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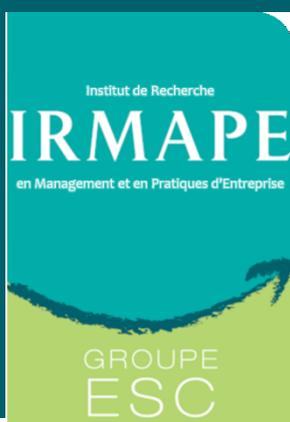
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Remittances to India and exchange rate: A Multivariate Threshold Autoregressive model Analysis

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Business Cycle properties of state-wise migrant remittance inflows to India

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ABSTRACT

This paper examines the relationship between migrant remittances to India and exchange rate using quarterly data (Q1, 1991 –Q1, 2014). A Multivariate Threshold Autoregressive model was employed to test the presence of nonlinear relationship between remittances and exchange rate. Results indicate that there is a nonlinear adjustment between exchange rate and remittances to India. The relationship between remittances and exchange rate is positive and significant under the threshold value at USD/IND=35.88 and a non-significant relationship above.

JEL Classification: F3; G00

Keywords: TVAR, Exchange Rate, Remittances, India

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1. INTRODUCTION

Remittances from abroad have become a very important component of the balance of payments for developing countries in recent years. For some countries they exceeded other types of capital flows. GDF (2012) shows that remittances in developing countries are higher than development aid flows and flows of private capital (Foreign Direct investment) (Figure 1). One can observe that remittances have risen rapidly in India over the past two decades, making it the largest recipient of remittances in the world (Figure 2). Transfers of funds to the India were multiplied by 30 between 1990 and 2012. Stability of remittances helped to significantly reduce the deficit in the current account during the 1990s and 2000s. They are also one of the most stable flows in the accounts of the Balance of payments in India, despite the slowdown expected by the world economic crisis since 2008. In addition, remittances are an important source of foreign currency for developing countries. The India has more than 11 million emigrants and annual net migration is 600 000 people. Mainly Indian emigrants are in Asia (72%), North America (15%) and Europe (10%). The Indian diaspora is deemed to be the more widely dispersed (Rai and Reeves, 2009). These migration flows are correlated with the origin of the flow of remittances, even if we see that the gap between Asia and North America is smaller (27% for North America and 58% for Asia.)

<Figure 1: Remittances Inflows as a Share of Selected Financial Inflows and GDP, 2009>

<Figure 2: top15 remittance recipient developing countries in 2014>

The size and the potential impact of the influx of transfers are great. Remittances increase reserves in foreign currency of the recipient country. While capital flows tend to increase during favourable economic cycles and to decline in bad times, remittances tend to be contra-cyclical over the economic cycles of the beneficiary countries (Frankel, 2009; Bernard et al. 2014; Sayan, 2006). Also, remittances tend to be less volatile than the other sources of income in foreign currencies (Rammeay and Ramsey, 1995; Kroft and Lloyd-Ellis, 2002; Hnatkovska and Loayza, 2003; IMF, 2005; World Bank, 2006 and Chami et al. (2008) Finally, transfers of funds supporting the development of the financial sector through a strong and positive impact on bank deposits and credit to the private sector (Amin et al., 2006;) Gupta, Patillo and Wahid, 2007; Giuliano and Ruiz-Arranz, 2009).

At the level of households, recipients often spend remittances to cover day-to-day expenses, to provide security in case of emergency or to make small investments in business or education. Remittances are better targeted to the needs of the poor as foreign aid or foreign direct

investment. In addition, because most remittances tend to be used for consumption rather than investment, they do not respond well to change of relative speed of the return on investments in the beneficiary countries of the payment (although the second effect on investment is positive, because the increasing demand for consumption gives a boost to production) (Gupta, 2006).

Sending money is a complex decision involving different variables such as exchange rates and the rate of interest. Remittances are the result of a mixture of pure altruism and self-interest (Lucas and Stark, 1985). Remittances are generated by individual decisions which are influenced by a macroeconomic environment in the host country. However, macroeconomic environments in the countries of origin also affect decisions to send money by migrants. In addition, several factors explain the behavior of remittances over time and between host countries. Vargas-Silva and Huang (2006) highlight that remittances are more sensitive to shocks operating in the host country than in the countries of origin.

Most of the studies on the behaviour of transfer of funds have a micro (Köksal, 2006) approach. Little empirical work are interested in the relationship between the exchange rate regime and the behaviour of remittances. It is worth noting that the behaviour of migrants in terms of transfers of funds can vary depending on the sensitivity of transfers to the exchange rate. Similarly, the uncertainties associated with the economic cycle affect the behavior of remittances (Mughal and Makhoul, 2011). For example, natural disasters remittances may increase, because they are motivated by altruistic behavior. They are considered contra-cyclical and stable (Ratha, 2007). In addition, remittances play an important role in reducing the magnitude of economic cycles in the country of origin (Mughal and Makhoul, 2011).

