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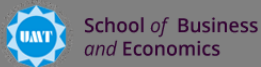
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## Exchange Rate Uncertainty and Workers' Remittances: Empirical Bayesian Approach

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## Exchange Rate Uncertainty and Workers' Remittances: Empirical Bayesian Approach

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### Abstract

*Exchange rate is one of the important determinates of worker's remittances to a country. Level of exchange rate as well as any fluctuation in it influences the volume of workers' remittances. The present study uses data of workers' remittances from ten major countries to Pakistan for the period 1973 to 2012. Uncertainty of exchange rate is estimated through GARCH model. We use Empirical Bayesian approach to compute posterior information (estimates, for which, the GMM estimates are used as prior in order to avoid biasness and inconsistency due to the presence of endogeneity in our model. The Empirical Bayesian estimates are found to be more efficient in terms of significance and correct signs of modeled variables. The findings suggest a significant role of home and host country characteristics in most of the cases. The findings also reveal a negative impact of exchange rate uncertainty on the inflow of remittances. The political instability reveals an insignificant impact on remittances. The study recommends different policy options for different host countries. Apart from the Middle East, the policy for other regions (like USA, Canada, and Germany etc.) must be considered separately to encourage inflow of remittances. Appropriate stabilization measures have to be taken on priority basis to curtail volatility of exchange rates and to ascertain regular inflow of remittances.*

**Keywords:** exchange rate uncertainty, remittances, GARCH, GMM, EB technique

**JEL Classification Codes:** F24, D81, C26

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## 1. Introduction

Remittances refer to the financial inflows remit by the emigrants to the home country from abroad<sup>4</sup>. It helps in the fulfilling of the financial needs of the families left behind by the emigrants. Although the process of remittances revolves around some specific number of individuals but these are considered to be one of the key indicators of economic situation in home country. Workers' remittances are one of the main sources of foreign exchange earnings of developing countries. It not only improves the balance of payment position but also reduces the dependence on external borrowing.

Workers' remittances, in developing countries, have been increased drastically during the last three decades. Their inflow to developing countries reached to 221.3 billion dollars in 2005 while the same was 31.2 billion dollars in 1990 (World Bank; 2006). The annual growth rate of the volume of remittances remained over 13 percent during this period and its share in the total financial flows is approximately 35 percent. The volume of remittances has exceeded the official development assistance (ODA) and financial flows other than FDI.

Pakistan is ranked 7<sup>th</sup> among the largest remittance recipient countries across the globe. During the last three decades, workers' remittances to Pakistan significantly increased; reaching to the highest amount of US \$11 billion (approx.) during 2010-2011 (Economic Survey of Pakistan 2010-11). After Foreign Direct Investment, remittances are the second most important factor of external resources of Pakistan. Remittances inflow also helps Pakistan combating against the negative effects of oil price shocks. It also helps reducing the problem of unemployment and improving the living standards of the society.

Remittances are used primarily for the consumption purpose by the households in Pakistan. A minor share of the remittances is devoted to the enhancement of the economic activities in the form of

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<sup>4</sup> Remittances are classified into (1) current private transfers to home country by the workers working abroad for more than a year, no matter whatever their immigration status is; (2) income of migrants, who have lived in the host country for less than a year, in the form of employees' compensation; and (3) transfers (net worth) made by those migrants who are expected to remain in the host country for more than a year-IMF (1993).

investment. The economic and political conditions are considered to be the key factors that affect the level of foreign remittances<sup>5</sup>. The economic and political conditions have been helpful in motivating to study and examine the effects of uncertain conditions on remittances inflow.

A vast literature exists which explores and analyzes the impact of relative rate of returns on the level of worker's remittances in the form of capital gains and welfares. The evidences from these studies show that immigrants respond to economic variables and increase remittances when they expect higher rate of returns (when the exchange rate of home country is depreciated). However, the response of inflow of remittances to uncertainty in exchange rate is neglected in these studies. This provides us with the scope to investigate the impact of uncertainty in exchange rate on the inflow of remittances to Pakistan along with the other variables.

With this brief introduction, rest of the paper is divided as under. Important studies in the field are discussed in Section-2. Section-3 reports data extraction, model used and methodology adopted. Section-4 is about the GARCH process and estimation of uncertainty in the exchange rate time series. Section-5 enjoys the central position in the study that reports, discusses and analyzes the results. This is followed by conclusions and policy recommendations in Section-6.

