforms in 1991, private transfers to India have played a major role in financing the trade deficits and reducing the current account deficits. Most of the studies find that host country³ macro-economic (push) factors play a more important role as compared to the home country macro-economic (pull) factors in determining the magnitude of private transfers. This study, covering the period from 1991-92Q4 to 2010-11Q4, examines various macroeconomic determinants of private transfers to India. While GDP of USA and Dubai Crude Oil prices are taken as proxies for the host-country macroeconomic factors, US \$-INR bilateral nominal exchange rate and all India average CPI for industrial workers have been taken as proxies for the home country macroeconomic factors. The study conducts an econometric investigation by applying methodologies, viz., (i) Stationarity Tests; (ii) Johansen's Cointegration Test; (iii) Johansen's Vector Error Correction Model (VECM) in VAR; and, (iv) Impulse Response Function and Variance Decomposition Analysis. With all the variables in log terms being $I(1)$, Johansen's cointegration test confirms two long run relationships among the variables at 5% significance level. The Vector Error Correction Model (VECM) indicates that while private transfers may temporarily deviate from its long run equilibrium, the deviations adjust towards the equilibrium level in the long run. The elasticity of private transfers with respect to GDP of USA, Dubai crude oil prices, US \$-INR bilateral nominal exchange rate and All-India CPI for industrial workers is found to be significant, which shows that both host as also home country macroeconomic factors have influenced the magnitude of private transfers to India.

Keywords: Migration, Private transfers, Macroeconomic factors, Time Series Econometrics

JEL Classification: F24

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Note: The views expressed by authors are not those of the Institution to which they are affiliated to.

³ Host country and home country refer to the country of origin of remittances and the remittance receiving country, respectively.

1. Introduction

Officially recorded private transfers (remittance flows)⁴ to the developing countries are estimated (World Bank, 2011) to have reached US \$ 372 billion in 2011, up by 12.1 per cent over 2010, which are expected to grow at 7-8 percent annually to reach US \$ 467 billion by 2014. While other financial flows to the developing countries have shown sizeable decline, mostly owing to the world financial crisis, private transfers have shown counter-cyclicality and resilience. Therefore, the study of private transfers has become pertinent, particularly from the view point of the developing nations.

Regarding India, private transfers to India have grown from US \$ 134 million in 1970-71 to US \$ 55,862 million in 2010-11, registering a compound annual growth of 16 percent over the period. India continues to be the highest recipient of private transfers in 2011 as well. A sharp increase in private transfers to India can be seen since the early nineties, owing to enhanced confidence in the Indian economy and migration of technically highly skilled people (to USA, Canada, Australia, etc.) with higher earnings. Considering the importance of private transfers in India in recent times, there is a dearth of studies on the subject in the Indian context. This paper is an attempt to fill this research gap.

Looking at the cross-border migration from India, the current phase of migration, which began in the 1990s, was in response to the expanding demand from the industrialized countries arising from the productivity boom in those countries, for highly skilled workers. The present study, over a time span of 20 years from 1991-92Q4 to 2010-11Q4, covers the current phase of migration of highly skilled workers from India to the developed countries.

Cross-border financial flows to India arising from international migration can be put under two broad heads: (i) private transfers; and, (ii) capital flows.⁵ Inflows from overseas Indians are mainly in the form of funds for family maintenance, which form part of current account in Balance of Payments (BoP) statement, Non-Resident Indian (NRI) deposits with banks in India, foreign direct and portfolio investments by NRIs, etc., which are included under capital account in the BoP Statement. Reserve Bank of India (RBI) classifies inward remittances to India under two broad heads, viz., direct inward remittances through official channels⁶ and funds domestically withdrawn from Non-resident rupee deposit accounts. RBI treats such inward remittances, along with gold and silver brought through declared passenger baggage and personal gifts/donations to charitable/religious institutions in India, as "private transfers" under current account of the BoP. These transfers represent one-sided transactions, i.e., transactions that do not have any *quid pro quo*. These are unrequited receipts in India.

Private transfers can take various forms, ranging from funds transferred through 'formal' or regulated institutions or channels (e.g., banks, non-bank financial institutions, and money transfer operators) to 'semi-formal' and 'informal' channels (e.g., hawala, cash carried in person, in-kind transfers). The Remittances Coordination Group (IMF, 2009a) emphasized that all international transactions, no matter whether they are informal or formal, legal or illegal, should

⁴ Private transfers, as defined by Reserve Bank of India, are current transfers between residents and non-residents. Some of the important concepts related to private transfers, as defined in the IMF (2009b) and the RBI (2010b), are given in Appendix-A.

⁵ It may be noted that only a part of capital flows can be attributed to international migration.

⁶ Details of official and unofficial channels are given in Appendix-B

be conceptually covered under balance of payments compilation. However, because of the difficulties in obtaining data, private transfers undertaken through informal channels are not well covered in current BoP data in India. Various official channels for receipt/payment of inward/outward remittance transfers to/from India are given in the **Appendix-B**.

Section 1 deals with the concept of private transfers, highlights the various channels for receiving private transfers in India and the major components of private transfers. Section 2 highlights the role of private transfers in the BoP of India. The literature survey on the determinants of private transfers follows in Section 3. In Section 4, an attempt has been made to perform an empirical analysis of macroeconomic determinants of private transfers to India. Section 5 concludes.

The major components of private transfers over the years have been: (i) inward remittances for family maintenance; and, (ii) local withdrawals/ redemptions from NRI Rupee Deposit accounts (**Table 1**). These two major components accounted for almost 90-96 percent of private transfers during the period 1999-2011.⁷

Table 1. Major Components of Private Transfers (PVTRAN)

Year	INWRF	LW_RNRI	PVTRAN	CAR	PVTRAN/ CAR	INWRF/ PVTRAN	g	LW_RNRI/ PVTRAN	g
	US \$ million				%	%	%		
1999-00	7423	4120	12290	67854	18	60		34	
2000-01	7747	4727	13065	76827	17	59	4	36	15
2001-02	6578	8546	15760	81440	19	42	-15	54	81
2002-03	9914	6644	17189	95699	18	58	51	39	-22
2003-04	10379	10585	22182	119793	19	47	5	48	59
2004-05	9973	8907	21075	154739	14	47	-4	42	-16
2005-06	10455	12454	24951	194839	13	42	5	50	40
2006-07	14740	13208	30835	243446	13	48	41	43	6
2007-08	21920	18919	43509	315037	14	50	49	44	43
2008-09	23418	20536	46903	356820	13	50	7	44	9
2009-10	28400	23600	53900	345639	16	53	21	44	15
2010-11	27408	26393	55862	448051	12	49	-3	47	12

Notations:

INWRF: Inward remittances for family maintenance

LW_RNRI: Local withdrawals/ redemptions from NRI Rupee Deposit Accounts

PVTRAN: Total Private transfers

CAR: Current Account Receipts

g: YoY growth per cent per annum of the respective variable

Source: RBI, *Handbook of Statistics on Indian Economy 2010-11*,

URL: <http://rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook of Statistics on Indian Economy>

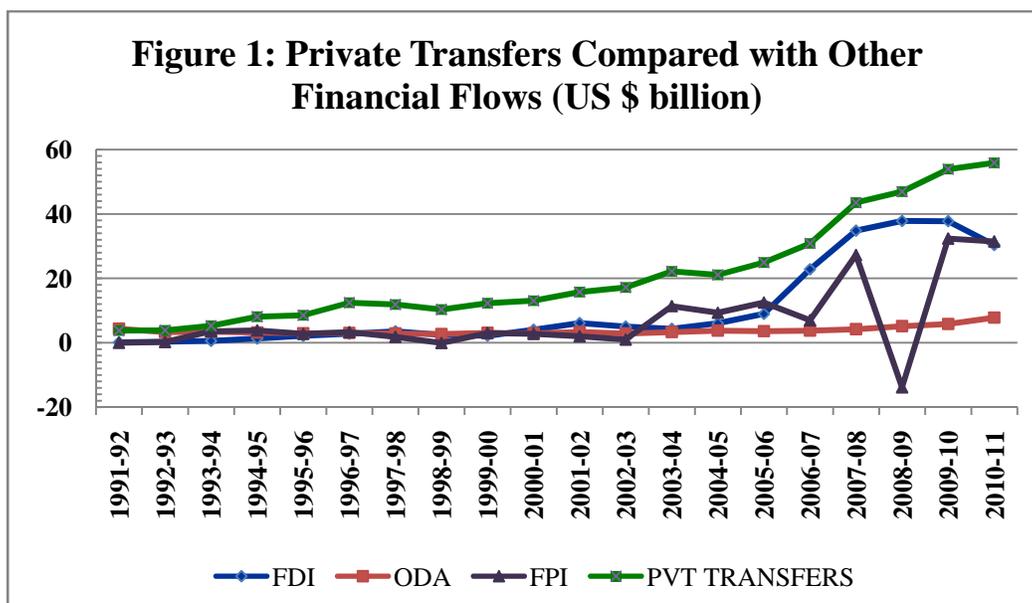
It may be observed from **Table 1** that total private transfers as percentage of current account receipts have been in the range of 12 to 19 percent during 1999-2000 to 2010-11. Inward remittances for family maintenance and local withdrawals/ redemptions from NRI Rupee Deposit accounts constituted almost equal components of private transfers during the period reported in **Table 1**.