Although a proportion of the flow are for altruistic reasons, to help the members of his family, many are also motivated by prospects of gains, taking advantage of the financial benefits offered not the destination country funds. For example, India deposits by non-residents benefit from higher interest rates and are exempt from income tax. Similarly in Pakistan and Bangladesh, there are tax incentives to attract more transfers of funds.

The Reserve Bank of India had announced a liberalised regime of payment (the plan) in February 2004 as a step towards more simplification and liberalization of the facilities of the currencies available to residents. Under the scheme, resident individuals can contribute up to 125 000 USD per fiscal year for all authorized capital and current account transactions or a combination of both.

Exchange rate policy is an important component of macroeconomic policy in developing (Cooper, 1999). In fact, the exchange rate affects the prices of goods and services. The exchange rate also

exerts a strong influence on remittances (Makhlouf, 2013). Over the last decade the Indian rupee has undergone a sharp depreciation, while at the same time remittances to India have continued to increase. We are interested in this paper on the impact of Exchange rate fluctuations the level of remittances, but also to the contribution of remittances to the exchange rate fluctuations. The rest of this paper is organized as follow: section II analyses the review of literature; section III provides some background information on recent patterns in remittance flows and Indian economy; section IV describes data and methodology and discusses results; section V draws conclusions.

2. REVIEW OF LITERATURE

Straubhaar (1986) notes that remittances are influenced by variations in the exchange rate in Turkey. In addition, El-Sakka and McNabb (1999) conclude that the exchange rate is an important variable which influence remittances in the case of Egypt. Changes in exchange rate induce two main effects on remittances namely revenue and substitution effect (Faini, 2007). Revenue effect from remittances occurs when a depreciation of the exchange rate encourage migrants to send less money. While, substitution effect occurs when an appreciation of exchange rate encourage migrants to send less money Also Yang (2008), in the case of Philippines finds that an appreciation of a migrant's currency against Peso's Pilipino raises remittances to Philippines. Their results also find that the elasticity between remittances and exchange rate is 0.60. Migrants prefer to use informal channels when the exchange rate is not attractive (Freund and Spatafora, 2008). Widely, remittances to developing countries are impacted by the economic characteristics such as economic activity, interest rate and exchange rate (Gabel, 2008). Singer (2008) argues that remittances exert a substantial influence on the choice of exchange rate regimes in the developing countries. Melkadze (2012), using quarterly data on remittances to Georgia, suggests that remittances respond to exchange rate variations. Short term, the depreciation of the Indian currency leads to an increase in remittances, but long term, it generates a decrease of remittances (Sirkeci et al., 2012, p. 115). Exchange rate also affects remittances (Makhlouf, Mughal, 2013). It is important to note that the relationship between remittances and exchange rate is bi- causal (Farid, 2013). Jackman (2013), using panel data for 93 countries, finds that portfolio variables such as exchange rate have significant impact on remittance volatility. Recently in the case of Morocco Farid (2014) show that the relationship between remittances and exchange rate is nonlinear in the case of Morocco. He finds that there is one best unique threshold at Euro/Moroccan Dirham=

11.2048: under the threshold, the effect of nominal exchange rate appreciation on remittances is positive, and above the threshold the effect is negative.

3. STYLIZED FACTS FOR INDIA

While the take-off of the Indian economy on a path to Chinese seemed to take shape in the mid-2000s with four years of growth above 9%, the turnaround in the world economy since 2008 is accompanied by growing questions about the resilience of the Indian model. Beyond growth rate fell below 6% since 2012, questions focus on more structural challenges in a global context more than gloomy and uncertain about the future of globalization and its governance. And in these challenges, financial issues appear in the foreground. It's a little like the euphoria of the 2000 decade had masked the strong limits of financial Indian system to accompany a system of sustained growth.

3.1. An economic recovery growth

After unprecedented growth at the beginning of the years 2000 (+ 9% per year) and a crossing of rather well controlled crisis, the Indian economy experienced a slowdown in its development from 2012 to 2014 with a less than 5% per year growth rate. One must go back at the end of the 1980s to find two consecutive years of less than 5% growth. This slowdown is mainly the result of the continuing uncertainties in the Economic Outlook global (crisis of the euro area and general downturn), compounded by domestic structural constraints and inflationary pressures. We observe the same pattern in other emerging countries, but the brake is stronger in India. Indeed, the pace of economic growth in India rose by 8.3% on average between 2004 and 2011 to 4.6 per cent from 2012 to 2014 (CSO), 2014, while for other emerging countries (including China) have seen the rate of growth increased from 6.8% to 4.9% per year over the same period.