## **2. Literature Review**

Since 1970's, the inflow of remittances to developing countries has attained an increased attention. The increase in foreign exchange earnings through workers' remittances has helped the recipient economies in accelerating their economic growth. Further, it also has reduced the dependence of the recipient countries on foreign borrowing to handle the current account deficits and to finance economic development programs.

Researchers have tried to explore and examine the determinants of the inflow of remittances. They have focused mainly on the macroeconomic condition and political instability as the key variables affecting the workers' remittances. Specifically, they consider exchange rate uncertainty and political instability as the factors that influence the behavior of emigrants to remit to their home countries. Here, we briefly discuss the important aspects of the literature that

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<sup>5</sup>For detail see "Cost of War on Terror for Pakistan Economy" Economic Survey of Pakistan 2010-11 (Pp. 219-220).

corresponds to some selected areas like the exchange rate, the general determinants of remittances and the specific economic and political situations that affect the inflow of remittances. Among the key macroeconomic indicators of volatility are exchange rate and inflation. Literature differentiates between uncertainty and volatility as two different terms. A time series variable can be more volatile yet predictable. Uncertainty, on the other hand, is that a series is volatile up to an extent that the probability becomes unknown.

Brzozowski (2006) found a significant and negative relationship between variability of exchange rate and the flow of foreign direct investment. Jackman, Craigwell, and Moore(2009) and Craigwell, Jackman, and Moore (2010) analyzed the link between macroeconomic volatility and the workers' remittances. Their findings revealed mitigating effects of inflow of remittances on volatility of output and volatility of investment. However considering the importance of the inflow of remittances, it can help reducing the unpleasant output shocks. Further, before making any policy the policy makers have to consider the proper monitoring and forecasting of the inflow of remittances. Higgins, Hysenbegasi, and Pozo(2004) examined the impacts of risk variables on remittances in the western hemisphere. Their findings shows that risk variable significantly affects the inflow of remittances. The authors suggest the removal of these risks through proper policy measures.

Solomon (2008) evaluated the impacts of political risk and uncertainty of exchange rate uncertainty on the level of workers' remittances. The author's findings reveal a negative impact of rate uncertainty of exchange on workers' remittances. Kandil and Mirzaie (2005) investigated the impacts of fluctuations in exchange rate on inflation and output. The authors found limited impact of anticipated depreciation in exchange rate on inflation and growth of output. However, more significant impacts of unanticipated fluctuations in exchange rate were found on growth rate of output and inflation. Arize Osang, and Slottje (2000) investigated the impact of exchange rate uncertainty on trade and found a negative relationship between these variables. The authors suggested an improvement in the policy to counter this negative impact of exchange rate uncertainty. On the other hand, Hau (2002) found that more trade openness stabilizes exchange rate fluctuations. According to Sopemi (2006), for developing countries the remittances are among the most important sources of capital.

Although the volume of remittances is lesser than foreign direct investment, it surpasses the capital market flows and official development assistance.

Quinn (2005) investigated the impacts of savings and relative rate of returns on remittances. The author empirically evidenced that rate of returns and the needs for consumption have largely affected the level of remittances. The findings of the study reveal that higher savings today increases remittances in the future due to higher rate of return in home country. Faini (1994) examined the link between real exchange rate and the inflow of remittances. The author found a key role played by exchange rate in determining the level of remittances. Amuedo-Dorantes and Pozo (2006) found that Mexican workers are highly responsive to the fluctuations in USA economy. Findings of the study revealed that remittances increased significantly due to the increase in the risk associated with income.

Aydas, Metin-Ozcan, and Neyapti (2005) investigated the impacts of different factors on workers' remittances. The study suggested that for a stable inflow of remittances there was a need of economic and political stability. Blue (2004) evaluated the responses of remittances to certain social factors in Cuba along with the economic factors. Findings of the study reveal that the level of remittances to home is increasing with the increase in "*family ties*". El-Sakka (2008) used data from 1970 to 2002 for Jordanian economy and found that economic growth in the home country is an important determinant of the inflow of remittances. Results also revealed that fluctuations in exchange rate influence the remittances by the emigrants. The author suggested that the policy makers should carefully watch the deviations of exchange rates from their long-run equilibrium levels. Catrinescu, Leon-Ledesma, Piracha, and Quillin (2009) evaluated the relationship that exists between remittances, institutions and macroeconomic growth. Interestingly enough, the findings of the study revealed no significant long run relationship between macroeconomic growth and remittances; although the impact may be positive but very weak.