⁷ The time period of 1999-2011 has been chosen on account of unavailability of necessary data for the entire period of study.

2. Role of Private Transfers in India's BoP

There was a surge in private transfers to India during the 1970s, in response to the oil-price boom in the Middle East. Thereafter, the second spike in private transfers has been witnessed by India due to information technology revolution in the 1990s and it has made India as one of the top remittance receiving countries in the World. This has also helped India, to a large extent, in offsetting the trade deficit. The resilience shown by private transfers during the financial crisis has highlighted their importance in countries facing external financing gaps. Private transfers can also play an important role in the nation's economic growth. Many countries, such as, India, Sri Lanka, Pakistan, Bangladesh, Nepal and Philippines have started showing interest in leveraging on such transfers, through innovative financial instruments, like Diaspora bonds, securitization of future transfers, *etc.*, to raise foreign capital. Private transfers are also playing a role in financial inclusion, acting as collateral for microfinance activities.

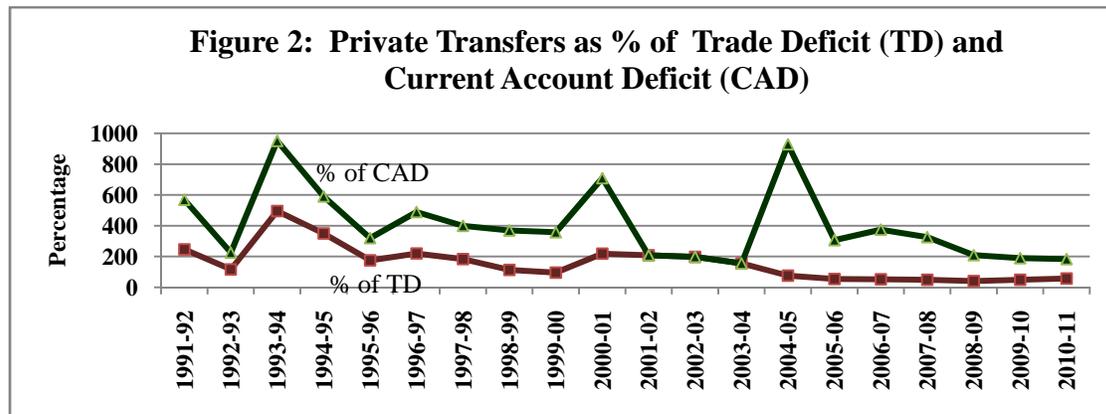
Private transfers to India have remained quite buoyant during the period of study, as compared to other capital flows, like foreign direct investment, foreign portfolio investment, *etc.* (**Figure 1**). India's current account balance has remained in deficit since independence except for few intervening years. The trade balance has always been negative. The full impact of the trade deficit in the recent years has not been felt on the current account deficit because of appreciable increase in private transfers (**Figure 2**).



Source: Based on data from RBI, Handbook of Statistics on Indian Economy 2010-11

URL: <http://rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook of Statistics on Indian Economy>

The stable nature of private transfers is clearly proved by the measure of standard deviation of the growth rate of various flows to the GDP, which turns out to be lower in case of private transfers vis-à-vis other financial flows to India, except the merchandise exports during the period 1991-92 to 2010-11 (**Table 2**).



Source: Based on data from RBI, Handbook of Statistics on Indian Economy 2010-11

URL: <http://rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook of Statistics on Indian Economy>

Table 2. Relative Volatility of Private Transfers vis-a-vis Other Financial Inflows:1991-92 to 2010-11

Current Account	
SD of log (Private Transfers/GDP at current market prices)	0.1239
SD of log (Merchandise Exports/GDP at current market prices)	0.1103
SD of log (Services/GDP at current market prices)	0.2532
SD of log (Income/GDP at current market prices)	0.3163
Capital Account	
SD of log (Foreign Direct Investments/GDP at current market prices)	0.4672
SD of log (Foreign Portfolio Investments/GDP at current market prices)	0.9861
SD of log (NRI Deposits/GDP at current market prices)	0.6696

Note: - SD: Standard Deviation

Source: Authors' calculation based on the RBI, Handbook of Statistics on Indian Economy 2010-11

Private transfers as percentage of CAD were rather high in the years 1993-94, 2000-01 and 2004-05. While significant rise in private transfers (numerator) in 1993-94 contributed to such high percentage, significant fall (denominator) in CAD in 2000-01 was the reason behind the spike in this year. In 2004-05, both sharp rise in private transfers (numerator) and the fall in CAD (denominator) that caused increase in this ratio. Private transfers have grown from less than 1.5 percent of GDP in 1991-92 to a peak of about 4 percent of GDP in 2009-10 (**Figure 3**).

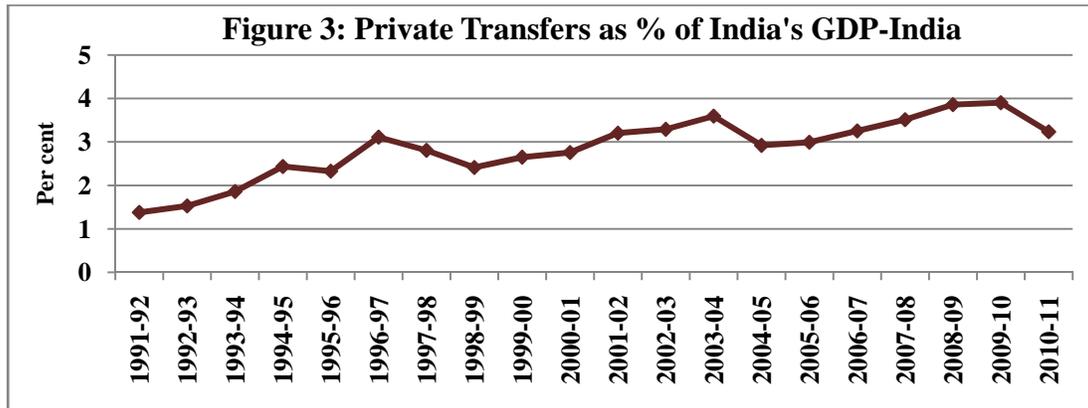
3. Determinants of Private Transfers: A Survey of Literature

The literature on the subject generally adopts two main approaches of analysis, viz., macro and microeconomic approaches.

3.1. Macroeconomic Approach

Under the macroeconomic approach, the literature identifies various macroeconomic determinants of private transfers pertaining to both host and home countries: (i) level of economic activity, proxied either by real GDP or real per-capita income; (ii) investment; (iii) interest rate

differential; (iv) exchange rate variations; (v) relative prices between host and home countries; (vi) unemployment rates; and (vii) stock of migrants.



Source: RBI, *Handbook of Statistics on Indian Economy 2010-11*

URL: <http://rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook of Statistics on Indian Economy>

Private transfers are determined both from demand (pull) as well as supply (push) side factors. In the destination country, the demand for immigrant labour is determined by both the prevailing domestic labour cost as well as the supply of skilled/unskilled labour. From the viewpoint of the source country, the outward movement of labour would be determined by the wage differential between host and home countries, the skill content of labour and the cost of and the flexibility in migration. Thus, the entire process of migration and consequent private transfers is a complex interaction of a range of factors (Jadhav 2003).

The studies conducted by Jadhav (2003), Gupta (2005) and Singh (2009) focus on macroeconomic determinants of private transfers to India. Jadhav (2003) analyzes the behaviour of private transfers to India between 1988 and 2003 flowing mostly from the US and the Middle East. The study analyzes the impact of various macroeconomic factors, such as, 'US GDP', 'export price of oil of oil exporting countries (OEPC)', 'differential between NRI deposit rates in India and the 12 month LIBOR' and 'US \$- INR nominal exchange rate' on private transfers. The study finds the elasticity of private transfers with respect to the economic activity in the host country (OEPC having elasticity of 0.412) and the exchange rate (US \$- INR nominal exchange rate having elasticity of (-) 1.886) to be significant. However, the impact of interest rate differential on private transfers did not emerge as consequential. Based on the analysis of remittance transfers from Australia, New Zealand and the US to Tonga during the period 1994-2009, Hannah (2011) observes that macroeconomic conditions in host countries and exchange rate fluctuations influenced the amount of remittances to Tonga. The study used the panel data regression, with 'growth in remittances' as the dependent variable. The explanatory variables used in the study were 'real bilateral exchange rate', 'real GDP growth', 'unemployment rate in remitting countries', and 'interest rate differential between Tonga and remitting countries'. The results indicate that remittance growth fall with an appreciation of the Tongan currency, but increases with higher real GDP growth and lower unemployment rate in remitting countries.