<Figure 3 : GDP Growth Rate 1990-2015>

3.2. The inflationary pressures

In addition to the slowdown in growth, inflation remains an important challenge for the India. Although the index of wholesale prices (WPI) has decreased (8.9% in 2011 - 2012; 7.4% in 2012-2013 and 6.00% in 2013-2014, this level is still higher than the "comfort" zone.

Maintaining inflation at a high level is the result of the increase in prices of raw materials and agricultural products. Furthermore, the level of inflation plays a major role in the deterioration of public finances.

<Figure 4: Inflation in India 1990-2015>

3.3 Remittances in India

Transfers of funds to the India show strong growth with an average of 10% per year (in constant dollars) since 1991. Remittances in constant dollars decreased by 7% in 2009, but correlated with the global trend, there has been a rebound in 2010 (+ 9%).

<Figure 5 : Remittances to India (1990-2012)>

Remittances were relatively low in India until 1991. Since the growth rate is high (10% per year) (Figure 5). In absolute terms, the India is the largest recipient of remittances in the world. The weakness of the transfers of funds between 1975 and 1989 is essentially the result of the heavy restrictions imposed by the Indian Central Bank on transactions in foreign currency and the exchange rate fixity. The change in trend in remittances in India corresponds to the movement of financial liberalization begun in 1991. The local currency was devalued by 30% within a year. Current account transactions have been liberalized, as well as the financial sector. The customs duties on the import of gold (source of traffic previously) decreased gradually to finally be abolished on the small quantities directly imported by individuals. All these changes have helped to reduce clandestine channels transactions and were mechanically, driven a surge in official remittances. However, the growth of remittances cannot be solely attributed to the disappearance

of illegal channels. The pace of growth is compatible with the increasing integration of the India economy world but also in the growing number of Indian migrants worldwide.

An important feature of the transfer of funds is that they are one of the most stable forms of external flows in India. Jadhav (2003) and Gupta (2006) have shown that remittances are more stable than the deposits of non-residents (NRI) or portfolio flows. Gupta and Singh (2012) compared measures of volatility of remittances with other current and financial flows. They show that remittances are also stable than exports of goods and services and more stable than FDI, portfolio investments and the NRI deposits.

Since 2004, observed that the transfer of funds to the India are sensitive to national macroeconomic factors, international interest rates and fluctuations in prices on the Indian stock market (Gupta and Singh, 2012). In particular, an increase of Indian interest rates, decreased foreign interest rates and an increase of Indian stock index are associated with an increase in remittances in India. This shows that remittances tend to be pro-cyclical, in other words to increase during periods of growth in the country of destination of the transfers. In contested by India, it can also highlight the positive role played by the opening of the capital account and the liberalization of the financial sector as reasons for increase in incoming funds transfers.

On the other hand, it may be noted that remittances to the India are not affected by the macroeconomic situation of the country of migrant. Transfers of funds to the India are susceptible to a downturn if the attractiveness of India as an investment destination, is reduced. This may be a reflection of a decrease of the interest rates in India, coupled with an increase in foreign interest rates, and a drop in stock values on the Indian financial markets.

4. EMPIRICAL ANALYSIS

The exchange rate is an important financial variable that affects remittances and other financial transfers (Farid, 2014). Relationship between remittances and exchange rate can exhibit breaks in their behavior connected with evolution of the exchange rate policy. Exchange rate variations affect the value of remittances and private transfers in terms of the value of their currency. To assess the impact of the evolution in India's exchange rate regime on privates transfers. A regime-switching model was stated in this section. Exchange rate stability is an important factor for

remittances and other private transfers' management. As a stable rate is anticipated to reduce remittances volatility. In this study endogeneity is obvious since remittances and other private transfers affect exchange rate. Furthermore, remittances can influence exchange rate regime (Singer, 2010). To assess the relationship between exchange rate and remittances, the VAR model is considered.

To describe the consequences of a dramatic change in the behavior of the relationship between exchange rate and remittances. We assume that this relationship can be described with this model bellow.