Hysenbegasi and Pozo (2004) analyzed the relationship between workers' remittances and economic conditions. Particularly, the study explored the impact of exchange rate on workers' remittances. The authors argued workers working abroad are behaving as risk neutral investors. Thus, the level of remittances is low when the economic conditions are unfavorable. Particularly remittances are adversely affected when the exchange rate is uncertain. Bugamelli and

Paterno (2011) investigated the relationship between remittances and volatility in output growth. The findings revealed that uncertain economic conditions have negative impacts on the growth rate of output, poverty and on overall welfare. However, the study also suggests that a higher inflow of remittances to developing economies may help in the reducing fluctuations in output growth. Therefore, for the better economic prospects of a country, remittance should be promoted.

### **3. Model, Methodology and Data**

To evaluate the factors, particularly risk, affecting remittances the economic conditions of the home as well as host countries must be considered. In general, it is difficult to capture the link between levels of risk and the volume of remittances unless we identify the political and economic conditions prevailing in the home as well as in the host countries.

Pakistan is facing the problems of high inflation, financial crises, and volatility in exchange rate. In addition, it is exposed to war-like situation since the 9/11 event due to terrorism and political instability. The fluctuations of these factors are likely to affect the level of remittances. The prevailing circumstances of Pakistan inspire the researchers to include the risk factors as explanatory variables along with the commonly used factors. This may be useful in explaining the level of remittances in a better way. The literature review indicates that no significant work has been done on these lines with reference to Pakistan's economy.

The current study is expected to help in explaining the effects of conventional macroeconomic variables in a better way because it also incorporates the impacts of political and economic uncertainty on inflows of remittances to Pakistan. Literature also suggests that economic conditions of the host country, economic conditions of the home country, the exchange rate and its uncertainty etc. are among the important determinants of the remittances.

#### **a. Model Specification**

As explained above, the political instability and the volatility of exchange rate along with the conventional economic variables are important factors that influence the inflow of remittances. Therefore, the following is our general model:

$$Re = f\{EC_{(Ht)}, EC_{(Hm)}, EX, UnEx, PI\} \quad (1)$$

Equation (1) shows that inflow of remittances (Re) depends on the economic conditions prevailing in the host  $\{EC_{(Ht)}\}$  and home country  $\{EC_{(Hm)}\}$ , the real exchange rate (EX), the exchange rate uncertainty (UnEx) and political instability (PI). In stochastic form, equation (1) can be written in its linear format as under:

$$Re = \alpha_0 + \alpha_1 EC_{(Ht)} + \alpha_2 EC_{(Hm)} + \alpha_3 PI + \alpha_4 EX + \alpha_5 (\sigma^2 EX) + \mu \quad (2)$$

In the above equation, ' $\sigma^2$ ' and  $PI$  are the measures of real exchange rate uncertainty and the political risk/uncertainty, respectively. The intercept ' $\alpha_0$ ' captures the average impact of all unobserved factors which, somehow, are affecting the level of remittances. ' $\mu$ ' is the stochastic error term which is assumed to satisfy all the standard assumptions about mean and variance.

## b. Estimation Methodology

As there exists two causation between remittances and exchange rate, therefore potential problem of endogeneity arises in equation (2). In this case the Ordinary Least Squares estimators will not only be biased but also inconsistent. To deal with the issue, the common alternatives are the Full Information Maximum Likelihood, Generalized Method of Moments (GMM) and Three Stage Least Square. We prefer using the GMM-HAC (which reports Heteroskedastic Autocorrelated Corrected estimates) and Empirical Bayesian (EB) techniques due to the reasons discussed below.

### 3.2.1. GMM and EB as Estimation Techniques

GMM is one of the sophisticated analytical technique which not only handles the problem of endogeneity but also overcomes the problems of autocorrelation and heteroscedasticity. However, Carrington and Zaman (1994) suggest the use of an alternative technique - the Empirical Bayesian (EB). EB estimators are more efficient with several additional advantages for small samples. Therefore, we will employ EB technique to obtain consistent estimates. For this purpose, we will first estimate our model by GMM. Then we will use GMM estimates as priors to compute Empirical Bayesian estimates.