However, the impact of these macroeconomic variables varies with recipients, viz., households or non-profit organizations. Contrary to the findings of Jadhav(2003), El-Sakka and McNabb(1999), based on the study of remittance transfers to Egypt during 1974-91, find that both the exchange rate and the interest rate differential are important in attracting remittance transfers through official channels.

Carlos and Huang (2006) analyze private transfers from the USA to Mexico during 1981-2006. The study analyzes various determinants of remittances, viz., 'US Federal Funds Rate (US FFR)', 'US Money Supply (US M2)', 'US Consumer Price Index' and 'US unemployment'. The study, through variance decomposition analysis, finds US M2 explaining a larger percent of the variance in remittances. US FFR, US Inflation and US unemployment rate are found to Granger cause Mexico's inward remittances. Regarding home country factors, Mexico's GDP is found to be the predominant determinant of the inward remittances to Mexico. The study concludes that remittances respond more to changes in the macroeconomic conditions of the host country. However, Kumar and Teeley (2009), using national accounts data on remittance transfers from the US to Mexico during 1980-2006, find almost no statistical relationship between either Mexican income and remittances or US income and remittances. One possible explanation for this discrepancy may be that the latter study used annual instead of quarterly data (as used by the former study), meaning that the latter study had fewer opportunities to observe variation in the series, as well as a smaller sample. Other possible reason may be that Mexican migrants in the US are concentrated in certain sectors/ economic activities. Therefore, Mexican remittances would show a counter or pro-cyclical relationship with income solely from fluctuations in those sectors and not from the economy as a whole.

Aydas *et al* (2005), examine the effect of various macroeconomic variables on private transfers to Turkey for 1965-1993 and 1979-1993 periods. Based on the regression analysis, they observe that macroeconomic variables, such as, home and host-country incomes, black market premium on foreign currency, differentials in interest rates, growth rates, inflation rates, and periods of military regimes emerge as determinants of private remittances. The study argues that improving financial intermediation and preventing exchange rate misalignments help increase in private transfers.

Singh (2009) examines the effect of transaction costs and payment infrastructure on private transfers to India. This study examines the factors, such as, 'real per-capita income levels in the gulf countries', 'volume of current account transactions in India'(a proxy for transaction costs), 'volume of cheques processed by the domestic banking system'(a proxy for efficiency of payment system) and 'nominal US \$-INR exchange rate' for the period from 1971 to 2007. The finding of this study is that the nominal exchange rate, development of remittance-receiving infrastructure and transaction costs significantly determine workers' remittance. Gupta (2005) analyzes impact of various factors, such as, 'U.S. employment', 'LIBOR', 'oil prices', 'industrial growth in India', 'BSE Sensex', 'agricultural growth in India' and 'GDP of India' on private transfers to India. She finds host country macroeconomic factors to be significant in explaining private transfers.

Chami *et al* (2005), using panel data regressions for explaining remittances for 113 developing countries during the period 1970-1998, find remittance transfers to be negatively correlated with GDP growth in the home country, suggesting that remittance transfers and GDP growth are compensatory in nature. Wucker (2004), in his qualitative study on remittances,

argues that, though remittances act as powerful tool for development in the remittance recipient countries, these induce migration of people across borders. Such migration gives rise to trauma in migrant families and social stress in both home as well as host countries. Wucker finds 'reduction in poverty' as a determinant of remittance transfers and suggests that Governments should continue their efforts to reduce transfer costs through competition. Adams and Page (2005), based on the survey data between 1984 and 1999 on international migration, remittances, inequality, and poverty from 71 developing countries, conclude that remittances significantly reduce the level, the depth, and the severity of poverty in the developing world. The study recommends that the international community needs to take efforts to reduce high transaction costs.

In brief, the private transfers are primarily influenced by the need of the recipient households, the home country GDP, domestic inflation, exchange rates, availability of conducive investment climate and adequate payment-system infrastructure.

3.2. Microeconomic Approach

The studies using the microeconomic approach converge on two main determinants of private transfers: (i) Altruism; and, (ii) Self-Interest (Risk-Sharing). In the absence of micro data on determinants of private transfers, the studies under the microeconomic approaches are generally based on findings of sample surveys. The literature identifies various microeconomic determinants of private transfers: (i) altruism; (ii) the nature of migration (temporary or permanent); (iii) purpose and use of remittances; (iv) characteristics of remitters and beneficiaries; (v) household size of remitters and beneficiaries; (vi) migrants' level of education; (vii) coinsurance; (viii) inheritance; (ix) joint utility maximization; and, (x) social and financial linkages with the home country.

How private transfers develop over time is a strategically important question for migrants' countries of origin. If money transfers wane rapidly after emigrants have settled abroad, continued migration is a prerequisite for sustaining the transfer of funds. If transfers have a specific target level, such as, repayment of education costs, one might expect them to decline with time (Stark and Lucas 1985). The same is true for repayment of other migration costs. As time passes since a migrant left home, the number of potential remittance recipients is likely to be reduced through chain migration and death. Migrants' more general ties with the community of origin are likely to fade with time, and that reduced transfers are a corollary. Stark and Lucas (1988), based on their study in Botswana, view transfers as part of a migrant family's self-enforcing, cooperative, contractual arrangement. Based on the regression analysis of the data collected through the National Migration Survey conducted in Botswana in 1978-79, they conclude that remittance transfers may be seen as one component of a longer-term understanding that may involve many aspects, including education of the migrant, migration itself, coinsurance and inheritance. The empirical illustrations from Botswana indicate that migration may be viewed as an inter-temporal proposition generating streams of various benefits to migrants and their families.

Hoddinott (1994) models migration as the outcome of joint utility maximization by the prospective migrant and other household members. The author assumes that parents and sons always agree to the migration contract. The model is based on the data collected through a household survey conducted by the author in Karateng East sub-location in Western Kenya

between January and June 1988. Based on a regression analysis of the 'remittances', 'land inherited' and 'number of adult sons and dependants', the author concludes that, though altruism cannot be ruled out as a motive behind sending remittances, land acts as a major inducement to increase remittances.

Arun and Ulku (2009) investigate into the remitting behaviour of South Asian community comprising 700 Indian, Pakistani and Bangladeshi households in Manchester. They consider 'socio-economic characteristics of the household head', 'economic and social capital and rootedness in the UK', 'economic and social capital in South Asia', 'recipient households' characteristics' and 'use of remittances' as determinants of remittances. Based on a regression analysis on the data collected through a survey, they conclude that remittances of South Asian community in Manchester are determined by income, social and financial linkages to the home country, the recipient's economic status, and the use of remittances for education and business.

Households face trade-offs in letting their members migrate. Households incur various explicit as well as implicit costs for enabling some of its members to migrate. Therefore, the households left behind expect migrants to contribute towards repayment of cost of migration. Therefore, transferring money for meeting the cost of migration is expected to determine private transfers. However, the magnitude and frequency of transfers depend upon the financials of the migrated member and the household back home. It also depends upon the temporary or the permanent nature of migration. In the initial phase of migration, the real remittance inflows can be negative net of cost of migration. It is a kind of payment against implicit loan obligation.

Migrants often send money to their families and relatives back home out of altruism. Altruism generally arises out of migrants' concern for their households left behind. Altruistic transfer increases with the migrant's income and degree of altruism, and decreases with the recipient's income and, more interestingly, the degree of altruism under mutual altruism (Rapoport and Docquier 2005). Private transfers may decrease over time as migrants' family attachments get weaker. A migrant's marital status also affects such flows. While the migrant's elderly parents in the home country may continue to receive some flows, such flows may completely cease once the parents expire or may reduce even if the parents are alive, if another member of the same household migrates and starts supporting the family left behind. Private transfers also tend to be positively associated with household size at the origin and negatively associated with household size at the destination. Future migration plans in the households left behind also influence remittance behaviour. Migrants intending to return are generally more likely to remit, and remit larger amounts.