4.1 Data

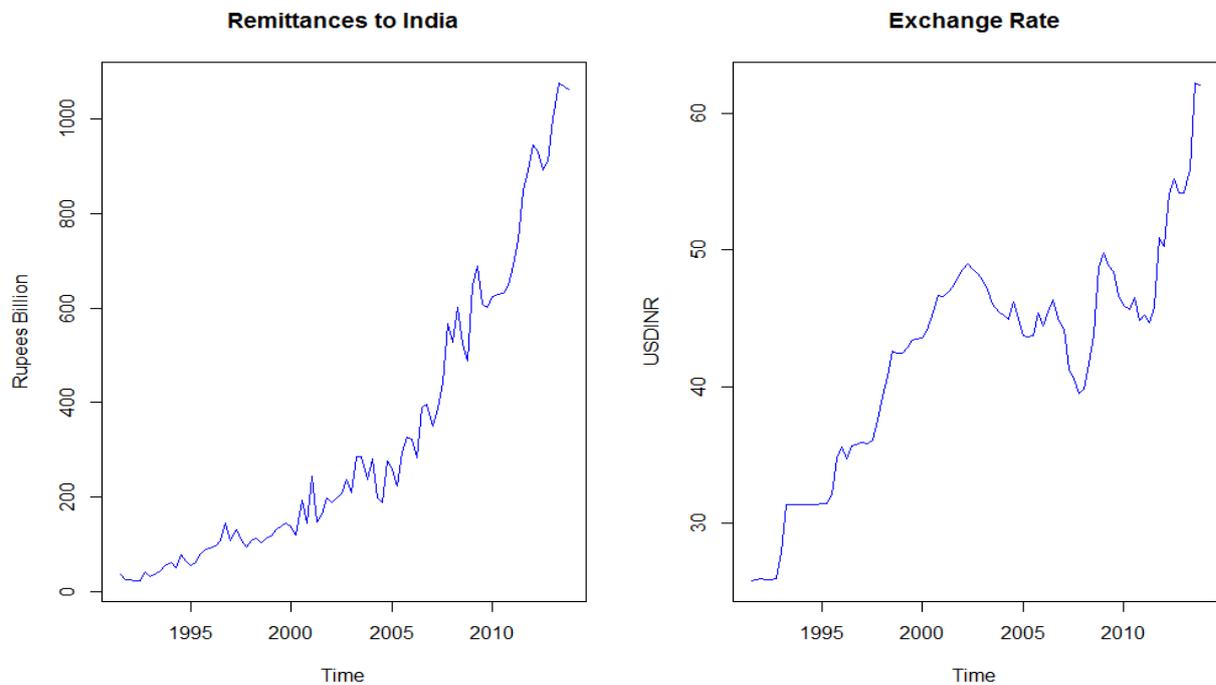
To avoid two significant structural breaks relevant for India namely economic liberalization from July 1991 and Gulf War which finished on February 1991. Quarterly data used in this paper from (1991, Q3) to (2013, Q4). The exchange rate is the market rate, period average (national currency, Indian Rupee, per US Dollar).

Private transfers are measured in Indian Rupee. As stated in Farid (2014) a chock of exchange rate is defined as a nominal depreciation of exchange rate by the India's Central Bank. It represents a positive variation of exchange rate. Table 1 gives a summary statistics. It shows that exchange rate varies from 1\$=25.76 INR To 1\$ =62.25 INR.

Table 2 : Summary statistics

	Min.	1st Quantile	Median	Mean	3 rd Quantile	Max	Source
Exchange rate INR/USD (Q)	25.76	35.83	44.14	42.17	46.64	62.25	Reserve Bank of India
Private transfers (Rupees Billion) (R)	22.26	107.10	203.20	326.7	525.80	1078	Reserve Bank of India

figure 5 provides a visual representation of the exchange rate and remittances used in our estimation.



In the first time a threshold value will be estimated endogenously through a TVAR model. Then we'll split the sample into two subgroups according to the threshold value. In the second time we will use the impulse response functions to see how remittances react to exchange rate variations.

4.2 Multivariate Threshold Autoregressive model

Our model can be expressed as:

$$\begin{cases} \text{Regime 1} \begin{cases} Q_t = C_1^1 + \beta_{11}Q_{t-1}^1 + \beta_{12}R_{t-1}^1 + \varepsilon \\ R_t = C_2^1 + \beta_{21}Q_{t-1}^1 + \beta_{22}R_{t-1}^1 + \varepsilon \end{cases} & Q \leq Q^* \\ \text{Regime 2} \begin{cases} Q_t = (C_1^2 + \gamma_{11}Q_{t-1}^2 + \gamma_{12}R_{t-1}^2) + \varepsilon \\ R_t = (C_2^2 + \gamma_{21}Q_{t-1}^2 + \gamma_{22}R_{t-1}^2) + \varepsilon \end{cases} & Q > Q^* \end{cases}$$

Where:

Q^* : threshold value ; Q: exchange rate and R: remittances

The model (1) identifies tow regimes based on the value Q^* which is endogenously calculated via simulations. The threshold Q^* We treat the exchange rate as the threshold variable.

