DYNAMIC EMPIRICS OF EXPATRIATES' REMITTANCES FROM SAUDI ARABIA TO BANGLADESH

Matiur Rahman, McNeese State University
Prashanta K. Banerjee, King Faisal University

ABSTRACT

The dynamics of the determinants of expatriates' remittances from Saudi Arabia to Bangladesh are studied using annual data from 1980 through 2008. The ARDL (Autoregressive Distributed Lag) procedure following (Pesaran et al., 2001) is implemented as the variables are of different orders of integration, I(0) and I(1). The statistical significance of the negative coefficient of the error-correction term (u_{t-1}) confirms a converging unidirectional causal flow from the changes in nominal exchange rate, per capita nominal GDP differential as well as Saudi inflation rate to the changes in nominal remittances from Saudi Arabia to Bangladesh. Furthermore, there are evidences of overall short-run positive interactive feedback effects. ***JEL Classifications:*** F10, F21, F22, F24

INTRODUCTION

International migration is an ancient phenomenon. People migrate to other countries for a wide variety of reasons in increasing numbers with progressing human civilization. About 3% of the world population of 6.5 billion currently live in other countries according to a UN estimate. Labor-surplus Bangladesh is one of the top ten (10) labor-sending countries and Saudi Arabia is one of the top ten (10) labor-receiving countries in the world (World Bank, 2008). Saudi Arabia is the largest recipient of Bangladeshi emigrants. Bangladesh immensely benefits from expatriates' remittances. The continuing and steadily rising inflows of remittances helped Bangladesh ride the shock-waves of the global recession that originated in the USA in December, 2007 and, perhaps, ended in June/July 2009.Both researchers and policy-makers are showing increasing interest in expatriate workers' remittances and their determinants. There are controversies surrounding the microeconomic and macroeconomic effects of the accompanying remittances on the labor-sending countries. The most frequently mentioned macroeconomic determinants of expatriates' remittances include exchange rate premium, interest rates differential, total number of migrants, inflation rates differential, wage gap, relative unemployment rate, income differential, and rate of return on real estate investment, among others. Additionally, international migration and remittances promote interdependence between the labor-sending and the labor-receiving countries (El-Sakka and McNabb, 1999; Russell, 1986; Faini, 1994; Quibria, 1986 and 1997;

Swamy, 1981; Straubhaar, 1986; Rahman and Caples, 1991; Buch and Kuckulenz, 2004, Neyapti, 2003; McMillan, 1982; Glytsos, 1988; Wahba, 1991; Lundahl, 1985).

The motives for sending remittances and their economic effects remain controversial in terms of economic expansion/contraction and ambiguities (Ratha, 2003 and 2004, Lucas and Stark, 1985; Buch and Kuckulenz, 2004; Aydas 2002; Neyapti 2003; Chami, Fullenkamp and Jahjah, 2005). The remittances at macro level are presumed to mitigate balance of payment problems, help pay import bills, build foreign exchange reserves, help debt servicing and strengthen external sector of the emigrants' home countries. At the micro level, they are expected to increase emigrants' household incomes back at home, improve standard of living, reduce poverty, promote savings and investment, and enhance human capital through investment in education contributing to their national economic growth process (Adams, 1991; Glytsos, 2002; Adams and Page, 2003 and 2005; Chami, Fullenkamp and Jahjah, 2005; Lucas and Stark, 1985; Nishat and Bilgrami, 1991; Taylor,1999. Stahl, 1982; Stahl and Arnold, 1986; Stahl and Habib, 1989).

International migration results from labor market mismatch between countries in terms of excess supply of labor in a labor-sending country and excess demand for labor in a labor-receiving country. The reasons for international migration are broadly classified as pull and push factors. The most frequently cited macroeconomic factors are real wage or income differential between labor-exporting and labor-importing countries, and high unemployment rate in the emigrants' home country. The effects of international migration of the labor-exporting countries are being debated both empirically and theoretically in terms of brain drain and external financial resource gain. Moreover, their effects are distributed asymmetrically (Bhagwati and Rodriguez, 1976; Ozden and Schiff, 2006; Djajic, 1989; Hass, 2005; Chandavarkar, 1980; Fankhouser, 1995; Flinn, 1986).