The density function of prior information is given as:

$$\hat{\beta}_i | \beta_i \sim N(\beta_i, \Lambda_i) \quad (3)$$

The distribution of GMM coefficient ' $\hat{\beta}_i$ ', is assumed to be normal with mean  $\beta_i$  and variance ' $\Lambda_i$ '. Under this assumption, the EB



estimator ' $\beta_i$ ', is normally distributed with mean ' $\mu$ ' and variance ' $\Omega$ ', can be obtained:

$$[\beta_i | \mu, \Omega] \sim N(\mu, \Omega) \quad (3.1)$$

The mean and variance of the prior density thus obtained via GMM are given by:

$$\mu = \Omega^{-1} [\sum_{i=1}^{10} \Lambda_i^{-1} \hat{\beta}_i], \quad \Omega = [\sum_{i=1}^{10} \Lambda_i^{-1}]^{-1} \quad (3.2)$$

Using the above equations, we find the posterior density of the data given as:

$$f(\beta_i) \sim N(m, V) \quad (3.3)$$

The mean ' $m$ ' and variance ' $V$ ' of the posterior density function can be obtained as:

$$m = V[\Lambda_i^{-1} \hat{\beta}_i + \Omega^{-1} \mu], \quad V = [\Lambda_i^{-1} + \Omega^{-1}]^{-1} \quad (3.4)$$

The final form of the Empirical Bayesian estimates is given as<sup>6</sup>:

$$\hat{\beta}^{EB} = V[\Lambda_i \hat{\beta}_i + \Omega^{-1} \mu] \quad (3.5)$$

### 3.2.2. GARCH as Measure of Uncertainty

As discussed above the exchange rate uncertainty is an important determinant of remittances in our model (equation (2)). In most of the studies on volatility, variability and uncertainty, researchers have used the standard deviation to measure fluctuations in exchange rate. Some of the researchers have also used rolling standard deviation to measure variability of exchange rate. Although 'standard deviation' is considered a good measure of variability, however, it is unable to provide a true answer to the uncertainty element attached with exchange rate fluctuations. Following Serven (2003), we use GARCH based conditional variance<sup>7</sup> as a measure of uncertainty.

The terms variability and unpredictability differ from each other in the sense that a series might be very volatile but at the same time it can be easily predicted. The unconditional volatility of a series might normally be very high in a series but yet it may be possible to estimate the simple variance easily. As compared to the standard deviation or simple variance, the estimates attained via GARCH are superior measures of uncertainty in time series data since the estimates

<sup>6</sup> See for details, Carrington and Zaman (1994).

<sup>7</sup> See Engle (1982) and Bollerslev (1986) for further understanding.

are conditional upon the information available in past. Keeping this in view the uncertainty of exchange rate is measured through the variance of the exchange rate conditional on information observed by agents.

### 3.3. Data

To examine the impacts of different factors affecting inflows of remittances to Pakistan, separate data of inflows of remittances from different host countries are needed. It can be seen that a large part of remittances to Pakistan is remitted from UAE (GCC), Saudi Arabia, United States (US), United Kingdom (UK) and other European countries. The percentage shares of remittances inflows from these countries are given in Table 3.1.

**Table 3.1: History of Remittances Inflows (as %) to Pakistan**

Country of Origin	1973	1977	1981	1986	1991	1996	2002	2005	2008	2012
UAE	0	20	13	12	9	11	20	17	17	21.60
Saudi Arabia	6	27	47	45	37	34	16	15	19	27.07
United Kingdom	5	9	9	9	10	8	6	9	7	11.54
United States	7	5	3	7	10	10	33	30	27	17.75
Other	33	39	29	27	34	37	26	29	29	22.04
Total %	100	100	100	100	100	100	100	100	100	100

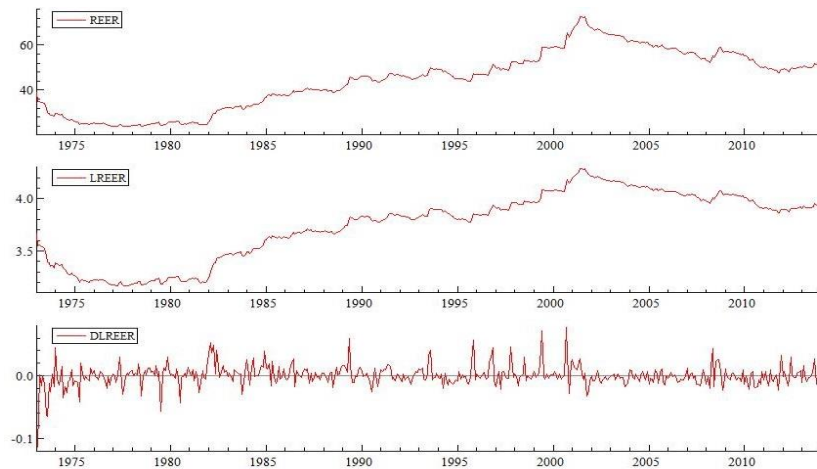
**Source:** World Bank Development Indicators

For our econometric analysis we use a time series data for the period 1973 to 2012. The data on remittances are taken from various issues of Economic Survey of Pakistan. Researchers have used different measures to indicate economic conditions prevailing in the host and home countries. Some common proxies used in this regards include the GDP of a country, the per capita income, employment rate, population or its growth rate etc. However, we will use the per capita income to capture the economic size for Pakistan and host countries.