Let $\hat{\theta}$ be a vector of parameters which:

$\theta = (C_1^1, C_2^1, \beta_{11}, \beta_{12}, \beta_{21}, \beta_{22}, C_1^2, C_2^2, \gamma_{11}, \gamma_{12}, \gamma_{21}, \gamma_{22})$. To estimate the parameter θ , the ordinary least square will be used to minimize this equation:

$$\hat{\theta} = \underset{\theta}{\text{Argmin}} \begin{cases} d^* \sum \begin{cases} Q_t - C_1^1 + \beta_{11}Q_{t-1}^1 + \beta_{12}R_{t-1}^1 \\ R_t - C_2^1 + \beta_{21}Q_{t-1}^1 + \beta_{22}R_{t-1}^1 \end{cases}, & Q \leq Q^* \\ d^* \sum \begin{cases} Q_t - (C_1^2 + \gamma_{11}Q_{t-1}^2 + \gamma_{12}R_{t-1}^2) \\ R_t - (C_2^2 + \gamma_{21}Q_{t-1}^2 + \gamma_{22}R_{t-1}^2) \end{cases}, & Q > Q^* \end{cases}$$

Where d equals 1 if its argument is satisfied and 0 otherwise. Before testing $\hat{\theta}$, we select the optimal lag order by using the linear VAR model. The optimal lag is determined in table 2

Table 2: Optimal Lag

Regime 1					
Criteria	1	2	3	4	5
AIC(n)	5.606105	5.611947	5.819663	5.672059	6.034212
HQ(n)	5.664418	5.709136	5.955727	5.846999	6.248027
SC(n)	5.904824	6.109813	6.516676	6.568218	7.129517
FPE(n)	273.326296	279.666631	358.324240	333.906295	548.801567
Regime 2					
	1	2	3	4	5
AIC(n)	8.932084	8.952128	8.924645	9.005343	9.070865
HQ(n)	9.013455	9.087746	9.114510	9.249456	9.369225
SC(n)	9.139711	9.298173	9.409108	9.628224	9.832164
FPE(n)	7572.229363	7730.005755	7530.190778	8181.917748	8767.788851

4.4 Results

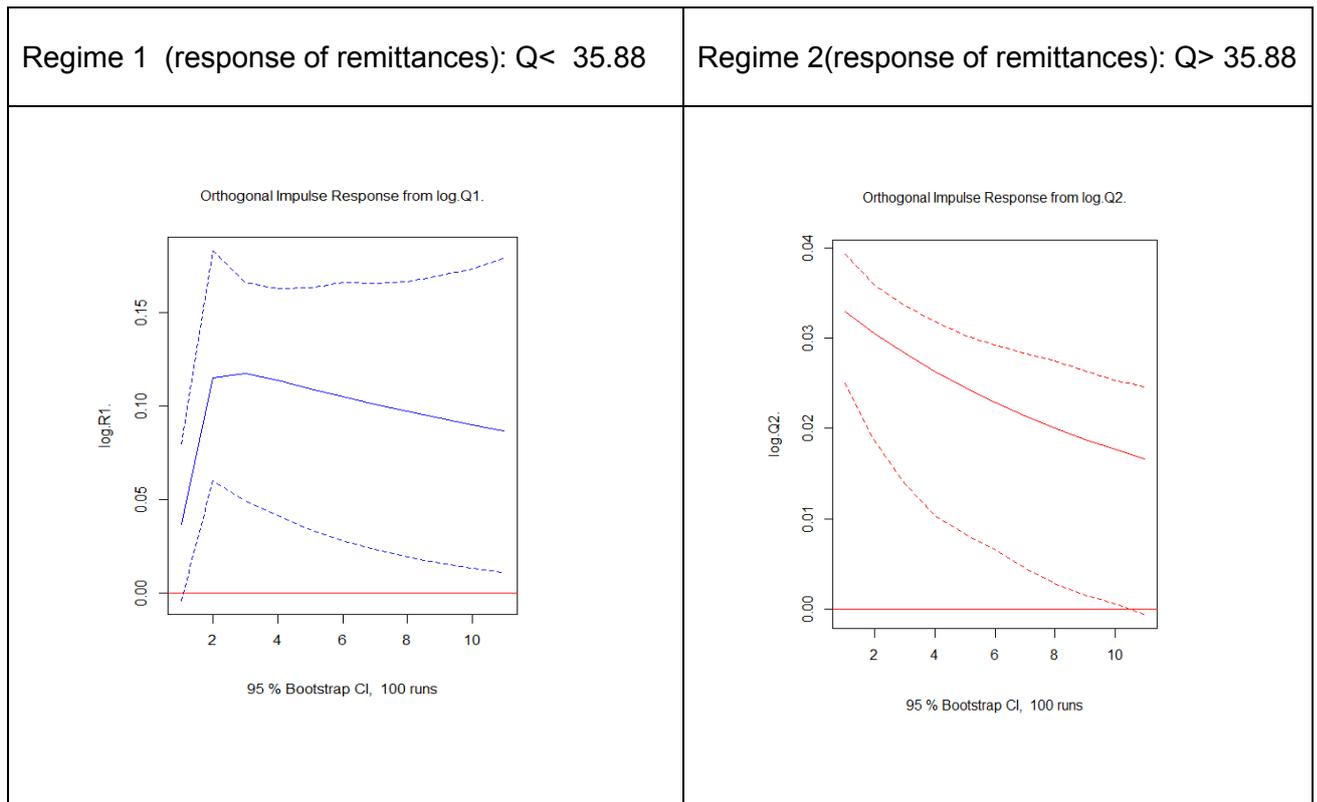
Results reported in table 3 indicate that there is one unique best threshold value at USD/INR = 35.88. Table3 also indicates that the percentage of observations in each regime are 27% and 73% in the high and low regime respectively.

