The Effects of Remittances on Inflation: Evidence from Bangladesh

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Abstract
Like many developing countries, remittances are relatively larger capital inflows in Bangladesh in the recent years. Hence, understanding the impact of remittances on the macroeconomic variables such as inflation is essential for the policy makers of the recipient economy. Incorporating remittances as an exogenous variable to the standard inflation function, this paper verifies how it affects the inflation rate in Bangladesh in the 1972-2010 periods. Applying Vector Autoregressive (VAR) techniques, the empirical results find that a one percent increase in remittances inflows increases inflation rate by 2.48 percent in the long run, whereas no significant relationship is evident between these two variables in the short-run in Bangladesh.
Keywords: remittance, inflation, Bangladesh, vector Autoregressive

Introduction

Remittances are relatively larger capital inflows in many developing countries in the recent years. The World Bank reports that the officially recorded remittances received by developing countries rose to US$ 240 billion in 2007 from US$ 75 billion in 2002. Like many other developing countries, there has been manifold increase in

remittances flow into Bangladesh in the last decade. The remittance inflow has increased from US$ 2.0 billion in 2001 to US$ 4.3 billion in 2005 and US$ 10.8 billion in 2010. The growth of remittances inflows has outpaced foreign direct investment (FDI) and other official development assistance (ODA) in Bangladesh (Nabi and Alam, 2011). As a major source of foreign exchange, it has growing the development potentials in Bangladesh. Hence, understanding the impact of remittances on the macroeconomic variables such as inflation is essential for the policy makers of the recipient Bangladesh economy.

Literature review

Literature on the effects of remittances mostly focuses on the exchange rate (e.g. 'the Dutch Disease') and terms of trade issues. Adelman and Taylor (1992), also Balderas and Nath (2008) pointed out that through their direct and indirect effects on aggregate demand, remittances may have effects on inflation. Remittances are spent partly on consumption and partly on investment. The direct effect of remittances on aggregate demand is resulted by the increase in consumption expenditure of the receiving households. In the case of Mexico, Durand et al., (1996) find that almost three quarters of the total reported remittances are spent on consumption. The scenario is almost similar in Bangladesh. A large portion of the wage earners working in the Middle East, are mostly member of the lower strata of the society. Their families have modest means; because of that, they are likely to spend most of the remittances to finance large durable goods such as furniture, appliances, housing, medical care and education (Balderas and Nath, 2008). The increase in the consumers' durables shifts in demand which creates an inflationary pressure in the economy.

Aggregate demand may also increase if remittances increase investment and resulted in demand-pull inflation. Several empirical studies on different countries (Martin, 1991 and Taylor et al., 1996) find that remittances fail to contribute to the substantial capital formation, only a very small percentage of remittances devoted to investment and savings. Like many developing countries, in Bangladesh, remittances are channeled into real estate and consumers' durable goods. However, a good number of studies (Gilani, 1998; Adams, 1998; McCormick and Wahab, 2001; Dustman and Kirchkamp, 2001) indicate that remittances rather consistently contribute to significant gains in saving and investment, although the recipient's economy come under inflationary

pressures and prices rise significantly in certain sectors (Kazi, 1989). In Bangladesh, while remittances are targeted primarily to consumption, a significant share goes to non-trade goods, like land and housing. The very sharp rise in land and housing prices in recent years in Bangladesh is also explained to be resulted by the fast growing remittances inflows. Besides boosting excess demand through increase in consumption and investment, remittances raise reservation wages which also results in an inflationary pressure (Feiler, 1987; Looney, 1990).

Amuedo-Dornates and Pozo (2004), Bourdet and Falck (2006), Lopez, Molina and Bussolo (2007), Jansen, Naufal and Vacaflores (2007) and Narayan, Narayan and Mishra (2011) show that increase in remittances generates an increase in inflation. While Katseli and Glytsos (1986) in their study on Greece find that remittances affects negatively the inflation in the home country. Ball, Lopez and Reyes (2012), investigating the relationship between remittances, inflation and exchange rate regimes in 21 small open economies concludes that under fixed exchange rate regimes, an increase in remittances generates an increase in inflation, while under flexible exchange rate regimes it decreases inflation. The objective of this paper is to investigate the relationship between remittances inflows and inflation in Bangladesh, including remittances as an exogenous variable to verify how it affects the inflation rate.