This study is principally a macroeconomic empirical investigation of the determinants of expatriates' remittances from Saudi Arabia to Bangladesh by implementing relatively recent developments in the cointegration procedures. The remainder of the paper proceeds in the following sequence: recent trends; theoretical macroeconomic model; empirical methodology and data; results; and conclusions as well as policy implications.

RECENT TRENDS

International migration and its concomitant remittances play an increasingly important role in economic development of a large number of developing countries. Workers' remittances have become the second largest stable source of net financial flows to these countries (Ratha, 2005a and 2005b). Global remittances steadily rose at an annual average rate of 7 percent in nominal terms during 1990s. They were ten times of net transfers from private sources and twice of those from official sources in 2001 (Kapur, 2003). In 2003, they amounted to $91 billion and a half of total inward FDI. In 2005, the official total remittance amount rose to $232 billion. Of this amount, developing countries received $167 billion, more than twice the level of development aid from external sources. Remittances sent through informal channels could add at least 50 percent to this amount making remittances the largest source of external capital in many developing countries (Ozden and Schiff, 2006). The remittances went up further to $318 billion in 2007. About 75% of this amount flowed to developing countries (World Bank, 2008).

For Bangladesh, expatriates' remittances are of crucial importance and have become an increasingly prominent source of external funding for development. Remittances as percentage of GDP were 1.99 in 1980 that rose considerably to 9.38 in 2008. As percentages of merchandise exports and merchandise imports, they were recorded at 50.41 and 45.28 respectively in 2008 amid some fluctuations since 1980. In absolute amount, remittances were $0.381 billion in 1980 and steadily rose as high as $7.9 billion in 2008 (Appendix IA). This amount went up further to $10 billion in 2009. This statistical picture underscores the overwhelming importance of expatriates' remittances in Bangladesh.

Among all the labor-importing countries, Saudi Arabia has been the most important destination country for Bangladeshi emigrants. This country alone received 46.4 percent and 15.1 percent of the total Bangladeshi emigrants in 1995 and 2008, respectively. Bangladesh also received 40.9 percent and 26.8 percent of the total remittances from Saudi Arabia over the same period (Appendix 1B). Although there were declines in percentage terms, the absolute numbers were much higher over the years from 1995 through 2008. Currently, 2.2 million Bangladeshis are working in this country alone. However, outflows of Bangladeshi emigrants are dwindling since 2008 due to global recession. But remittances went up, as shown above.

THEORETICAL MACROECONOMIC MODEL

A simple theoretical macroeconomic model is developed as follows:

$$N=f\left(\frac{Y*}{P*}-\frac{Y}{P}\right) \tag{1}$$

$$P=EP* \tag{2}$$

$$R=\frac{N.Y*}{P*} \tag{3}$$

where, N= Total Number of Bangladeshi Emigrants working in Saudi Arabia

Y* = Per Capita Nominal GDP of Saudi Arabia

Y= Per Capita Nominal GDP of Bangladesh

P= Consumer Price Index of Bangladesh

P* = Consumer Price Index of Saudi Arabia

E= Nominal Exchange Rate (units of Bangladesh Taka per unit of Saudi Riyal)

R= Total Amount of Nominal Remittances to Bangladesh from Saudi Arabia, expressed in Bangladesh Taka

Substituting for P =EP* from equation (2) in equation (1)

$$N=f\left(\frac{Y*}{P*}-\frac{Y}{EP*}\right) \tag{4}$$

Again, substituting for N from equation (4) in equation (3),

$$R=\frac{Y*}{P*}\,.\,f\left(\frac{Y*}{P*}-\frac{Y}{EP*}\right) \tag{5}$$

Rewriting equation (5) in general functional form,

$$R = g\,(\overset{+}{Y}*,\overset{-}{Y},\overset{-}{P},*\overset{+}{E}) \qquad (6)$$

Reliable average wage and unemployment rate data are not available for both Bangladesh and Saudi Arabia. As a result, per capita income differential is used as a proxy for wage gap in this study. Higher per capita income in the host country has some enticing effects on prospective emigrants, if they feel poor and deprived upon comparing their much lower income with much higher income of others (Stark and Taylor, 1989 and 1991; Quinn, 2006).