Self-interest of migrants and mutual risk mitigation play a major role in determining private transfers. Migrants' ownership of assets in the community of origin, nature of independent holding of assets, requirement of regular maintenance of those assets and dependency of migrants on the household for the same, are among the various factors which influence the migrant's interests in sending remittances. Holding of assets can act as insurance for the migrants. The link gets stronger if it is difficult to hold assets permanently for the migrants in the host country and the migration is not permanent. If remittance transfers are part of a co-insurance arrangement, one would expect fluctuations in income to be even more important than the income level.

4. Macroeconomic Determinants of Private Transfers to India: An Empirical Analysis

While the cross-border financial inflows can directly be linked to migration, increase in private transfers to India has been attributed to various factors, such as, diminishing role of unofficial channels, reduction in financial and time costs in remittances and time taken, market-determined exchange rates, migration of highly skilled people with higher incomes overseas, greater competition in the money transfer market, extent of economic activity in the host countries and the resilient nature of the Indian economy. Based on the literature review, theoretical underpinning and the purpose of private transfers to India, an analysis has been made to ascertain the major macroeconomic determinants of private transfer to India.

4.1. Objectives, Data Used and Hypotheses Tested

The objective of this study is to ascertain the macroeconomic determinants of private transfers to India. The quarterly data on private transfers to India and the bilateral nominal exchange rate (Indian Rupees per US Dollar) have been compiled from the RBI's database on the Indian Economy. The quarterly data on the GDP of USA has been compiled from the database of the Bureau of Economic Analysis, United States Department of Commerce. Similarly, the quarterly data on fob Dubai Crude Oil (petroleum) prices has been compiled from the IMF database. The quarterly data on all-India average Consumer Price Index (CPI) for Industrial Workers (Base:2001=100) has been compiled from the database of the Labour Bureau, Government of India. The dataset used is of quarterly frequency and covers the period from 1991-92:Q4 to 2010-11:Q4. All the series have logarithmic transformation.

As per the current trend of flow of private transfers to India, majority (about 65 per cent) of such transfers originate from the North America (most prominent being the US) and the Gulf countries (RBI, 2010b). Therefore, GDP of USA and Dubai Crude Oil prices have been taken as the proxies for the host-country macroeconomic factors. Bilateral nominal exchange rate of US \$ against Indian Rupee (Indian Rupees per US Dollar) and all India average CPI for industrial workers have been taken as proxies for the home country macroeconomic factors. The choice of home country macroeconomic factors is based on the fact that majority (about 61 per cent) of private transfers is used for the purpose of family maintenance (RBI, 2010b). The hypotheses tested in this study are:

(1) The inflows of private transfers to India are positively related to the economic activity (proxied by its GDP) in the US.

(2) The inflows of private transfers to India are positively related to Dubai crude oil prices (which serves as the proxy for the purchasing power in the Gulf countries).

(3) The inflows of private transfers to India are positively related to the external value of the Indian Rupee, *i.e.*, if the Indian Rupee appreciates (depreciates) nominally against US \$, it is expected to have a positive (negative) effect on private transfers to India in US \$ terms. This is because majority of private transfers to India is used for the purpose of family maintenance and the amount received by beneficiaries in Indian Rupees ultimately matters. Therefore, depreciation of Indian Rupee against US \$ indirectly gives an option to the remitters to remit less in US \$ terms without affecting the beneficiaries. Further, in a depreciating rupee scenario, remitters tend

to take a view on rupee, thereby postponing their current remittances, in expectation of further fall in rupee.

(4) The inflows of private transfers to India are positively related to the all India average CPI. With rising CPI, the beneficiaries of remittances need more money for family maintenance and hence, other factors remaining constant a positive relationship between these two variables is stipulated.

Based on the above four hypotheses, the relationship of private transfers to India to the four explanatory variables is represented by the following functional form as indicated in F1:

$$PT_t = f(GDPUS_t, OIL_t, XR_t, CPI_t) \quad (F1)$$

(+) (+) (-) (+)

The notations used are as follows:

PT: Private Transfers to India in current US \$ million

GDPUS: GDP of USA in current US \$ million

OIL: fob Dubai Crude Oil (Petroleum) prices in US \$ per barrel

XR: Bilateral nominal exchange rate (Indian Rupees per US Dollar)

CPI: All-India Average CPI for Industrial Workers (Base: 2001=100)

Subscript 't' denotes time period.

The log-linear form of the model is expressed in Equation 1:

$$LPT_t = \beta_0 + \beta_1 LGDPUS_t + \beta_2 LOIL_t + \beta_3 LXR_t + \beta_4 LCPI_t + \varepsilon_t \quad (\text{Equation 1})$$

The prefix 'L' stands for the natural logarithmic of the respective variables. The log conversion has been used so that the elasticities of the dependant variable can be directly estimated from the estimates of β_s obtained. The log conversion also reduces the problem of multicollinearity.

The *a priori* values of β_s as stated in Equation 1 are as follows.

$$\beta_1 > 0, \beta_2 > 0, \beta_3 \leq 0, \text{ and } \beta_4 > 0$$

4.2. Methodology used for Econometric Investigation

The study has empirically examined the above macroeconomic factors, pertaining to both host as well as home countries, determining private transfers to India by applying the following methodologies:

- i. Stationarity Tests;
- ii. Johansen's Cointegration Test;
- iii. Johansen's Vector Error Correction Model (VECM) in VAR; and
- iv. Dynamic Analysis in a Cointegrated VAR Framework: Impulse Response Function and Variance Decomposition Analysis.

(i) Stationarity Tests

The basic purpose of stationarity tests is to find out the time-series properties of the variables so that one can avoid regressing data with trends and obtaining spurious results. Hence, we try to find out the order of integratedness of a series to avoid estimation of spurious regressions. We have conducted the three Unit Root Tests, *viz.*, the Augmented Dickey-Fuller (ADF), Phillips and Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests to check for unit roots in the data (for more details, refer to **Appendix-C**). In this study, we have subjected all the variables to these stationarity tests to rule out spurious regressions.

(ii) Johansen's Cointegration Test

More often than not, macroeconomic variables are trended and non-stationary and estimation using these series may be spurious. In the case of stochastic non-stationary series that are integrated of order one [$I(1)$ series], these may be first differenced before conducting regression analysis. However, this results in the loss in information regarding the long-term relationships embedded in the data. A solution to this problem is to verify if the time series are cointegrated. Though these series may show deviations in their relationship in the short run, these series will have some relationship in the long-run. If a stationary linear combination exists among various time-series variables, these series are said to be cointegrated. Such a stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables.

We can have $p-1$ cointegrating vectors for p number of variables. Johansen (1995) developed a maximum likelihood estimation procedure based on *reduced rank regression method*. It takes into account the short-run dynamics of the 'system' whilst estimating the cointegrating vectors (for more details, refer to **Appendix-C**). We have performed Johansen's Cointegration Test for the dataset used in our study to examine the possibilities of long-run relationships.

(iii) Johansen's Vector Error Correction Model (VECM) in VAR

The Vector Error Correction Model (VECM) is a restricted VAR designed for use for non-stationary series that are known to be cointegrated. The VECM has cointegration relations built into the specification, so that it restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics (Brooks 2008). The cointegration term is known as the *Error Correction Term (ECT)* since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. For the purpose of testing the number of cointegrating vectors, Johansen (1995) proposed the use of two likelihood ratio test statistics, *viz.*, the *trace test* and the *maximum eigen values test* (for more details, refer to **Appendix-C**).

(iv) Dynamic Analysis in a Cointegrated VAR Framework: Impulse Response Function and Variance Decomposition Analysis

(a) Impulse Response Function

Impulse response function traces out the responsiveness of the dependent variable in the VAR framework to shocks to each of the variables, *i.e.*, shocks in the error terms. The Impulse

Response Function traces out the impact of shocks for several time periods from the date the shock (innovation) is administered. The shock is expected to gradually die away, provided that the system is stable (for more details, refer to **Appendix-C**), *i.e.*, the variables converge to their long-run equilibrium values.

(b) Variance decomposition Analysis

Variance decompositions give the proportions of the movement in the dependent variables that are due to their 'own' shocks, versus shocks to the other variables (for more details, refer to **Appendix-C**).

4.3. Empirical Estimates and Analysis of Results

4.3.1. Empirical Results of the Unit Root Tests

All econometric exercises have been carried out by using EViews 6/7 by QMS software. **Table 3** summarizes the results of the unit root tests, *viz.*, ADF and PP tests on log levels and in first differences of logs of the variables. It is observed from the test statistics that all the variables are found to be non-stationary at log levels but stationary in first differences. Therefore, all the series are I(1). The same conclusion is derived from the KPSS test (**Table 4**).