Methodology and Data

Since the issue of causality is at the foundation of any study that examines an economic relationship, the empirical analysis starts with the Granger-causality tests to determine if Remittance (RM) Granger-causes Inflation (P) and/or inversely Inflation (P) Granger-cause Remittance (RM).

A formal test for Granger-causality running from RM to P is:

$$P_t = \alpha_1 + \sum_{j=1}^{t} \beta_j P_{t-j} + \sum_{k=1}^{t} \varphi_k RM_{t-k} + v_t \tag{1}$$

A formal test for Granger-causality running from P to RM performed using a symmetrical test is as:

$$RM_t = \alpha_2 + \sum_{l=1}^{t} \theta_l RM + \sum_{m=1}^{t} \rho_m P_{t-m} + \omega_t \tag{2}$$

Based on the results provided by the Granger-causality tests, this study draws an empirical relationship between the variables concern. In modelling empirical relationship between remittances flows (RM) and inflation (P), the study uses a Vector Autoregressive (VAR) methodology, including control variables based on the standard theory of inflation. Following Balderas and Nath (2008), Balderas (2009) and Ball, Lopez and Reyes (2012) and a number of other papers (Fama 1981; Eita 2011; Aggarwal 1981; Joseph 2002; Vygodina 2006; Yau and Nieh, 2006; Kamin 1996; Klau 1998; Kamas 1995) this study includes money supply (M_2) and nominal effective exchange rate (NEER) as monetarist variables and government expenditure (G) as structuralist variable of demand-pull inflation in the empirical model.

Therefore, the empirical model of interest of the study is:

$$P = \int (G, NEER, M_2, RM) \tag{3}$$

The inflation (P) function based on equation (3) is expressed in log-linear form for estimation, incorporating the disturbance term (u) which according to standard time-series model is assumed to be white-noise process. Adding time subscripts (t) the estimating equation becomes:

$$lnP_t = a_0 + b_1 lnG_t + b_2 lnNEER_t + b_3 ln\, M_2 + b_4 lnRM_t + u_t \tag{4}$$

Equation (4) outlines the long-run relation between inflation and the variables determining inflation. The short-run dynamics has been incorporated by specifying equation (4) in an error-correction modelling format of Vector Autoregressive (VAR) model. The empirical analysis has been done following standard time-series econometric techniques.

The Data

Annual data of the variables of the model over the 1972 – 2010 period in Bangladesh are collected from various secondary sources. Data on Money Supply (M_2) and Nominal Effective Exchange Rate (NEER) are taken from various issues of the Bangladesh Economic Review and the *International Financial Statistics 2011* CD-ROM of IMF. The data on Consumer Price Index (CPI), which is taken as the measure of Inflation in this study, is obtained from the International Financial Statistics 2011 CD-ROM of the IMF. The data on Government Expenditure (G) and Remittance (RM) are collected from various quarterly and monthly reports of the Bangladesh Bank. For this

study, each of the series of data is taken in natural logarithmic form so that their first differences approach the growth rates.

The Empirical Results

Causality between Inflation and Remittance Flow
This study examines the relationships between inflation and remittance flows first, using Granger causality analysis for Bangladesh over the period 1972-2010. The Granger causality approach provides a plausible technique to consider both lagged and endogenous relationships. The F-statistics of the tests does not reject the hypothesis of 'P does not Granger cause RM', but reject the hypothesis of 'RM does not Granger cause P' at 5% level of significance. This indicates that there is unidirectional causality from remittances flows to the inflation rate in Bangladesh. Hence remittance (RM) is incorporated as a variable in the empirical model explaining inflation.

The Unit root Test
Following standard practice, empirical analysis starts with the test of stationarity of variables of the model (4), using unit root test procedures. The Augmented Dickey-Fuller (ADF) test has been used to perform the unit root test in all the series of the model and examine their order of integration. The test has employed automatic lag length selection by *EViews 6* statistical software using a Schwarz Information Criterion (SIC). Schwarz Information Criterion (SIC) is considered to be more appropriate for studies with small numbers of observations like this study. Test statistics of the variables in the model at level and in first differences are presented in Table-1.