Denoting per capita nominal GDP differential as Z =Y*-Y, equation (6) is finally expressed as follows:

$$R = g\,(\overset{+}{Z},\overset{-}{P}*,\overset{+}{E}) \qquad (7)$$

The expected effect of each explanatory variable on total amount of nominal remittances from Saudi Arabia to Bangladesh is indicated on its top.

EMPIRICAL METHODOLOGY AND DATA

The estimating regression in percentage change form is specified as follows:

$$r_t = \alpha + \beta_1 Z_t + \beta_2 \pi_t^* + \beta_3 e_t + u_t \qquad (8)$$

The expected signs of the parameters are indicated as $\alpha>0$, $\beta_1>0$, $\beta_2<0$ and $\beta_3>0$. The error-term (u_t) is assumed to be independently and identically distributed. To explain, widening per capita income diffential between Saudi Arabia and Bangladesh will entice more emigrants to Saudi Arabia boosting the associated remittances ($\beta_1>0$). Higher inflation in Saudi Arabia will raise expatriates' cost of living leading to a decline in remittances ($\beta_2<0$). Depreciation of Bangladesh Taka against Saudi Riyal will provide incentive for higher remittances ($\beta_3>0$).

Annual data from 1980 through 2008 are employed as GDP data are available only on yearly basis. Data on Saudi Arabia's nominal GDP, population and consumer price index are obtained from various issues of the Year Book of International Financial Statistics (IFS), published by the IMF. The data on nominal GDP, nominal remittances, consumer price index, Taka-Riyal nominal exchange rates and population of Bangladesh are collected from various issues of the Economic Trends, published by the the Bank. Per capita nominal GDP data are calculated by dividing annual GDP of each country with respective annual population.

The applicable cointegration methodology is outlined as follows:

First, the time series property of each variable is investigated by implementing the ADF (Augmented Dickey- Fuller) test for the unit root (nonstationarity) following (Dickey and Fuller, 1981; Fuller, 1996). The KPSS (Kwiatkowski, Philips, Schmidt and Shin, 1992) test for no unit root (stationarity) is also applied as a counterpart of the ADF test. For stationarity in time series data of each variable, equation (8) is estimated appropriately by the Ordinary Least Square

(OLS). Otherwise, its application leads to misleading inferences in presence of spurious correlation (Granger and Newbold, 1974). In the event of nonstationarity of each variable, the cointegrating relationship among variables is studied either by the Engle –Granger (1987) procedure or by the Johansen-Juselius procedure (Johansen1988; Johansen and Juselius 1992, 1990) to overcome the associated problems of spurious correlation and misleading inferences. In the Johansen and Juselius procedure, λ_{max} and λ_{trace} tests are conducted for cointegrating relationship among the variables. Both procedures require very large sample size and each variable is to be of the same order of integration. To be noted that the length of the sample period is more important than the high frequency of data in a relatively short sample period for a meaningful cointegration analysis (Hakkio and Rush, 1991).

To address the issue of unequal order of integration of the nonstationary variables for long-term equilibrium relationship and causal flows, Pesaran et.al. (2001) suggested the Autoregressive Distributed Lag (ARDL) procedure. This procedure bypasses the pre-testing for unit-root. Moreover, this is also applicable to small sample unlike the Engle-Granger and the Johansen-Juselius procedures. The estimating equation is modified as follows:

$$\Delta r_t = A + \sum_{i=1}^{m} B_i \Delta r_{t-i} + \sum_{i=1}^{n} C_i \Delta z_{t-i} + \sum_{i=1}^{k} D_i \Delta \pi^*_{t-i} + \sum_{i=1}^{l} E_i \Delta e_{t-i} + f r_{t-1} + g z_{t-1} + h \pi^*_{t-1} + k e_{t-1} + \mu_t \qquad (9)$$

