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The Effect of Exchange Rate, Remittances Inflow and Inflation on Economic Development of Bangladesh

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Abstract:

This paper has empirically explored the effect of exchange rate, remittances inflow, inflation and consumption on economic development of Bangladesh using annual time series data from 1979-2018. In this study ARDL model was used and according to the analyzed results of the ARDL the coefficient of exchange rate and remittances inflow are negative but have statistically significant effect on economic growth of Bangladesh. However inflation and consumption have positive but statistically significant effect on economic development of Bangladesh.

Keywords: Remittances, economic development, exchange rate, inflation, consumption

1. INTRODUCTION

There are many factors which affect the economic development of any country. Macroeconomic factors play a vital role in the economic stability of any country. But sometime macroeconomic factors negatively affect the economic development of a country due to political instability and uncertainty in stock exchange business. Economic development is very vital for any economy because the

prosperity and development of any sector in a country is associated with the economic system. The exchange rates of a country which is economically developed remain stable for a longtime. Remittances bring very effective changes in the socioeconomic conditions and living standard of the people as most of the remittances are used for the domestic purposes which alternatively effect on the size of the market and development of the recipient countries. Global remittances share 0.31% to GDP across the world and 27% of the GDP in the developing countries (World Bank, 2018). Sharply increased has been observed in remittances inflow after 9/11 as it jumped from $USS 1075 million in 2000 to $USS 6000 in 2007 million. Straubhaar (1985), Swamy (1981) considered remittances as a key factor to bring improvement in the Balance of payment. Naseem (2004), Siddiqui and Kemal, (2006) analyzed that remittances inflows have very significant effect on poverty and socioeconomic condition of the recipient country. There are several sources of the growth but one cannot deny the importance of the remittances as it shows significant role in the correctness of the balance of payment, current account and resource for foreign exchange earnings. But sometimes remittances also have a negative effect on the output level as persistence migration reduces the amount of skillful labor as Chami et al. (2003) used panel data for data analysis of 113 developing countries and pointed out the unsupported effect of remittances on growth. It should be remembered that the 2/3 of the total share of remittances comes from the Gulf countries and having an important effect on the household's consumption and the standard of living of the recipient, which has structure wise effect on the local market demand as well. The wage differences become the main reason of migration from one country to another. In 1981 it was estimated that 2.5 million Asian workers send %7.9 billion remittances to their countries (Abella 1984 and Demery 1986). In the Middle East, Bangladeshi workers remitted 60% of their earnings to their homelands (Gilani *et al,* 1981). Remittances inflow are the transfer earnings from international migrants send to their homeland considered the main source of the financial stream. History shows that the migration of people from one country to another exchange the skills, technology, and culture as well. Worker remittances are considered to be very important International financial stream and income source of the people of the recipient country. Sometimes it becomes more than the FDI inflows, so it has a very deep impact on

the growth of the economy. According to the annual report of World Bank estimation officially recorded remittances to developing countries amounted to $429 billion in 2016, a decline of 2.4 percent over $440 billion.

The main objective of this paper is to find out the effect of exchange rate on economic development of Bangladesh and further to examine the effect of remittances inflow, consumption and inflation on economic development of Bangladesh.

The rest of this research paper is structured as follows. Section 2 provides brief literature of previous studies. Section 3 provides data and methodology. Section 4 provides results and discussion, and conclusion in section 5.

2. LITERATURE REVIEW

Previously many researchers of the world have worked on this topic but their work is different from current study in term of selection of data, variables, econometric technique and geographical location. Literature of the earlier researchers is as follows:, Faini (2002) pointed out that remittances can influence growth positively through different channels. Labor supplying countries took the advantage of exporting labor in terms of foreign remittances which have impact on foreign reserve and on growth positively (Ratha 2003; Pernia 2006). Fayissa and Nsiah (2010) also find the positive impact of worker remittances using panel data for 18 Latin American countries and establish positive relationship between worker remittances and economic growth. Khawaja and Hiranya (2010**)** found positive effect of remittances on output and growth. They used time series data from 2000 to 2008 for Bangladesh. They pointed out that remittance's inflow have positive effect on per capita growth in Bangladesh in long run. Chami et al. (2003) used panel data for developing countries and pointed out that remittances have negative effect on development as remittances goes to consumption and domestic needs and very less amount uses for saving and investment. Acosta et al (2006) and Rodrick et al. (2004) pointed out negative effect of remittances on growth by using panel and time series data respectively for developing economies. Impacts of remittances on growth are partial and observed negative for several years by using panel data from 1963 to 1969 and again from 2002 to 2005. Ekanayake and Mihalis (2008) used panel