Table 3. Unit Root Tests of the Variables

	ADF Test		PP Test	
	Level	First Difference	Level	First Difference
LPT _t	-1.372130	-9.287326***	-0.976917	-15.86894***
LGDPUS _t	-1.676304	-3.201368**	-2.137842	-4.528840***
LOIL _t	-0.124416	-7.232025***	-0.319766	-6.531226***
LXR _t	-1.643807	-5.968448***	-1.943970	-6.006709***
LCPI _t	-0.446780	-2.820813*	-0.334719	-7.338334***

Note: "H₀: The series under consideration has a unit root"; "H₁: The series under consideration is stationary". The maximum number of lags included in Augmented Dickey Fuller (ADF) tests is 4. For the ADF tests, the lag length is based on the Akaike Information Criterion (AIC), while for the PP test bandwidth selection is based on Newey-West. Both the tests include a constant (intercept).*** Significant at a 1% level. ** Significant at a 5% level. * Significant at a 10% level.

Table 4. KPSS Stationarity Tests of the Variables

	Level	First Difference
LPT _t	1.156508***	0.087979
LGDPUS _t	1.195827***	0.390207
LOIL _t	1.080627***	0.118782
LXR _t	0.887884***	0.233938
LCPI _t	1.180089***	0.200373

Note: "H₀: The series under consideration is stationary"; "H₁: The series under consideration is non-stationary".

The test includes a constant (intercept). Bandwidth selection is based on Newey-West.

*** Significant at a 1% level. ** Significant at a 5% level. * Significant at a 10% level.

4.3.2. Johansen Cointegrating Systems based on VAR

Since there are more than two variables, there may be more than one cointegrating relationships. Thus, it is appropriate to examine the issue of cointegration within the Johansen

VAR framework. All the variables are tested under Johansen's technique and results have been presented in **Table 5**.

Table 5. Johansen Cointegration Test Result

Sample (adjusted): (1991-92Q4 to 2010-11Q4) No. of observations: 73 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: LPT_t , $LGDPUS_t$, $LOIL_t$, LXR_t , $LCPI_t$ Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.472908	125.4908	88.80380	0.0000
At most 1 *	0.388226	78.74306	63.87610	0.0017
At most 2	0.252038	42.87144	42.91525	0.0505
At most 3	0.159132	21.67196	25.87211	0.1527
At most 4	0.116228	9.019585	12.51798	0.1791
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.472908	46.74776	38.33101	0.0043
At most 1 *	0.388226	35.87162	32.11832	0.0165
At most 2	0.252038	21.19947	25.82321	0.1815
At most 3	0.159132	12.65238	19.38704	0.3569
At most 4	0.116228	9.019585	12.51798	0.1791
Max-eigenvalue test indicates 2 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 test in **Table 5** indicates that the null hypothesis of at most 1 cointegrating vectors is rejected. The *max* test also confirms this result.

4.3.3. Estimation of Vector Error-Correction Model

The next step is to examine the interaction among the variables in the system using the error-correction model. The VECM involves selection of appropriate lag length. An inappropriate lag selection may give rise to problems of over-parameterization or under-parameterization. The resulting lag structures are reported in **Table 6**. According to AIC criterion, the three period is considered to be the optimal lag here.

Table 6. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	212.9947	NA	1.96e-09	-5.859006	-5.699663	-5.795640
1	708.8674	907.9360	3.42e-15	-19.12303	-18.16696*	-18.74283
2	756.9899	81.33371	1.80e-15	-19.77436	-18.02158	-19.07734*
3	792.2696	54.65875*	1.38e-15*	-20.06393*	-17.51443	-19.05008
4	813.0521	29.27111	1.64e-15	-19.94513	-16.59891	-18.61445
5	824.1781	14.10334	2.65e-15	-19.55431	-15.41138	-17.90680
6	849.5670	28.60721	3.00e-15	-19.56527	-14.62561	-17.60092

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

4.3.3.1. Long-run equilibrium: Cointegration

The next step is to examine the interaction among the variables in the system using the error-correction model.

Table 7. Restricted Estimation of Cointegrating and Adjustment Coefficients

Variable	Cointegrating Equation (1) #
Normalized cointegrating coefficients β	
LPT _t	1.000000
LGDPUS _t	-5.693719 [-2.50893]
LOIL _t	-1.485939 [-2.44679]
LXR _t	4.508266 [3.76138]
LCPI _t	-5.469388 [-2.11345]
TREND _t	0.147887 [2.46782]
Adjustment coefficients α	
DLPT _t	-0.135625 [-3.31571]
DLGDPUS _t	0.001927 [1.31386]
DLOIL _t	-0.157138 [-3.61846]
DLXR _t	-0.025288 [-2.55536]
DLCPI _t	0.000000

Note: t-statistics in [], 'D' denotes the first difference

Though we found two cointegrated relationships among the variables considered in this study, we have reported the highly significant first cointegrated relationship on the basis of our theoretical underpinning.

Using standard notation, the long run equilibrium condition is finally stated:

$$Z_{1t} = LPT_{t-1} - 5.693719LGDPUS_{t-1} - 1.485939 LOIL_{t-1} + 4.508266LXR_{t-1} - 5.469388LCPI_{t-1} + 0.147887TREND_{t-1} + 90.97119 \quad (\text{Equation 2})$$

where $TREND_t = t - 1991-92:Q4$ in the year t and Z_{1t} is the long run equilibrium error term

The signs of all the coefficients of the cointegrated equation are as expected and their magnitudes are reasonable. In particular, according to Equation 2, a 1 per cent increase in GDP of USA causes a 5.69 per cent growth in private transfers to India. Similarly, a 1 per cent increase in Dubai Crude oil prices causes a 1.49 per cent growth in private transfers to India. Further, a 1 per cent depreciation of the Indian Rupee vis-a-vis US \$ (more INR for US \$) causes a 4.51 per cent reduction in private transfers to India. Similarly, a 1 per cent increase in all India average CPI for industrial workers causes a 5.47 per cent growth in private transfers to India.

4.3.3.2. Short-run Dynamics: Vector Error Correction Model

Based on the results of the cointegration test above, the VEC model has been presented. Since, in this paper, we only focus on how private transfers are influenced by macroeconomic factors, only DLPT_t is presented in **Table 8**.

The estimated coefficient of the ECT has the correct negative sign and is significant, confirming further that the variables in the system are cointegrated. Also, it indicates that while private transfers may temporarily deviate from its long run equilibrium, the deviations are adjusting towards the equilibrium level in the long run. The estimated coefficient of ECT is -0.136, implying that about 13.6 percent of the short-run deviations of private transfers would be adjusted each quarter towards the long run equilibrium level of private transfers.

Table 8. Estimation of Vector Error Correction Model

Error Correction:	$D(LPT_t)$
ECT	-0.135625 [-3.31571]
D(LPT _t (-1))	-0.643534 [-4.27104]
D(LGDPUS _t (-1))	2.633412 [0.53697]
D(LOIL _t (-1))	-0.102020 [-0.50802]
D(LXR _t (-1))	-1.902222 [-1.74779]
D(LCPI _t (-1))	-4.106659 [-2.13707]
C	0.244294 [2.75085]

R-squared 0.481831 Adj. R-squared 0.321670
 F-statistic 3.008415 Log likelihood 35.90522
 Akaike AIC -0.490554 Schwarz SC 0.074217
 Figures in the brackets are t-statistics.