The null and its associated alternative hypotheses for the cointegrating relationship are as follows:

Ho: $f = g = h = k = 0$ for no cointegration

Ha: $f \neq g \neq h \neq k \neq 0$ for cointegration

To elaborate further, the methodology is based on the bounds testing approach constructed within an ARDL framework (Pesaran and Shin, 1995, 1999; Pesaran, 1997; Pesaran et. al, 2001), which does not involve pre-testing variables, thereby obviating uncertainty. Put differently, the ARDL approach to testing for the existence of a relationship between variables in levels is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mutually cointegrated. One of the statistics underlying the procedure is the F-statistic in a generalized Dickey-Fuller type regression, which is used to test the significance of lagged levels of the variables under consideration in a conditional unrestricted equilibrium correction model (ECM) (Pesaran et al., 2001).

Amongst other advantages, the ARDL method of cointegration analysis is unbiased and efficient. This is because it performs well in small samples, such as the present study. One can also estimate the long- and short-run components of the model simultaneously, removing problems associated with omitted variables and autocorrelations. Finally, the ARDL method can distinguish dependent and explanatory variables.

$$u_{t-1} = \hat{\alpha} + \hat{f}\, r_{t-1} + \hat{g}\, z_{t-1} + \hat{h}\, \pi^*_{t-1} + \hat{k} e_{t-1} \qquad (10)$$

The u_{t-1}, thus, obtained is subsequently used to estimate the relevant vector error – correction model (VECM) as specified in equation (11) below:

$$\Delta r_t = \alpha + \lambda u_{t-1} + \sum_{i=1}^{n} Bi\,\Delta r_{t-i} + \sum_{i=0}^{n} Ci\,\Delta z_{t-i} + \sum_{i=0}^{k} Di\,\Delta \pi^{*}_{t-i} + \sum_{i=0}^{l} E_i \Delta e_{t-i} + \varepsilon_t \quad (11)$$

In this specification, the variables are cointegrated if the estimate of λ is negative and statistically significant in terms of the associated t-value. This will indicate unidirectional long-run causal flows from changes in z, $\pi^*$and e to r as well as long-run convergence. For short-run dynamics, changes in z, $\pi^*$and e Granger cause changes in r when Ci's, Di's, and Ei's are jointly significant in terms of the joint F- test. Rather imposing arbitrary lag-length, the Akike Information Criterion (AIC), as found in (Akaike, 1969), is employed to determine the optimum lag-length.

RESULTS

To examine the time series properties of each variable, the ADF test for unit root and the KPSS test for no unit root are implemented. The ADF and the KPSS tests reveal stationarity of r and e uniformly at 5 percent significance level. In other words, they depict I(0) behavior. But z and π^* become stationary on first- differencing at 5 percent significance level revelaing I(1) behavior. They are shown as follows:

Table 1
ADF and KPSS Tests

r	-6.2815*	0.25861*		
e	-7.4511*	0.4021*		
z	-24139	0.4931*	-6.9126* *	0.6811* *
π^*	-2.3165	0.5216	-5.9231* *	0.5516* *

The Mackinnon (1996) ADF critical values are -3.752946 and - 2.998064 at 1 percent and 5 percent levels of significance, respectively. The KPSS critical values (Kwiatkowski, et al., 1992, Table 1) are 0.73900 and 0.46300 at 1 percent and 5 percent levels of significance, respectively. * indicates stationarity at the level and ** indicates stationarity at the first differencing.