Table 3: Results of TVAR

Full sample size: 90 End sample size: 89			
Number of variables: 2 Number of estimated parameters: 12 + 1			
AIC -904.1419 BIC -871.7896 SSR 2.691351			
Regime 1			
	Intercept	log.Q. -1	log.R. -1
Equation log.Q.	0.5724(0.3881)	0.7963(0.1463)***	0.0348(0.0314)
Equation log.R.	-8.5304(2.1110)***	3.3798(0.7959)***	0.2518(0.1708)
Regime 2			
	Intercept	log.Q. -1	log.R. -1
Equation log.Q.	0.2321(0.1817)	0.9287(0.0527)***	0.0085(0.0068)
Equation log.R.	-0.4476(0.9883)	0.1873(0.2864)	0.9596(0.0372)***
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1			
Threshold value: 3.58018			
Percentage of Observations in each regime: 27% 73%			

Results in the figure 6 report two regimes: the lower regime (exchange rate < 1USD=35.88INR) and the upper regime for ($Q > 35.88$). Results also show in figure 5 responses of exchange rate are not the same in two regimes. In the lower regime, the impact of devaluation of exchange rate is positive. Conversely, in the regime 2, the impact of devaluation of exchange rate on remittances is not significant.

Figure 6: Impulse response functions



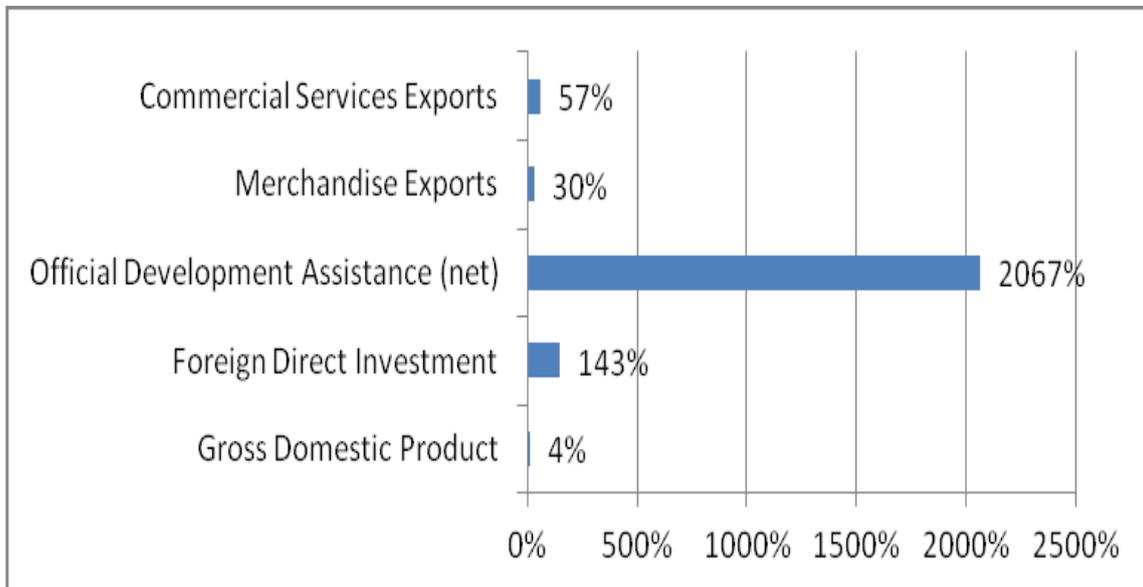
5. CONCLUSION

Several macroeconomic determinants of remittances are documented in the economic literature such as economic activity in host and origin countries, interest rate, and exchange rate. Most of these studies consider the relationship between exchange rates and remittances is linear. However, the added value of this paper is to consider that the relationship is nonlinear. Indeed, the relationship between remittances and exchange rate is nonlinear in the case of India. The central bank of India intervenes to stabilize exchange rate. Interventions can affect the behavior of remittances. To maximize remittances, The