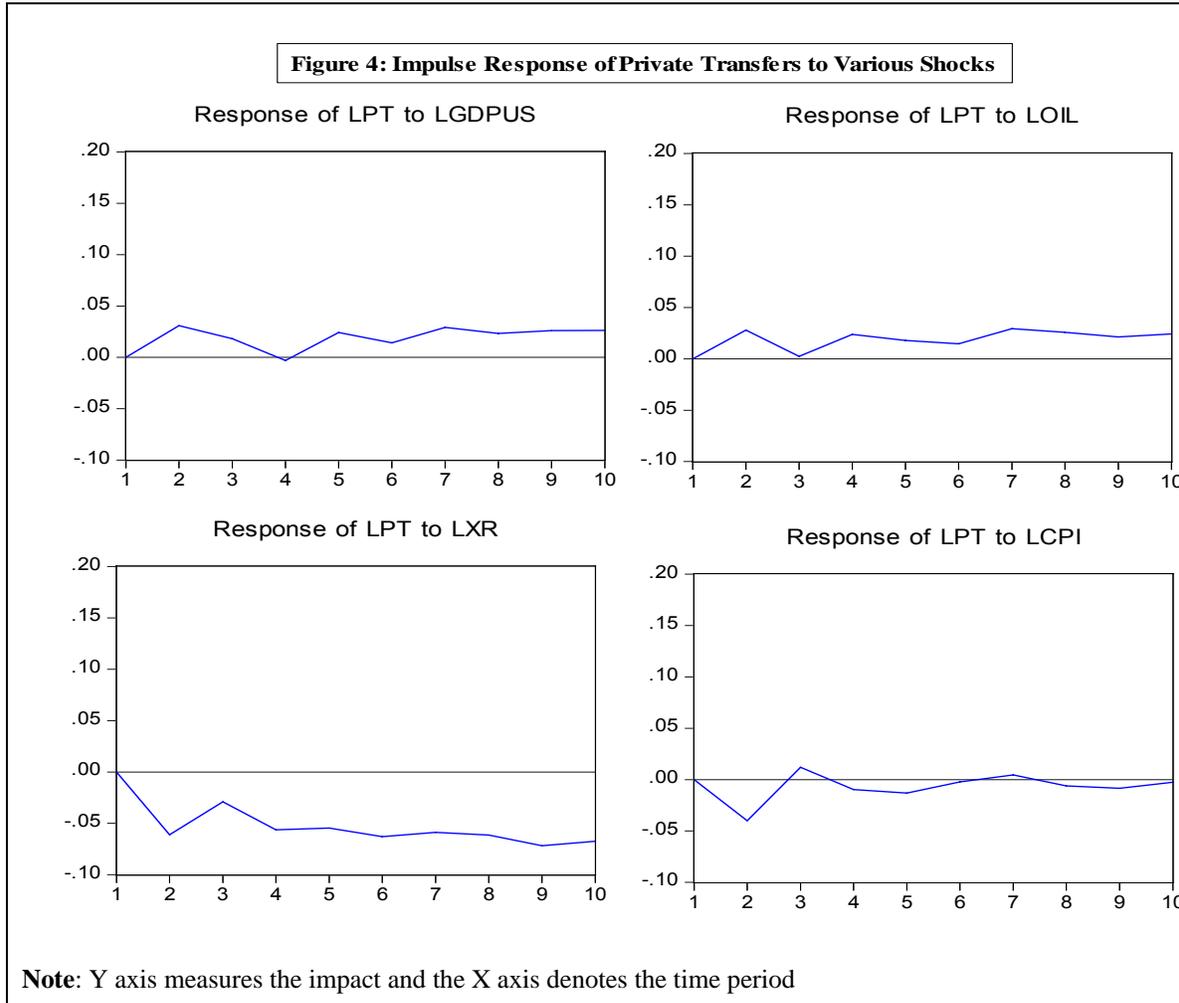
4.3.4. Dynamic Analysis in a Cointegrated VAR Framework: Impulse Response and Variance Decomposition Analysis

After investigating the long-run relationship and short-run adjustment dynamics of private transfers to India with some of the macroeconomic variables, the study has made use of the VAR model and reported the impulse response functions and variance decomposition results in order to analyze the dynamic interaction among the variables.

4.3.4.1. Impulse Responses

The impulse response function analyzes (**Figure 4**) the responsiveness of the dependent variables to shocks of each of the variables in a Cointegrated VAR framework. The impulse response analysis of private transfers reveals that GDPUS shock, *i.e.*, an increase in GDP of USA positively affects private transfers in the short term. However, its impact gets moderated in the medium term. GDP of USA positively affects private transfers in the long term. Oil price shock has got more or less similar impact on private transfers like GDP of USA. In the short term, shocks to nominal exchange rate exert negative impact on private transfers. The direction of impact remains the same in both the medium term and the long term. Shock to All India average

Consumer Price Index for industrial workers negatively impacts private transfers initially and this soon gets reversed within the short period of time. However, it does not have any lasting impact on private transfers in the long term.



4.3.4.2. Variance Decompositions Analysis

After investigating the impulse response results, an attempt has been made to analyze the variance decomposition results in a Cointegrated VAR framework to find out the proportion of the movements in the dependent variables that are due to their ‘own’ shocks, versus shocks to the other variables. The results of decomposition of fluctuations in private transfers caused by macroeconomic shocks are presented in **Table 9**. The variance decomposition analysis reveals that the history of private transfers itself predominantly explains its behaviour, although the impact somewhat gets moderated over time. It is the exchange rate shock (among the other explanatory variables) that explains the largest proportion of variations in private transfers over the medium to

long term. Real activity in the host country explains the behaviour of private transfers over the longer horizon. CPI explains about one per cent of variation in private transfers in the long term.

4.4. Interpretation of Empirical Results

Application of unit root/stationarity tests, viz., ADF, PP and KPSS, confirms that all the variables are non-stationary at log levels but stationary in first differences. With all the series being I(1), the study tests the co-integrating relationship among the variables using Johansen's procedure that permits identification of the co-integration space and enables the testing of number of co-integration relationships. The *trace test* and the *max test* used in this procedure demonstrate two co-integrating vectors at the 5% level. In the subsequent Vector Error Correction Model (VECM), the estimated coefficient of the ECT has the correct negative sign and is significant, confirming further that the variables in the system are cointegrated. Also, it indicates that while private transfers may temporarily deviate from its long run equilibrium, the deviations are adjusting towards the equilibrium level in the long run. It shows that about 13.6 percent of the short-run deviations of private transfers are adjusted each quarter towards its long run equilibrium level.

Table 9. Variance Decomposition of the fluctuations caused in Private Transfers

<i>Period</i>	<i>Private Transfers shock</i>	<i>US GDP shock</i>	<i>Oil Price shock</i>	<i>Exchange rate shock</i>	<i>Consumer Price Index shock</i>
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	83.57110	2.189379	1.809153	8.704712	3.725653
3	83.23021	2.531183	1.566342	9.179268	3.492993
4	80.74827	2.009241	2.111250	12.23130	2.899939
5	79.44257	2.335751	2.099078	13.58114	2.541461
6	77.87697	2.189790	2.009816	15.76217	2.161254
7	76.40307	2.637240	2.498398	16.59966	1.861628
8	75.76184	2.691270	2.668560	17.24453	1.633806
9	74.64496	2.793919	2.622414	18.47273	1.465981
10	73.87738	2.901438	2.692693	19.21817	1.310325

The signs of all the coefficients of the cointegrated equation are as expected and their size is reasonable. In particular, according to Equation (2), a 1 per cent increase in GDP of USA causes a 5.69 per cent growth in private transfers to India. Similarly, a 1 per cent increase in Dubai Crude oil prices causes a 1.49 per cent growth in private transfers to India. Further, a 1 per cent increase in US \$-INR bilateral nominal exchange rate (INR depreciating against US \$) causes a 4.51 per cent reduction in private transfers to India. Similarly, a 1 per cent increase in all India average CPI for industrial workers causes a 5.47 per cent growth in private transfers to India.

The impulse response function analysis of private transfers reveals that USGDP shocks, *i.e.*, an increase in GDP of USA positively affects private transfers in the short term. However, though its impact gets moderated in the medium term, it does positively affects private transfers to India in the long term. Oil price shock has got more or less similar impact on private transfers like GDP of USA. Shock to nominal exchange rate result in a negative impact on private transfers in the short term. While the direction of impact remains the same in both the medium term and

the long term, the degree of impact comes down in the medium term. Shock to All India average Consumer Price Index for industrial workers initially impacts negatively the private transfer and this impact is reversed within the short run itself. However, it does not have any significant impact on private transfers in the long term.

The variance decomposition analysis reveals that private transfers are predominantly explained by its own history. Next to its own history, it is the exchange rate innovation that explains the largest proportion of variations in private transfers over the medium to long term. Real activity in the host country and oil price movement explain the behaviour of private transfers over the longer horizon and the extent of explanation embedded in these variables is much weaker than the one embedded in the exchange rate variations.

5. Conclusions

We find that the behaviour of private transfers to India is significantly influenced by the macro-economic factors of both home as well as host countries. We say this because, the exchange rate variable is jointly determined by the macroeconomic conditions prevailing in both host and home countries. The oil-price hike and economic activity of host countries also play some role in determining the private transfers. One may also interpret as the existence of links through financial markets to be stronger than those exhibited through goods/commodity markets.

The determinants that explain private transfers are: exchange rate, US GDP and oil price movements. Of these the last two are purely exogenous from the point of view of conduct of macroeconomic policy in India. Exchange rate is a variable that captures the macroeconomic conditions of both the host and home countries. In view of this, control of inflation seems to be the most crucial policy prescription that can boost private transfers through foreign exchange market channel.

There is no denying of the fact that private transfers to India have become a major source for reducing the magnitude of current account deficits. More importantly, these are unrequited receipts. In order to use these flows for developmental purposes, their stability is necessary. Though these are sent to the relatives left behind, one does not know for sure if these are used for consumption purposes or whether these are further invested. Hence, the examination of developmental role of remittances requires a much more detailed database on remittance inflows and the uses to which these are put.