The data on per capita GDP are taken from the “World Economic Outlook”, a publication of the “IMF”. Data on monthly nominal exchange rate are extracted from “International Financial Statistics”. The variable exchange rate uncertainty is estimated via the GARCH method from the real effective exchange (REER). The data on political conditions are taken from the ‘Freedom House’. We further construct dummies by taking ‘1’, if Pakistan is rated as “free” or “partly free” in a certain year and ‘0’, if it is rated as “not free”.

### 3.4. Fitting the GARCH Model

It seems appropriate to check the trends in the exchange rate, before fitting the GARCH model. The upper most graph of Figure 3.1 shows upward trend in the exchange rate. This violates the criteria for fitting an efficient model of GARCH as it requires a stationary series. We then transformed the series into log form. Its graph is given in the middle part of the figure. However, it also shows upward trend indicating that series is still non stationary. However, in the lower portion, the series become stationary after taking difference of the log real effective exchange rates (D-log transformation).



**Figure 3.1: Trend in Exchange Rate of Pakistan**

Further, we also check the stationarity of the series by applying Augmented Dickey Fuller (ADF) test proposed by Dicky and Fuller (1979). Results are given in Table 3.2. The results of ADF test given in column 2 and column 3 of the Table 3.2 for both original exchange rates and its log-transformation reveal that in both the cases we can not reject the null of unit root. Therefore both the series, original exchange rates and its log-transformation, are non stationary. However, when we take the first difference of the log form of exchange rate it rejects the presence of unit root and becomes stationary.

**Table 3.2: Unit Root Test**

	ADF-Statistic		
	Real Effective Exchange Rate		
	Original Form	Log Transformation	Difference Log Transformation
No Intercept and no trend	0.807	0.930	-9.974*
Intercept and no trend	-0.568	-0.482	-10.026*
Intercept and time trend	-2.216	-2.565	-10.014*

*Note:* \* significant at 1%.

After confirming that first difference of the log of exchange rate (D-log transformation) is stationary, we fit GARCH model on it. There are three major components in generating the conditional volatility as a measure of uncertainty, namely, the mean, ARCH term and GARCH term. Step-wise results of the GARCH model are presented below in Table 3.3.

**Table 3.3: GARCH: Stepwise Fitting**

1		ARCH - LM	
ARCH 1-2			10.492 (0.0000)**
ARCH 1-5			8.8149 (0.0000)**
2		GARCH Model	
Mean Equation		Variance Equation	
M	-0.000597 (0.000559)	$\Omega$	1.242559* (0.41122)
AR(1)	-0.060903 (0.088520)	ARCH(Alpha1)	0.627199* (0.24481)
MA(1)	0.320908* (0.094825)	GARCH(Beta1)	0.155321** (0.079736)
<b>Student(DF)</b>	2.941897*	<b>Alpha(1)+Beta(1)</b>	0.78252
3 Model Diagnostic			
ARCH 1-2			0.35912 (0.6985)
ARCH 1-5			0.2351 (0.9470)

*Note:* \*, \*\*, \*\*\* stands for 1%, 5% and 10% significant level, respectively.

In the first step we test the presence of “ARCH effect”. For this we apply “ARCH – LM” test to the series. Results given in section-1 of Table 3.3 reject the null hypothesis of “No ARCH” and thus confirms the presence of ARCH effects.

Section-2 of the Table 3.3 is ARMA specification (the mean equation) where exchange rate is regressed on its own lagged values to

generate residual series, which in turn can be used in variance equation to generate conditional volatility. Both ARCH and GARCH terms are significant which indicate that information about volatility from previous periods is a significant determinant of exchange rate uncertainty. A larger value of the coefficient of ARCH term than the GARCH term reveals that news from previous periods explains more volatility than conditional variance of last period.

Finally, in Section-3 the residuals are again tested for the ARCH effect for the final diagnostics of the model in order to ensure that there is no longer ARCH effect in the residuals before fitting the model. It is evident from the results that there is no ARCH in the model and GARCH (1, 1) model is well specified. Therefore, we use the conditional variance series of our GARCH (1, 1) model as measure of volatility in the final model.