In light of the above, the ARDL procedure is, thus, appropriate to search for cointegration. The results are as follows:

Table 2 depicts that none of the coefficients of the first three variables with one- period lag in equation (10) is individually Zero. The calculated F-statistic at 8.665 exceeding the upperbound critical F-statistic at 4.223 clearly rejects the null

Table 2
ARDL Procedure*

Variable	Coefficient	t-Statistic	P-value**
r_{t-1}	2.561	1.573	0.125
z_{t-1}	3.106	2.532	0.038
π^*_{t-1}	-2.325	-1.975	0.025
e_{t-1}	5.256	2.582	0.105
Δr_{t-1}	1.921	1.502	0.153
Δr_{t-2}	0.976	0.581	0.176
Δr_{t-3}	0.763	0.532	0.185
Δz_{t-1}	0.825	0.554	0.225
Δz_{t-2}	0.561	0.346	0.256
Δz_{t-3}	0.935	0.192	0.391
$\Delta \pi^*_{t-1}$	-0.136	-0.115	0.432
$\Delta \pi^*_{t-2}$	-0.102	-0.052	0.481
$\Delta \pi^*_{t-3}$	-0.095	-0.046	0.046
Δe_{t-1}	3.582	2.115	0.115
Δe_{t-2}	1.562	1.576	0.175
Δe_{t-3}	0.876	1.312	0.193
$R^2 = 0.782, DW = 1.985, AIC = 9.825, F = 8.665$			

*The upper-bound and the lower – bound critical F-Statistics at 5% level of significance are 4.223 and 2.816, respectively.

hypothesis of no cointegration. They, thus, confirm cointegrating relationship among the variables. As suggested in (Pesaran et al, 2001), a relevant vector error- correction model (VECM) as specified in equation (11) is then estimated. The results are reported as follows:

$$\underset{(0.052)}{\Delta r_t = 0.156} - \underset{(-3.174)}{2.165u_{t-1}} + \underset{(4.163)}{1.853\Delta r_{t-1}} + \underset{(1.312)}{0.587\Delta r_{t-2}} + \underset{(0.682)}{0.321\Delta r_{t-3}} + \underset{(0.295)}{0.115\Delta z_t} + \underset{(0.261)}{0.093\Delta z_{t-1}}$$

$$+ \underset{(0.291)}{0.176\Delta z_{t-2}} + \underset{(0.562)}{0.413\Delta z_{t-3}} - \underset{(-1.132)}{0.356\Delta\pi^*_t} - \underset{(-1.285)}{0.486\Delta\pi^*_{t-1}} + \underset{(0.886)}{0.117\Delta\pi^*_{t-2}} - \underset{(-1.216)}{0.413\Delta\pi^*_{t-3}} +$$

$$\underset{(0.381)}{0.786\Delta e_t} + \underset{(2.165)}{2.584\Delta e_{t-1}} + \underset{(0.592)}{1.395\Delta e_{t-2}} - \underset{(-0.094)}{0.165\Delta e_{t-3}}$$

The associated t-values are reported within parentheses.

$$\overline{R}^2 = 0.842, DW = 2.010, AIC = 9.876, F = 10.756$$

As observed above, the negative coefficient of the error-correction term (u_{t-1}) at 2.165 is statistically highly significant in terms of the associated t-value at -3.174. This indicates long-run convergence and a long-run unidirectional causal flow from the changes in nominal exchange rate, per capita nominal GDP differential and Saudi inflation rate to changes in nominal remittances. The sums of the coefficients of their subsequent lagged-terms reveal short-run positive interactive feedback effects. The numerical value of adjusted - R^2 at 0.821 discloses a significant explanatory power of the model. The F-statistic at 10.756 is also quite significant. The DW-value at 2.010 shows no autocorrelation. The optimum number of lags is determined by the AIC criterion, as stated earlier.

CONCLUSIONS AND POLICY IMPLICATIONS

To summarize, some of the variables are I(0) and the rest are I(1) meaning they are of different orders of integration. Moreover, the sample size is relatively small. Thus, the ARDL procedure is applied. Based on this procedure, cointegrating relationship is evidenced among the variables. The estimates of the vector error-correction model confirm strong unidirectional long-run positive interactive feedback effects.