There are also various issues associated with greater mobilization of remittances, such as, availability of adequate infrastructure and outreach, need for technological improvement and simplification of procedure for reducing turn-around time in remittance transfer, lowering cost of remittances and making the same transparent, taking care of money laundering/ terrorist financing concerns, absorption of sustained flows of remittances to ensure that these flows do not create excessive liquidity in the economy or generate inflationary pressures, *etc.* With the provision of various official channels for routing remittances and flexible, market-determined exchange rates, more and more inclusion of remittances under official fold has been possible.

To sum up, we find that both home as well as host country macroeconomic factors determine the magnitude of private transfers to India. It is very important that policy prescriptions should aim at long-term sustainability of private transfers. India should endeavour to have macro-economic policies with an anti-inflationary stance so as to stabilize exchange rate.

References

- Adams, R. and John Page (2005), "Do International Migration and Remittances Reduce Poverty in Developing Countries?", *World Development*, 33(10),1645-69.
- Arun,T. and Hulya Ulku (2009), *Determinants of Remittances: The Case of the South Asian Community in Manchester*, LBS Working Papers New Series 1(1), Lancashire Business School
- Aydas, O.T., K. Metin-Ozcan and B. Neyapti (2005), "Determinants of Workers' Remittances: The Case of Turkey", *Emerging Markets Finance and Trade*,41(3), 53–69
- Brooks, Chris (2008), *Introductory Econometrics for Finance 2nd edn.*, Cambridge University Press, Cambridge
- Bureau of Economic Analysis, United States Department of Commerce (2011), "Current Dollar Gross Domestic Product", <http://www.bea.gov/national/index.htm#gdp> (accessed January 14, 2012)
- Chami, Ralph, Connel Fullenkamp and Samir Jahjah (2005), *Are Immigrant Remittance Flows a Source of Capital for Development?*, *IMF Staff Papers* 52(1),International Monetary Fund
- Dickey, D. A. and W. A. Fuller (1979), "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, 74 (366), 427–431
- El-Sakka, M. I. T. and R. McNabb (1999), "The Macroeconomic Determinants of Emigrant Remittances", *World Development* , 27(8), 1493-1502.
- Gujarati, D. N. (2007), *Basic Econometrics 4th edn.*, McGraw-Hill, New York
- Gupta, Poonam (2005), *Macroeconomic Determinants of Remittances: Evidence from India*, IMF Working Paper 05/224, International Monetary Fund
- Hoddinott, John (1994), "A Model of Migration and Remittances Applied to Western Kenya", *Oxford Economic Papers*, 46(3), 459-476
- International Monetary Fund (2009a), *International Transactions in Remittances Guide for Compilers and Users*, International Monetary Fund
- _____ (2009b), *Balance of Payments and International Investment Position Manual, Sixth Edition (BPM6)*, International Monetary Fund
- _____ (2011), Oil; Dubai, medium, Fateh 32 API, fob Dubai Crude Oil (petroleum), Dubai Fateh 32 API, US\$ per barrel, International Monetary Fund,<http://www.imf.org/external/np/res/commod/index.aspx> (accessed January 2, 2012).
- Jadhav, Narendra (2003), *Maximising Development Benefits of Migrant Remittances: The Indian Experience*, Paper presented at the International Conference on Migrant Remittances, Department for International Development and World Bank, London, October 9-10.
- Johansen, S. (1995), *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*, Oxford University Press, New York
- Kumar, Atisha and Dawn L. Teeley (2009), *A View from Above: Macroeconomic Determinants of Mexican Remittances*, Global Citizenship Workshop at Yale University

- Labour Bureau, Government of India (2011), All-India Average Consumer Price Index Numbers for Industrial Workers(base 2001=100), <http://labourbureau.gov.in/indtab.pdf> (accessed January 15, 2012)
- Lin, Hannah H. (2011), *Determinants of Remittances: Evidence from Tonga*, IMF Working Paper WP/11/18, International Monetary Fund
- Rapoport, Hillel, and Frederic Docquier (2005), *The Economics of Migrants' Remittances*, IZA Discussion Papers 1531, Institute for the Study of Labour (IZA)
- Reserve Bank of India (2010a), *Balance of Payments Manual for India*, Reserve Bank of India, Mumbai.
- _____ (2010b), *Remittances from Overseas Indians: Modes of Transfer, Transaction Cost and Time Taken*, RBI Monthly Bulletin, April, 2010,779-796
- _____ (2010-11), *Handbook of Statistics on Indian Economy*", Reserve Bank of India (RBI), Mumbai, [http://www.rbi.org.in/scripts/AnnualPublications.aspx?head= Handbook of Statistics on Indian Economy](http://www.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20Economy) (accessed September 17, 2011).
- _____ (2011), *Database on Indian Economy*, Reserve Bank of India, Mumbai
<http://dbie.rbi.org.in/InfoViewApp/listing/main.do?appKind=InfoView&service=%2FInfoViewApp%2Fcommon%2FappService.do> (accessed December 6, 2011)
- Singh Bhupal (2009), "Workers' Remittances to India: An Examination of Transfer Cost and Efficiency", *International Migration*, 48(5), 63-88
- Stark, O. and Robert E. B. Lucas (1985), "Motivations to Remit: Evidence from Botswana", *Journal of Political Economy*, 93(5), 901-918
- _____ (1988), "Migration, Remittances and the Family", *Economic Development and Cultural Change*, 36(3), 465-481
- Vargas-Silva, Carlos, and Peng Huang (2006), "Macroeconomic Determinants of Workers' Remittances: Host versus Home Country Economic Conditions", *Journal of International Trade and Economic Development*, 15, 81-99
- World Bank (2011), *Migration and Development Brief 18*, The World Bank, Washington D C
- Wucker, Michele (2004), "Remittances: The Perpetual Migration Machine", *World Policy Journal*, 21(2), 37-46

Appendix-A: Concepts and their Connotations

Item	Balance of Payments and International Investment Position Manual (BPM6) of the IMF	BOP Manual of India
<p>Remittances</p> <p><i>(Remittances represent household income from foreign economies arising mainly from the temporary or permanent movement of people to those economies.)</i></p>	<p>Private Transfers correspond to the “Secondary Income” under the Standard Presentation of BoP as per BPM6. Secondary Income comprises “Personal transfers” (including workers’ remittances) and “other current transfers”, such as, (a) current taxes on income, wealth, etc., (b) social contributions, (c) social benefits, (d) net nonlife insurance premiums, (e) nonlife insurance claims, (f) current international cooperation, and (g) miscellaneous current transfers.</p> <p>Personal transfers consist of all current transfers in cash or in kind made or received by resident households to or from non-resident households.</p>	<p>Private transfer receipts include (i) remittances for family maintenance, (ii) local withdrawals from Non-Resident Rupee Accounts (NRE and NRO), (iii) gold and silver brought through passenger baggage, and (iv) personal gifts/ donations to charitable/religious institutions.</p> <p>On the other hand, private transfer payments include remittances by non-residents towards (i) family maintenance and savings and (ii) personal gifts/ donations to charitable/religious institutions. The inflows from overseas Indians for deposits in NRI deposit schemes are treated as capital account transactions. However, local withdrawals/redemptions from NRI deposits (especially NRE and NRO rupee deposit schemes) are treated as forming part of private transfers.</p>
<p>Exchange or transfer</p>	<p>Every transaction involves either an exchange or a transfer. An exchange involves the provision of something of economic value in return for a corresponding item of economic value. An exchange is sometimes called a transaction with “something for something” or a transaction with a quid pro quo. A transaction involving a transfer involves a provision(or receipt) of an economic value by one party without receiving (or providing) a corresponding item of economic value. A transfer entry is used to provide a corresponding entry to the unrequited flow. A transaction involving a transfer is also called a transaction with “something for nothing” or a transaction without a quid pro quo.</p>	<p>An “exchange” is called a transaction involving “something for something in return” or a transaction with a <i>quid pro quo</i>, whereas a “transfer” is called a transaction involving “something for nothing in return” or a transaction without a <i>quid pro quo</i>.</p>

Source: Compiled from “Balance of Payments Manual for India.” RBI, Mumbai and “Balance of Payments and International Investment Position Manual, Sixth Edition (BPM6)”, IMF.

Appendix-B: Channels of Receiving/ Sending Cross-Border Remittances in/ from India

Receipt/Payment of cross-border inward/outward remittances in/from India is governed by relevant provisions of the Foreign Exchange Management Act (FEMA), 1999. Beneficiaries/remitters in India can receive/send cross-border inward/outward remittances through official channels, such as, the banking and the postal channels. There are two more official channels for receiving inward remittances in India ,viz., Rupee Drawing Arrangement (RDA) and Money Transfer Service Scheme (MTSS).