data for developing counties from 1980-2006 also found the Positive relation between remittances and economic growth. Barajas et al. (2009) used panel data from 1970-1998 for different countries. They revealed that remittances didn't appear to serve as capital for economic development, as remittances recipient countries would reduce their labor supply and it will directly affect the economic activities. Jongwanich (2007) pointed out affirmative and crucial impact of remittances on poverty and economic growth. Burney (1987) used time series from the period 1969-1986 data for Pakistan found the Positive effect on GNP, performing the key role in reducing the current account deficit, remittances also have positive effect on poverty in the long run through structural channels using time series data from the period of 1973-2007 Qayyum et al. (2008). Azad (2003) examined that Bangladeshi workers became cheap as 70% of rural people completely migrate to urban area or towards the Gulf countries due to river erosion in different parts of the country and these worker send millions dollars of remittances every year. He also analyzed that remittances inflows are very important for the development and balance of payment. Labor supplying countries took the advantage of exporting labor in terms of foreign remittances which have impact on foreign reserve and on growth positively (Ratha, 2005; Pernia, 2006). Azam and Gubert (2006) Adams and Page (2005) pointed out positive effect of worker's remittances on growth, they conclude that worker sends their remittances directly to their home countries which have very deep positive effect on the local demand.

3. METHODOLOGY

This paper has empirically explored the effect of exchange rate, remittances inflow, inflation and consumption on economic development of Bangladesh using annual time series data from 1979-2018. In this study ARDL model was used and according to the analyzed results of the ARDL the coefficient of exchange rate and remittances inflow are negative but have statistically significant effect on economic growth of Bangladesh. However inflation and consumption have positive but statistically significant effect on economic development of Bangladesh. GDP (current US$), worker remittances, received (% of GDP), Official exchange rate (LCU per US$, period average), Inflation, consumer prices (annual %),

Household final consumption expenditure, etc. (% of GDP). Annual time series data is utilized for the period of 1979 to 2018 according to the data availability. The data source is world development indicator (WDI) indicators, World Bank (2018). In this study our dependent variable is economic growth (measured by gross domestic product) while exchange rate, remittances, Inflation and consumption are independent variables. Data is transformed in logarithmic form as it provides efficient, better and consistent results Ehrlich, I. (1996). The logarithmic form of the data does not only make the data smooth but also overcome the heteroskedasticity issue Boutabba, M. A. (2014). Below is the model used in this research study.

$$gdp_t = \beta_o + \beta 1 Exch_t + \beta 2 Remi_t + \beta 3 inf_t + \beta 4 consu_t + \mu_t$$

Here t is the time trend and μ is white noise error term. GDP is gross domestic product, exch is exchange rate, remi is remittances, inf is inflation and consu is consumption. β_o Is constant.

3.1 Autoregressive Distributed Lag Bounds test

In this research study Bounds test were used to examine the long run relationship among the dependent variable and independent variables. Based on the hypothesis the following ARDL bounds test model was applied to examine the long run association among the study variables.

$$\begin{aligned}\Delta GDP_t = {} & \varphi_0 + \varphi_1 GDP_{t-i} + \varphi_2 Exch_{t-i} + \varphi_3 Remi_{t-i} + \varphi_4 Infl_{t-i} \\ & + \varphi_5 Consu_{t-i} \sum_{i=1}^{q} \beta_1 \Delta GDP_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta Exch_{t-i} \\ & + \sum_{i=1}^{q} \beta_3 \Delta Remi_{t-i} + \sum_{i=1}^{q} \beta_4 \Delta Inf_{t-i} \\ & + \sum_{i=1}^{q} \beta_5 \Delta Consu_{t-i} + \varepsilon_t - - - - - - - - - - \\ & - - - - - - - - - - - - (2)\end{aligned}$$