Table no.1: ADF Statistics for Testing for Unit Roots in Level

Variables	ADF Test Statistics at Level		ADF Test Statistics at 1st Difference	
	t-ADF	*P- value*	*t*-ADF	*P- value*
lnP_t	-1.299191	0.1756	-6.432779	0.0000
lnG_t	2.718335	0.9978	-5.354029	0.0000
$lnNEER_t$	1.442170	0.9604	-3.629083	0.0006
$lnM2_t$	-0.271876	0.9187	-4.818145	0.0004
$lnRM_t$	3.710934	0.9998	-6.514915	0.0000

The estimated statistic for all the variables at level does not exceed ADF test statistics. It shows that the null hypothesis of unit root cannot be rejected at 5% level of significance for all the variables at level. To test for the presence of more than one unit root in all these variables, the unit root test of the variables at first difference has been checked. The results show that the unit root hypothesis is rejected at the first differences for all the variables. This result from unit-root tests provides strong evidence of non-stationarity at level and stationarity at first difference and that all five series are integration to degree one, *I (1)*.

Inflation in Bangladesh in the long- run
As all the variables in the model are found non-stationary and integrated with the same order *I*(1), the co-integration analysis is performed to infer the long-run relationship among variables in the model. The cointegration between variables reveals the existence of the long-run stable (equilibrium) relationship. Results of the Johansen Maximum Likelihood procedure of cointegration test applied to a vector autoregressive (VAR) version is presented in Table no. 2. Table 2 reports the Trace statistics and Maximum Eigen statistics of the unrestricted cointegration rank test among variables under study to identify number of cointegrating vectors, assuming a linear deterministic trend and an optimum lag length of 1 as determined by all lag selection criteria (LR, FPE, AIC, SC and HQ). Both, the Trace statistics and Maximum Eigen statistics reject the null hypothesis of no cointegrating relationship between variables of the model of equation (4). Both statistics indicate two cointegrating equation among the variables. This result confirms the existence of the long-run equilibrium relationship between the variables of the model. It also gives an indication that there exists Granger causality in at least two directions.

Table no. 2: Johansen Cointegration Tests Results

Hypothesized No. of CE(s)	Trace Statistics	Critical Value	p-value	Max-Eigen Statistics	Critical Value	p-value
None*	87.80709	69.81889	0.0010	36.49244	33.87687	0.0238
At most 1*	51.31465	47.85613	0.0228	4.288488	3.841466	0.0384
At most 2	24.97266	29.79707	0.1624	26.34198	27.58434	0.0714

* denotes rejection of the hypothesis at the 0.05 level.

The parameter estimates representing the cointegration between the inflation and its determinants is specified as:

$ln(P_t)$ - $4.99ln(G_t)$ + $5.78ln(NEER_t)$ - $0.75\ ln(M_{2t})$ - $2.48ln(RM_t)$ + $35.87 = 0$

or, $ln(P_t)$ = $4.99ln(G_t)$ - $5.78ln(NEER_t)$ + $0.75\ ln(M_{2t})$ + $2.48ln(RM_t)$ - 35.87 .... (5)
         (-1.93)   (0.33)   (-5.29)   (-3.04)

Equation (5) represents the long-run relationship between inflation rate (P) and the determinants of inflation in Bangladesh. It is found from the values of the numbers in parentheses representing t-statistics of the respective coefficients that except *lnNEER* all other variables have significant impact on the rate of inflation in Bangladesh in long-run. The positive value of the coefficient (at 10% level of significance) of *lnG* indicates that the elasticity of inflation with respect to the government expenditure is positive, that is, the inflation rate weakly responses to the increase in government expenditure in the long-run. It confirms the structuralist view regarding the cause of inflation.

The low value of t-statistics of *lnNEER* indicates that nominal effective exchange rate does not have significant effect on the rate of inflation in the long-run. But the money supply (M2) has significant positive impact on inflation in Bangladesh in the long-run, which is consistent with the monetarist view.