Central Bank can use the exchange rate as a tool to boost remittances. Finally the determinants of remittances are not only macroeconomic but also microeconomic. Authorities of the country of origin have an important role to play in order to reduce the transaction costs of transfers and create opportunities for migrants to send more of remittances.

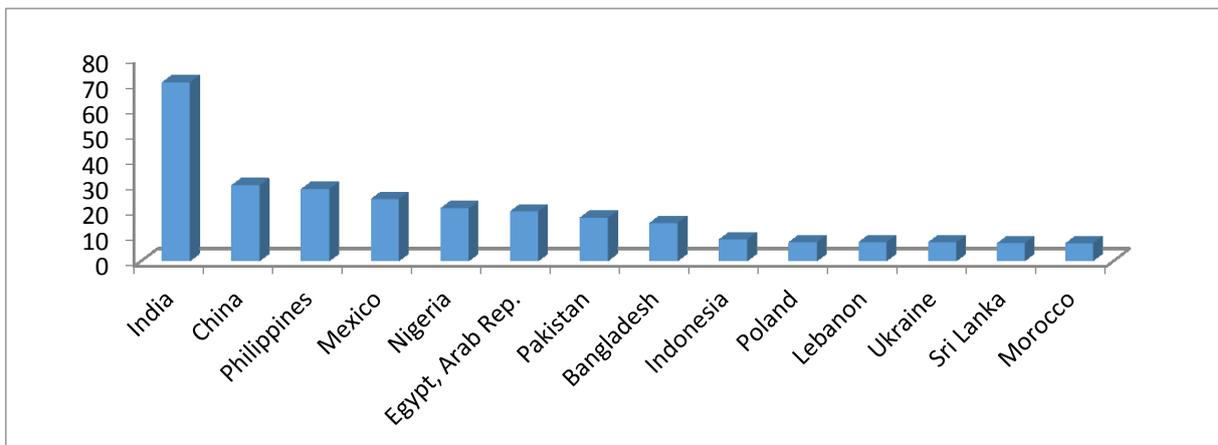
6. ANNEX

<Figure 1: Remittances Inflows as a Share of Selected Financial Inflows and GDP, 2009>