In equation 2 Δ represent the first difference, GDP is gross domestic product, exch is exchange rate, remi is remittances, inf is inflation and consu is consumption and all these variable were calculated as GDP (current US$), worker remittances, received (% of GDP), Official exchange rate (LCU per US$, period average), Inflation, consumer

prices (annual %), Household final consumption expenditure, etc. (% of GDP). t-i represent the optimal lags selection based on Akaike information criterion. φ and β are variables that will be examined for checking long run association among the study variables. Long run associations exist among the study variables so we estimate the short run and long run ARDL model. Null and alternative hypothesis of bounds test are following.

$$H_0 = \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0$$
$$H_1 = \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq 0$$

Null hypothesis can be accepted or rejected based on the examined value of F-statistics. Pesaran et al. (2001**)** stated that Long run association present among the study variables if the calculated F statistics values are greater than the upper bounds value, no long run association exists if the calculated F statistics value is less than the lower bounds value and decision is inconclusive if the calculated F statistics value between the lower and upper bounds value.

3.2 Autoregressive Distributed Lag (ARDL) model

ARDL model was suggested by Pesaran and Shin (1999); Pesaran et al. (2001). ARDL model have different advantages as compared to other time series models. Haug (2002) stated that ARDL model can be utilized with short time data. ARDL model can be utilized if the series are stationary at I(0), I(I) or both of them. Different lags can be used for dependent and independent variables. As the estimated results of ARDL bound test indicate that cointegration exists among the study variables. This is the long run ARDL model.

$$GDP_t = \alpha_0 + \sum_{i=1}^{q} \sigma_1 \mathrm{GDP}_{t-i} + \sum_{i=1}^{q} \sigma_2 Exch + \sum_{i=1}^{q} \sigma_3 \mathrm{Remi}_{t-i} + \sum_{i=1}^{q} \sigma_4 \mathrm{Inf}_{t-i} + \sum_{i=1}^{q} \sigma_5 \mathrm{Consu}_{t-i} + \varepsilon_t \quad (3)$$

In the above equation σ represent the long run variation in the study variables. Akaike information criterion was applied to select

suitable lags for each variable. For the short run ARDL model the following error correction model was applied.

$$GDP_t + \alpha_0 + \sum_{i=1}^{q} \beta_1 \Delta GDP_{t-i} + \sum_{i=1}^{q} \beta_2 \Delta Exch_{t-i} + \sum_{i=1}^{q} \beta_3 \Delta Remi_{t-i} + \sum_{i=1}^{q} \beta_4 \Delta Inf_{t-i} + \sum_{i=1}^{q} \beta_5 \Delta Consu_{t-i} + \varphi ECT_{t-i} + \varepsilon_t \quad ----------(4)$$

In the above equation β show the short run variation while ECT indicate the error correction term that estimate the speed of adjustment from disequilibrium, normal range of error correction term is from -1 to 0. Error correction term should be negative and statistically significant that means that any shock is adjusted to equilibrium in the next time period. Stability of model was checked through CUSUM and CUSMSQ **Brown et al. (1975)**. Serial correlation was check by Breusch–Godfrey Lagrange Multiplier (LM); Heteroskedasticity was checked through Breusch-Pagan-Godfrey (BG) and autoregressive conditional heteroskedasticity (ARCH); Jarque–Bera was used to check the residual normality, Model specification was checked through Ramsey reset Test.

4. RESULTS AND DISCUSSION

This section presents the results of Unit root, Lag selection criteria for ARDL, ARDL Bond test, short run and long run ARDL and finally Cumulative Sum (CUSUM) and Cumulative Sum of Squares graphs.

Table: 4.1 Unit Root Testing

	Variable	ADF	PP
Level Intercept	Gross Domestic Product	-0.3768(0.7718)	-0.3834(0.7704)
	Exchange Rate	-0.2301(0.8081)	-0.2515(0.8046)
	Inflation	-1.7586(0.0471)	-2.9705(0.0466)
	Remittances	-1.3352(0.4387)	-1.7684(0.3901)
	Consumption	-1.47777(0.3686)	-1.5195(0.5133)
Level Intercept & Trend	Gross Domestic Product	-1.7712(0.5350)	-2.1373(0.5097)
	Exchange Rate	-1.4578(0.6987)	-2.0054(0.5803)
	Inflation	-2.5614(0.2194)	-2.8226(0.1833)
	Remittances	-1.4402(0.7980)	-1.2222(0.6177)
	Consumption	-1.5223(0.8100)	-1.3323(0.8556)
Ist Difference Intercept	Gross Domestic Product	-5.27774(0.0001)	-5.4460(0.0001)
	Exchange Rate	-3.35642(0.0009)	-4.5560(0.0011)
	Inflation	-6.4467(0.0000)	-4.5440(0.0010)
	Remittances	-4.8775(0.0000)	-4.9358(0.0000)
	Consumption	-6.2235(0.0000)	-6.40716(0.0001)