The impact of the variable of interest of this study, the *lnRM* on inflation is found positive and significant at 5% level in the long-run. That is, the remittances inflows result in an increase in inflation rate in Bangladesh and the elasticity of inflation with respect to remittance inflow is found more than proportional (2.48).

The Error Correction Model (ECM)
With the existence of cointegration established, equation (4) is re-parameterised as an error correction model (ECM) to estimate a model for improved forecasting. The error correction model alone also can make direct inference both about the long-run and short-run relationship. Since there existence of cointegrating equation, the Vector Autoregressive (VAR) needs to include an error correction term involving levels of the series, and this term appears on the right-hand side of each of the VAR equations, which otherwise will be in first differences.

The estimated equation of the model in error correction form including the *lnRM* to capture the effects of remittance on inflation of Bangladesh is:

$\Delta ln(P_t)$=-0.27-0.07$\Delta ln(P_{t-1})$-3.34$\Delta ln(G_{t-1})$-1.45$\Delta ln(NEER_{t-1})$+3.40$\Delta ln(M_{2t-1})$+ 0.74$\Delta ln(RM_{t-1})$
            (-0.38)   (-1.78)   (-0.50)   (1.43)   (1.42)

        -0.26[$ln(P_t)$-4.99$ln(G_t)$+5.78$ln(NEER_t)$-0.75$ln(M_{2t})$-2.48$ln(RM_t)$+35.78]   …. (6)
        (-1.73)   (-1.93)   (0.33)   (-5.29)   (-3.04)

The values in parentheses represent the *t*-statistics for the respective coefficients. The coefficients of the short-run differenced estimation variables indicate that only the coefficient of government expenditure with 1-period time lag is significant at 10% level. The negative sign of the coefficient of *lnG* indicates that the increase in government expenditure reduces the inflation in the short-run, though it increases the inflation in the long-run as seen from equation (5).

No significant effects of the variables NEER, M2 and RM of the model have been found on inflation in the short-run. That is the money supply (M2) and remittances inflows (RM), which do not have any impact on the inflation rate in Bangladesh, in the short-run. But no significant impact of nominal effective exchange rate is found both in short-run and long-run on inflation rate, in Bangladesh.

An increase in remittances growth leads to a statistically significant positive increase in inflation rate in the long-run, whereas no response of inflation to remittances is found in the short-run in Bangladesh. These results match with Narayan, Narayan and Mishra (2011) that remittances generate inflation in developing countries including Bangladesh, and the effect of remittances on inflation is found more pronounced in the long run.

The negative and statistically significant (at 10% level) of the error correction term (-0.26) means that the speed at which the rate of variation of the inflation rate $\Delta ln(P_t)$, the dependent variable in the first equation of the vector error correction (VEMC) system (6), adjusts towards the long-run cointegrating relationship differs from zero. The short-run disequilibrium of inflation rate is corrected at the rate of 26% per annum.

Conclusion
Over the last decade, workers' remittances played a crucial role in the economic development of Bangladesh and are expected to remain so over the coming years. Remittance plays a significant role in poverty

reduction and economic development of the country, but there is no empirical evidence whether remittance causes inflation in Bangladesh or not. In this paper, a moderate initiative is taken to explore the issue using a time series data set of Bangladesh over the period 1972 to 2010. The empirical result suggests that, there exists unidirectional causal relationship from remittances inflows to the inflation. The relationship is significant in the long run, but no relationship is found between them in the short-run. Results also indicate that any shock in the short-run inflation gradually adjusted to the long-run equilibrium.

Results of Balderas and Nath (2008) study on Mexico differ from the results of this study. Using monthly data over the 1995- 2005 period in Mexico, they found that remittances have significant positive effects on inflation in the short-run, which gradually tapers off in the long-run. The cause of such difference might be due to not considering the exchange rate regimes change, as different exchange rate regimes have considerably different effects on the macroeconomic variables (Reinhart and Rogoff, 2004). Future research proposes to account exchange rate regimes changes in investigating the effects of remittances on inflation.

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IMF, International Monetary Fund, International Financial Statistics CD-Rom 2011

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