(I) Rupee Drawing Arrangements

Authorised Dealer Category-I banks require one-time approval of Reserve Bank of India to enter into Rupee Drawing Arrangements (RDAs) with the Exchange Houses of the Gulf countries, Hong Kong, Singapore, Malaysia and other FATF compliant countries for channelising cross-border inward remittances into India. RDAs fall into 3 categories viz., Designated Depository Agency (DDA), Non-DDA and Speed Remittances. Though these arrangements are basically meant for non-trade related personal remittances, trade remittances up to INR 5,00,000 (per transaction) can be made. No outward remittance is permitted under these arrangements.

(II) Money Transfer Service Scheme

Money Transfer Service Scheme (MTSS) is a quick and easy way of transferring personal remittances from abroad to beneficiaries in India. Only personal remittances such as remittances towards family maintenance and remittances favouring foreign tourists visiting India are permissible. The system envisages a tie-up between reputed money transfer companies abroad and agents (Authorised Dealers Cat-I, Authorised Dealers Cat-II, Full Fledged Money Changers, Scheduled commercial banks and Deptt. of Posts) in India who would disburse the funds to the beneficiaries at ongoing exchange rates. The system does not permit any outward remittance. Under MTSS, both remitters and beneficiaries are individuals only.

Appendix-C

(i) Unit Root Tests

The Augmented Dickey-Fuller (ADF) test

Dickey-Fuller (DF) test (Dickey and Fuller 1979) is based on independently and identically distributed (*iid*) errors. The test examines the null hypothesis that the series X_t contains a unit root, *i.e.*, $\alpha=1$. Suppose we are given an AR(1) process, as specified in equation 1 (Brooks 2008);

$$X_t = \alpha X_{t-1} + u_t \quad -1 \leq \alpha \leq 1 \quad \dots (1)$$

where u_t is a white noise error term. If $\alpha = 1$, that is, in the case of a unit root, equation (1) becomes a random walk model without drift, which is a non-stationary stochastic process. Thus, the null hypothesis or H_0 is: "Series X_t contains a unit root" versus alternative hypothesis " H_1 : X_t series is stationary".

Subtracting X_{t-1} from both the sides of equation (1), we obtain equation (2) as follows.

$$X_t - X_{t-1} = \alpha X_{t-1} - X_{t-1} + u_t = (\alpha - 1) X_{t-1} + u_t \quad \dots (2)$$

Equation (2) can be alternatively written as equation (3) as

$$\Delta X_t = \delta X_{t-1} + u_t \quad \dots (3)$$

Where $\delta = (\alpha - 1)$ and Δ is the first difference operator. This transformation of coefficients from α to δ enables us to test the hypothesis as to whether the coefficients of X_{t-1} are statistically significantly different from zero or not.

Besides equation (3), the other two types of non-stationary series are given below.

$$\Delta X_t = \beta_0 + \delta X_{t-1} + u_t \quad \dots (4)$$

$$\Delta X_t = \beta_0 + \delta X_{t-1} + \beta_1 t + u_t \quad \dots (5)$$

Equation (3) describes a non-stationary series which can be made stationary after differencing it once. It is a pure random walk model. Equation (4) has a drift but no trend and equation (5) has both a drift and a linear trend. The parameter of interest in the regression equations (3) to (5) is δ , if $\delta = 0$, the X_t sequence contains a unit root. The null hypothesis of presence of a unit root in series X_t is rejected in favour of the alternative hypothesis of stationarity in each of the above equations, if the test statistics τ is more negative than the critical value at a given level of significance.

The Augmented Dickey-Fuller (ADF) tests here consist of estimating the regression equation (6) (Gujarati 2007).

$$\Delta X_t = \beta_0 + \delta X_{t-1} + \beta_1 t + \sum_{i=1}^p \gamma_i \Delta X_{t-i} + u_t \quad \dots (6)$$

Where u_t is a pure white noise error term and where $\Delta X_{t-1} = (X_{t-1} - X_{t-2})$, $\Delta X_{t-2} = (X_{t-2} - X_{t-3})$, and so on. It can be determined empirically as to how many lagged difference terms are required to be included. The basic purpose is to include enough terms so as to make the error term serially uncorrelated.

The Phillips-Perron(PP) test

Both ADF and PP tests often give the same conclusions and suffer from most of the same important limitations. Unit root tests are criticised because of their low power if the process is stationary but with a root close to the non-stationary boundary (Brooks 2008).

(ii) Johansen's Cointegration Test and Johansen's Vector Error Correction Model (VECM) in VAR

Johansen (1995) developed a maximum likelihood estimation procedure based on *reduced rank regression method*. It takes into account the short-run dynamics of the 'system' whilst estimating the cointegrating vectors.

A vector error correction model (VECM) is a restricted VAR designed for use with non-stationary series that are known to be cointegrated. The VECM has cointegration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics (Brooks 2008). The cointegration term is known as the *error correction term*(ECT) since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

For the purpose of testing the number of cointegrating vectors, Johansen (1995) proposed the use of two likelihood ratio test statistics, *viz.*, the *trace test* and the *maximum eigenvalues test*. The trace statistic for the null hypothesis of r cointegrating relations is computed as follows (Brooks 2008):

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^g \ln(1 - \hat{\lambda}_i) \quad \dots (7)$$

$$\lambda_{max}(r, r + 1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad \dots (8)$$

Where r is the number of cointegrating vectors under the null hypothesis and $\hat{\lambda}_i$ is the estimated value for the i -th ordered eigenvalue from the Π matrix. Larger is $\hat{\lambda}_i$, the more large and negative will be $\ln(1 - \hat{\lambda}_i)$ and hence the larger will be the test statistic. Each eigenvalue will have a different cointegrating vector associated with it. A significantly non-zero eigenvalue indicates a significant cointegrating vector.

λ_{trace} is a joint test where the null is that the number of cointegrating vectors is less than or equal to r against the alternative that these are more than r . It starts with p eigenvalues, and then successively the largest one is removed. $\lambda_{trace} = 0$ when all the $\lambda_i = 0$, for $i=1, \dots, g$. λ_{max} conducts separate tests on each eigenvalue, and has as its null hypothesis that the number of cointegrating vectors is r against an alternative $r+1$.

If the test statistic is greater than the critical value from Johansen's tables, we reject the null hypothesis that there are r cointegrating vectors in favour of the alternative that are $r+1$ (for λ_{trace}) or more than r (for λ_{max}).

The first test involves a null hypothesis of no cointegrating vectors (corresponding to Π having zero rank). If this null is not rejected, it would be concluded that there are no cointegrating vectors and the test is completed. However, if $H_0: r = 0$ is rejected, the null that there is one cointegrating vector (i.e. $H_0: r = 1$) has to be tested and so on. Thus, the value of r is continually increased until the null is no longer rejected.

(iii) Dynamic Analysis in a Cointegrated VAR Framework: Impulse Response Function and Variance Decomposition Analysis

One fundamental weakness of the VAR approach to modelling is its atheoretical nature and involvement of a large number of parameters, which makes the estimated models difficult to interpret. In particular, some lagged variables may have coefficients which change sign across the lags, and this, together with the interconnectivity of the equations, could render it difficult to see what effect a given change in a variable would have upon the future values of the variables in the system. In order to partially alleviate this problem, three sets of statistics are usually constructed for an estimated VAR model: block significance tests, impulse responses and variance decompositions. We will be discussing impulse responses and variance decompositions here.

Impulse Response Function

Impulse response function traces out the responsiveness of the dependent variable in the VAR to shocks to each of the variables, *i.e.*, shocks in the error terms. The Impulse Response Function traces out the impact of shocks for several time periods in the future. The shock is expected to gradually die away, provided that the system is stable. If there are 'k' variables in a system, a total of ' k^2 ' impulse responses could be generated.

Variance decomposition Analysis

Variance decompositions offer a slightly different method for examining VAR system dynamics. They give the proportion of the movements in the dependent variables that are due to their 'own' shocks, versus shocks to the other variables. A shock to the *i*-th variable will directly affect that variable of course, but it will also be transmitted to all of the other variables in the system through the dynamic structure of the VAR. Variance decompositions determine how much of the *s*-step-ahead forecast error variance of a given variable is explained by innovations to each explanatory variable for $s = 1, 2, \dots$. In practice, it is usually observed that own series shocks explain most of the (forecast) error variance of the series in a VAR. To some extent, impulse responses and variance decompositions offer very similar information (Brooks 2008).