Ist Difference Intercept & Trend	Gross Domestic Product	-4.0922(0.0010)	-6.0944(0.0012)
	Exchange Rate	-2.9335(0.0210)	-5.32217(0.0063)
	Inflation	-6.37448(0.0000)	-6.4215(0.0000)
	Remittances	-4.8556(0.0001)	-6.87733(0.0001)
	Consumption	-6.4669(0.0000)	-8.4224(0.0000)

The above table 4.1 showed the results of unit root test. Unit root test is used to check the stationarity of variables. I have checked all study variables with two different methods i.e. Augmented Dickey Fuller test and Philips Perron test. The results of our variables shows that they are not stationary at level and but stationary at 1st difference. So the null hypothesis is rejected because there is no trend in our data and accept alternative hypothesis because our data is stationary at 1st level. The assumption of ARDL bounds testing requires that all variables should be integrated at purely order 0, purely order 1 or mutually cointegrated. Therefore, it is necessary before applying ARDL bounds testing to test the integrating order of all variables; otherwise, the calculation of the F-statistic of ARDL becomes invalid (Baum, 2004).

Table: 4.2 Selection criteria of lag order of variables for the ARDL approach

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-277.3339	NA	0.01332	14.5468	14.22	14.6542
1	-25.6221	411.1128	1.8100	3.2496	7.7229*	4.2113*
2	29.2297	65.1105*	1.7300*	3.8184*	7.3344	4.5224

Table 4.2 indicates the results of criteria of lag order of variables for ARDL approach. There are five different approaches for selection of lag for ARDL model. Normally researchers select AIC and SC method for ARDL lag selection. Lag selection is very important for the ARDL approach to cointegration. I applied Schwarz information criterion to choose the optimum lag length for ARDL Model.

Table 4.3 ARDL Bond Test

F-Statistics	7.3555	
	Critical Value bounds	
Significance	I0 Bound(Lower Bounds)	I1 Bound(Upper Bounds)
10%	2.43	3.27
5%	2.77	3
2.50%	3.28	4.22
1%	3.5	4.8

Table 4.3 demonstrated the results of results of ARDL Bound test. The results of the ARDL bounds testing and critical value according to Narayan (Narayan, 2005) is presented in the above table. ARDL Bound test is used show the results of F statistics. If the value of F statistics is more than critical value of upper bounds, it indicates long run relationship among variables. As the results showed that F Statistics Value is higher than upper bound value at 5 percent significance level (7.3555) so it shows long run relationship among used variables in our research study.

Table 4.4 Estimated Long Run Coefficient Using ARDL Approach

Long Run Coefficients Gross Domestic Product as Dependent variable				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Exchange	-1.405700	0.262842	-5.728546	0.0000
Remittances	-0.015420	0.006887	-2.400239	0.0245
Inflation	0.002235	0.001374	2.630763	0.0146
Consumption	0.008075	0.003580	2.537889	0.0181
C	11.400712	0.280356	40.665059	0.0000
@TREND	0.075933	0.007928	9.577572	0.0000