#### **4. Results Discussion**

After estimating the exchange rate uncertainty through GARCH, we estimate equation (2) using from 1973 to 2012 for a set of ten countries where majority of Pakistani emigrants are working and sending remittances home. As explained earlier, we proceed in two steps so far as estimation is concerned. In the first step we will estimate our model by GMM method. In the second step we will estimate the Empirical Bayesin estimates by using GMM estimates as priors.

##### **a. GMM Estimation**

We apply GMM estimation technique in the first step to equation (2) and the results are given below in Table 4.1.

As evident from the results, economic conditions at home country, the per capita income, plays an important role in determining the level of inflow of workers' remittances to Pakistan. The emigrants to Canada seem to be more responsive to Pakistan's economic conditions. The sign for Germany shows that with increase in the incomes of their dependents, the inflow of remittances also increases with a larger magnitude. It might be the case of safety of the remittances that Pakistani emigrants feel safe enough that the money remitted by them would not go waste; rather they feel that their money will be used to generate further more income.

Further, our findings also reveal that economic conditions of Pakistan influence the behavior, as expected, of most of the emigrants

working in the Middle East countries. Results also reveal that remittances to Pakistan are also affected by the economic conditions of the host country. Especially it can be observed from the results that remittances from Canada to Pakistan are highly influenced by the economic conditions of Canada.

**Table 4.1: GMM Estimates Dependent Variable: Remittances**

Variable	$EC(Ht)$	$EC(Hm)$	$PI(Hm)$	$EX$	$\sigma^2EX$	C	$R^2$
Country	$\alpha 1$	$\alpha 2$	$\alpha 3$	$\alpha 4$	$\alpha 5$	$\alpha 0$	
<b>UAE</b>	0.966* (0.23)	-0.471 (0.312)	-0.13* (0.063)	2.010* (0.607)	-931.65* (249.64)	-3.558* (1.352)	0.84
<b>Saudi Arabia</b>	0.231 (0.204)	-0.57* (0.229)	-0.035 (0.033)	-1.30* (0.299)	84.89 (109.93)	5.68* (1.006)	0.90
<b>Bahrain</b>	1.885* (0.477)	-1.93* (0.476)	0.119** (0.062)	-3.45* (0.703)	3.36 (105.72)	5.52* (2.543)	0.85
<b>USA</b>	0.586 (0.757)	1.31** (0.697)	0.127** (0.070)	1.658* (0.643)	-1288.3* (347.81)	-6.283* (1.643)	0.91
<b>Germany</b>	0.460* (0.218)	3.573* (0.452)	-0.042 (0.045)	1.383* (0.534)	5.896 (144.9)	-19.71* (8.09)	0.91
<b>Canada</b>	7.956* (1.053)	-6.04* (0.948)	-0.252* (0.068)	-7.33* (1.223)	-228.702 (757.08)	-4.556* (0.971)	0.61
<b>Norway</b>	-0.440 (0.353)	1.520* (0.666)	0.045 (0.046)	-1.6** (0.869)	-37.92 (194.54)	1.77 (2.437)	0.87
<b>UK</b>	1.498* (0.430)	0.079 (0.524)	0.043 (0.037)	0.847 (0.493)	-532.65* (103.07)	-6.151* (2.276)	0.87
<b>Kuwait</b>	1.946* (0.315)	-2.57* (0.989)	-0.169 (0.118)	0.059 (2.217)	-13.122 (431.28)	1.032** (5.738)	0.73
<b>Oman</b>	3.728* (0.419)	-3.13* (0.425)	0.299* (0.096)	-1.27* (0.380)	-738.49* (248.04)	-1.857* (0.849)	0.59

*Note:* In parenthesis are the standard errors. \*, \*\* and \*\*\* indicate significance at 1%, 5% and 10% level.

It is further observed that increase in political instability leads the workers to send more money to their dependents and thus the level of remittances increases. This finding is contrary to what is expected by the theory that inflows of remittances increases with the increase in political stability. However, it can also be argued that with the increase in political instability in home country, the dependency burden on the workers working abroad also increases. Therefore, they send more money to their dependents in the home country, Pakistan. Further, it

may be that political instability in Pakistan is not that serious to affect much the inflow of remittances.