Expatriates' remittances are a boon for the Bangladesh economy. Labor-surplus Bangladesh, as a result, should actively pursue manpower exports to labor-deficient countries around the world. To be more successful, it should train prospective emigrants to meet skill-specifications of the potential host countries. Instead of relying on a limited number of host countries, it should diversify the markets all over the world.

At the same time, Bangladesh should reduce emigration costs and ease costs associated with remitting foreign currencies from overseas. Moreover, expatriates' convenience should be enhanced for speedy remittances without hassles. Prudent exchange rate policy will also boost remittances to Bangladesh.

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Appendix IA
Remittance Picture of Bangladesh
(Overall)

Year	No. of Immigrants	Total Remittance (In Million US $)	Year wise Growth (%)	Remittance As a Percentage of GDP	Remittance As a % of Merchandise Exports	Remittance As a % of Merchandise Import
1980	38000	381.18	-	1.99	56.33	20.29
1981	66000	418.47	9.78	1.26	72.32	22.27
1982	64000	619.48	48.03	1.92	120.40	38.51
1983	52000	590.6	-4.66	2.25	81.95	32.62
1984	69000	441.6	-25.23	1.27	57.02	22.57
1985	78000	648.61	46.88	1.65	76.67	29.46
1986	61000	697.45	7.53	2.27	78.41	34.14
1987	74000	737.43	5.73	1.98	68.31	33.59
1988	87000	770.82	4.53	1.76	60.43	27.16
1989	110000	758.2	-1.64	1.37	57.32	25.73
1990	97000	764.04	0.77	1.57	53.18	24.13
1991	185000	847.97	10.99	0.91	54.28	29.33
1992	238000	944	11.32	0.79	50.69	27.87
1993	192000	1088.79	15.34	1.13	46.87	27.23
1994	200000	1197.63	10.00	1.19	47.74	28.75
1995	181000	1217.06	1.62	1.34	35.61	21.15
1996	228000	1475.4	21.23	1.29	39.44	22.29
1997	243000	1525.42	3.39	1.25	36.85	22.70
1998	270000	1705.74	11.82	1.26	35.33	24.20
1999	248000	1949.32	14.28	1.57	39.00	25.83
2000	213000	1882.1	-3.45	1.77	35.27	24.04
2001	195000	2501.13	32.89	2.57	43.98	28.22
2002	251000	3061.97	22.42	2.44	57.31	36.15
2003	277000	3371.97	10.12	2.44	59.63	35.45
2004	250000	3848.29	14.13	3.08	57.60	36.38
2005	291000	4801.88	24.77	8.00	45.61	32.56
2006	564000	5978.47	24.50	9.80	49.09	34.84
2007	981000	7914.78	32.39	11.63	56.09	36.59
2008	576000	7890.91	-0.003	9.98	50.41	45.28

Source: Economic Trends, Bangladesh Bank.

Appendix IB

Remittances from Saudi Arabia

Years	Total		Saudi Arabia (SA)		Emigrants and Remittance from SA as a Percentage to Total	
	No of Emigrants	Remittance(In Million US $)	No of Emigrants	Remittance(In Million US $)	No of Emigrants	Amount of Remittance
1995	181000	1217.06	84009	498.2	46.41	40.93
1996	228000	1475.4	72734	587.15	31.90	39.80
1997	243000	1525.42	106534	589.29	43.84	38.63
1998	270000	1705.74	158715	685.49	58.78	40.19
1999	248000	1949.32	185739	916.01	74.89	46.99
2000	213000	1882.1	144618	919.61	67.90	48.86
2001	195000	2501.13	137248	1147.95	70.38	45.90
2002	251000	3061.97	163254	1254.31	65.04	40.96
2003	277000	3371.97	162131	1386.03	58.53	41.10
2004	250000	3848.29	139031	1510.45	55.61	39.25
2005	252702	3848.29	80425	1696.96	31.82	44.10
2006	381516	4801.88	109513	1734.70	28.70	36.12
2007	832609	5978.47	204112	2324.20	24.51	38.87
2008	875055	7914.80	132124	2121.42	15.09	26.80

Source: Economic Trends, Bangladesh Bank