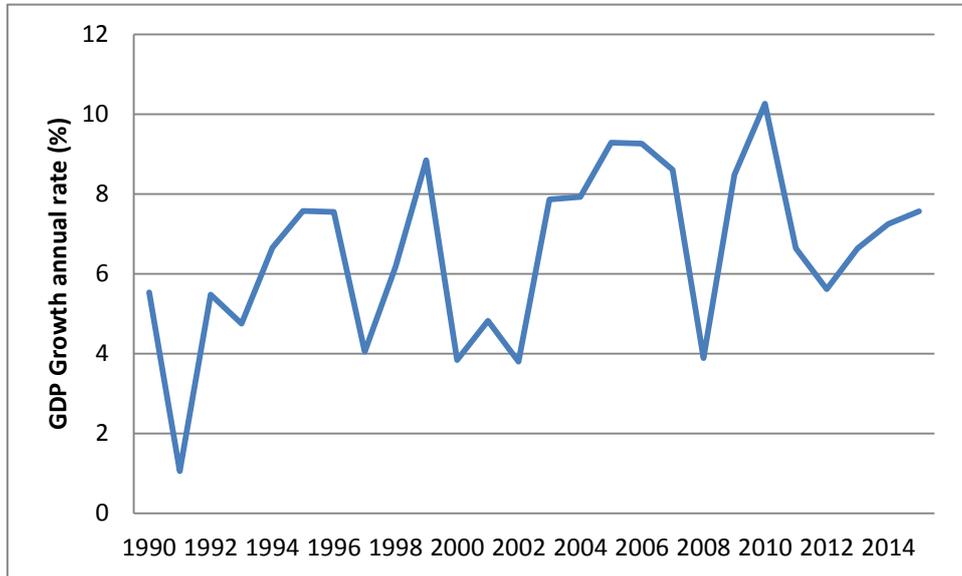
Source: World Bank

<Figure 2: top15 remittance recipient developing countries in 2014>



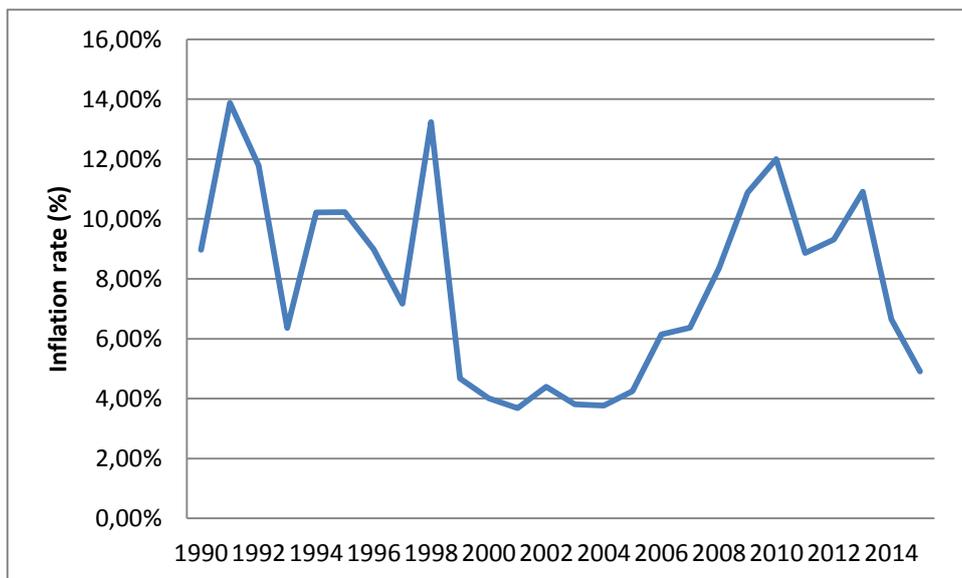
Source: World Bank

<Figure 3 : GDP Growth Rate 1990-2015>



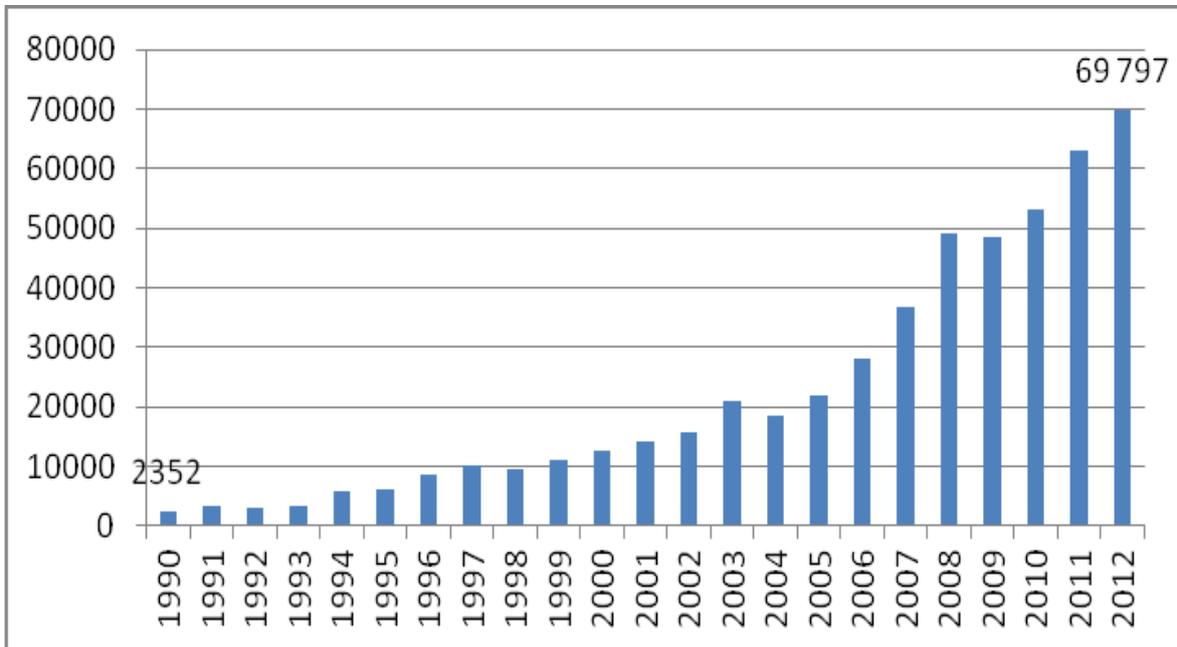
Source: World Bank

<Figure 4: Inflation in India 1990-2015>



Source: World Bank

<Figure 5 : Remittances to India (1990-2012)>



Source: World Bank

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