Exchange rate is one of the important determinants of the workers' remittances. Results show that values of the coefficients of the exchange rate are relatively higher for most of the countries. This shows that exchange rate is more important relative to other variables in determining the level of remittances. For some countries the magnitude of the exchange rate is observed as negative. However, the primary concern of the study is to explore the impact of exchange rate uncertainty on the level of workers' remittances of Pakistan. The coefficients for this variable range from the lowest (3.36) for Bahrain to the highest (-1288.3) for USA. This finding can be justified on basis of theoretical ground as explained by Brzozowski (2006)<sup>8</sup>. Being the uncertainty measure, very high estimates can be expected with different signs for every observation<sup>9</sup>. The important and relevant thing is the direction (signs) and significance rather than the size of coefficients. The role of uncertainty is very important since the ordinary emigrant is not aware of the unpredictability associated with exchange rate. The highest magnitude of this coefficient for USA means that Pakistani workers (generally highly educated) working in USA are strongly responding to the uncertainty in exchange rate of Pak-Rupee viz-a-viz US Dollar. As the uncertainty increases, the remittances to Pakistan decline.

The signs of coefficients of exchange rate uncertainty are negative for seven countries, namely, UAE, USA, Canada, Norway, UK, Kuwait, and Oman. Further, all the coefficients are significant except for Canada, Norway and Kuwait. It is important to mention here that the coefficients for USA and UK are strongly significant. A probable reason for this outcome may be the family background of workers deployed in highly skilled professions in USA and UK. This can be compared to the signs and significance levels of concerned coefficients in case of Saudi Arabia, Bahrain and other countries, where

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<sup>8</sup> According to Brzozowski (2006), there are three possible environments which affect individuals' decision i.e. "certainty", "risk" and "uncertainty". Certainty is situation where the result of an economic decision is clear and obvious. Risk refers to an environment where the probabilities are known for all possible outcomes. However, uncertainty refers to a situation where the probabilities of different possible outcomes are unknown or even don not exist. The study finds the coefficients of exchange rate even greater than 4000.

<sup>9</sup> See for example Osinubi and Amaghionyeodiwe (2009).

Pakistani workers are often unskilled and generally belong to poor families. They are bound to send money to their families in the home country mostly for consumption purpose. It is due to this reason the exchange rate uncertainty becomes less important.

### **b. Empirical Bayesian Estimation**

GMM is argued to be one of the most sophisticated econometric techniques that handle the problems associated with time series analysis. Carrington and Zaman (1994), however, claim Empirical Bayesian (EB) to be more efficient technique in time series analysis with several extra advantages for small samples. Therefore, we are extending our analysis a step forward towards EB estimation. The information obtained through GMM will be used as prior to compute the Empirical Bayesian posterior estimates. It is expected that Empirical Bayesian will improve the results for all the countries in terms of appropriate signs and acceptable magnitudes of all the coefficients of all the variables. Table-4.2 presents the Empirical Bayesian estimates.

The EB estimates of economic conditions in the home country display improvement up to a large extent over the GMM estimates. Consistency in EB estimates can be easily observed throughout in terms of the signs as expected and in terms of levels of significance of the coefficients except for Germany, which is negligible.

Compared with the mixed results found for the economic conditions in host countries via GMM method the estimates obtained through EB are more consistent and are highly significant. The signs for all countries are found positive according to the theory. The magnitudes of the coefficient are close to "1" indicating one to one relationship between the level of remittances and economic conditions of the host countries.

Results also reveal that political instability in Pakistan has negligible impact on the workers' remittances. The coefficients for all the countries are not only small in magnitudes but also statistically insignificant. It may be due to the fact, as explained above, that remittances are remit primarily for the fulfilling of the basic needs of consumption of the families left behind rather than investment and business. The coefficient of exchange rate has also carried the sign as expected by the theory using the Bayesian approach. The coefficients are negative for all the countries and all the coefficients turn out to be highly significant.



**Table 4.2: Empirical Bayesian Estimates**

Variable	$EC_{(Ht)}$	$EC_{(Hm)}$	$PI_{(Hm)}$	$EX$	$\sigma^2 EX$	$C$
Country	$a_1$	$a_2$	$a_3$	$a_4$	$a_5$	$a_0$
UAE	0.953* (0.092)	-0.492* (0.125)	-0.011 (0.016)	-0.373* (0.163)	-238.931* (49.744)	-1.523* (0.428)
Saudi Arabia	0.811* (0.09)	-0.514* (0.117)	-0.01 (0.015)	-0.737* (0.147)	-158.411* (46.086)	-0.129 (0.412)
Bahrain	0.991* (0.098)	-0.604* (0.131)	0.005 (0.016)	-0.714* (0.164)	-170.265* (45.761)	-1.089* (0.444)
USA	0.945* (0.099)	-0.429* (0.133)	0.003 (0.016)	-0.414* (0.163)	-232.772* (50.23)	-1.646* (0.435)
Germany	0.866* (0.091)	-0.158 (0.13)	-0.008 (0.015)	-0.381* (0.161)	-186.657* (47.907)	-1.354* (0.45)
Canada	1.014* (0.1)	-0.607* (0.134)	-0.017 (0.016)	-0.684* (0.167)	-210.371* (50.648)	-1.875* (0.409)
Norway	0.847* (0.096)	-0.415* (0.133)	0.002 (0.015)	-0.595* (0.166)	-199.301* (49.117)	-1.195* (0.444)
UK	0.979* (0.098)	-0.459* (0.131)	0.004 (0.015)	-0.41* (0.16)	-273.22* (45.538)	-1.48* (0.442)
Kuwait	1.043* (0.095)	-0.534* (0.135)	-0.006 (0.016)	-0.553* (0.168)	-207.595* (50.414)	-1.282* (0.45)
Oman	1.101* (0.097)	-0.739* (0.129)	0.005 (0.016)	-0.674* (0.154)	-231.521* (49.731)	-1.42* (0.398)

*Note:* in parenthesis are the standard errors. \*, \*\* and \*\*\* stands for 1%, 5% and 10% level of significance.

The exchange rate uncertainty, the main factor of concern, is assumed to affect the level of inflow of remittances negatively. As compared to the ambiguous results of GMM approach, the results obtained through Empirical Bayesian are consistent with the theory and carry the correct negative signs for all the host countries.

## 5. Conclusions and Policy Implications

Summing up, the remittances inflows to Pakistan depend on many socio-economic factors. Remittances somehow are influenced by the exchange rate uncertainty and the economic conditions prevailing in Pakistan and host countries up to the large extent. The impact of political instability (in home country) is found to be insignificant. Hence the hypothesis built on the grounds that political instability will negatively affect the inflow of remittances can be rejected. Remittances from European countries, Canada and North Americas are found to be more responsive, as compared to the other countries, to the determinants given in our model.

Another important conclusion that can be drawn from our findings is the impacts of the economic conditions (prevailing both in host countries and Pakistan) on the level of remittances inflow. It can be concluded that levels of income significantly influence the level of remittances and variations in income levels of Pakistan and host countries affect the inflow of remittances more than uncertainty factor.

The policy implications based on the findings may be summarized as under:

- A key implication of the study suggests that Pakistan should promote emigration of its workers to the countries with higher per capita income. However, the government needs not to worry on this aspect. People know better where to emigrate and where the chances of earnings are bright.
- Political instability in home country was incorporated in the model, which turned out to be insignificant so far as the inflow of remittances is concerned. Yet it cannot be ignored, since this factor is inimical to long run economic growth.
- For a remitter, exchange rate is the main motivational factor. In particular, impact of the exchange rate uncertainty is found to be significantly negative on the inflows of remittances. Therefore, all possible efforts are needed to stabilize the local currency both on the internal and external fronts; to control inflation and to stabilize the balance of trade as far as possible.
- The country-wise inflow of remittances to Pakistan suggest a diverse policy instead of uniformity; i.e. while framing the emigration policy, specific focus should be placed on those regions which show encouraging trends of the inflow of remittances. The results reveal that USA, UK and Canada are important destinations for our workers along with the Middle East in order to increase the inflow of remittances from these specific regions.

## **6. Importance and Limitations of the Study**

As already noted in the introductory section, Pakistan is ranked 7th among the largest remittance recipient countries across the world. In fact, the 'human resource' is the most important 'exportable commodity' for Pakistan. During the last three decades, Pakistan received a significant amount of workers' remittances. After FDI, these are the second largest component of the external resources of Pakistan. These inflows improve the balance payment position and thus reduce the dependence on external borrowing. The remittances also help in

reducing the problem of unemployment problem, and improving the standard of living of its masses.

The credibility of any empirical study depends heavily on the reliability of underlying data. The present study investigates through the determinants of remittances over a period of four decades since 1973. The data on various variables have been derived from official sources. However, the reliability of this information can be questioned. In particular, the record of foreign remittances to Pakistan can be regarded as 'under-estimated', since all the remittances do not take place through the official (banking) channel. The underground mechanism is also active that involves money laundering (outflow of foreign currency) and 'Hundi channel' (inflow of remittances in local currency and capturing of foreign currency from emigrants at source by private agents). Thus, nothing can be said with certainty about the factual volume of foreign remittances inflow, which is used as dependent variable in the study.

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