Table 4.4 indicated results of long run ARDL approach. It can be seen that we used gross domestic product as a proxy for measuring economic growth as dependent variable and exchange rate, remittances inflow, inflation and consumption as independent variables. Exchange rate is negatively and statistically significant. One percent increase in exchange rate decrease gross domestic product up to -1.40 percent, this decrease in gross domestic product may be due to overvaluation or devaluation of exchange rate and government restriction for other countries currency. Our results are in line with Munir Khan et al. (2007). Munir Khan et al. (2007) stated that marginal propensity of imports and coefficient of remittances are positively related with imports and real exchange rate is negatively related with economic growth. Remittance is statistically significant. Coefficient shows that 1 percent increase in remittance inflow will decrease gross domestic product up to -.0154 percent because remittances money has been used toward consumption rather than investment. Migrants from different regions are mostly permanent immigrants who settle in the host countries. Remittance results are same with Habib and Nourin (2006). Habib and Nourin (2006) pointed out the impact of worker remittances on economic growth in South and South East Asian countries. They pointed out negative

relationship between remittance and per-capita GDP growth in Thailand, Sri Lanka, India and Indonesia, while positive relationship in Bangladesh, Pakistan and Philippines. Inflation is statistically significant at 5 percent significant level. Coefficient of inflation show positive effect on gross domestic product. Coefficient value shows that 1 percent increase in inflation increase gross domestic product up to 0.002235 percent. Our results support Shahbaz and Aamir (2009), Buch and Kuckulenz (2004). Shahbaz and Aamir (2009) indicated in their time series study that inflation was positively and world real interest rate was negatively related to inflow of workers' remittances. Buch and Kuckulenz (2004) stated that effect of inflation on the remittances is still unclear in the literature. High rate of inflation having positive relationship with international remittances because unstable macroeconomic situations might increase the migration where as some studies indicated that instability in prices have negative relation with inflow of remittances. Consumption is positively and statistically significant at 5 % level of significance. Consumption's coefficient showed that one percent increase in consumption upto 0.008075 percent. Jongwanich (2007) conducted study on Asian and Pacific countries and pointed out remittances have a positive but marginal impact on economic growth and a significant direct impact on poverty reduction by increasing income, smoothing consumption, and easing capital constraints of the poor.

Table 4.5 Estimated short run coefficient using ARDL approach

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Gross Domestic Product(-1)	-0.1508	0.10333	-1.459	0.1575
D(Exchange)	-0.6379	0.15957	-3.9979	0.0005
D(Remittance)	-0.0119	0.0036	-3.3077	0.0030
D(Inflation)	0.00099	0.00103	0.96101	0.3461
D(Consumption)	0.00083	0.00309	0.26915	0.7901
D(@trend())	0.05472	0.00699	7.83037	0.0000
Cointeq(-1)	-0.8206	0.13514	-5.3321	0.0000

Table 4.5 shows the short run results; inflation and consumption have positive contribution to economic growth of Bangladesh but statistically insignificant. Remittance and exchange rate have negative sign but statistically highly significant. Remittance and exchange rate in the short run and long run have same results and same coefficient sign that show that these variables have negative impact on economic growth of Bangladesh. The error correction term has negative sign and it is highly significant with the coefficient 0.82.

It is showing that the speed of adjustment from short run to long run equilibrium path is quite fast. In other words, the system will take less time to reach its equilibrium in the long run in case of disturbance in short run.

Table 4.6 Diagnostics Test

Diagnostic Tests	Statistics
R^2	0.9777
Adjusted R^2	0.9982
AIC	-5.3880
SC	-4.7847
HQ	-5.1734
F-statistic	1422.552(0.0000)
Durbin-Watson	2.1064

Table 4.6 shows the result of diagnostics test. R-squared value indicates that 0.97 percent variation in dependent variable is due to independent variables. Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion shows that the model is econometrically fit. Durbin Watson statistics value shows that there is no Heteroskedasticity problem in our data.

Table 4.7 Heteroskedasticity Test : Breusch-Pagan-Godfrey

F-statistic	1.195376	Prob. F(13,24)	0.3398
Obs*R-squared	14.93469	Prob. Chi-Square(13)	0.3114

Table 4.7 indicated the results of Heteroskedasticity. I have checked Heteroskedasticity in our data through Breusch Pagan-Godfrey test. Results of the above test showed that there is no problem of Heteroskedasticity in our data because the probability value is greater than 0.05 percent.

Table 4.8 Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.824895	Prob. F(1,23)	0.3732
Obs*R-squared	1.315683	Prob. Chi-Square(1)	0.2514

Table 4.8 indicates the results of serial correlation test. I have checked serial correlation in our data through Breusch Godfrey serial correlation LM test. Results of our data indicated there is no serial correlation in our data because the P value is greater 0.05.

Figure .1 Cumulative sum of recursive residuals (CUSUM)

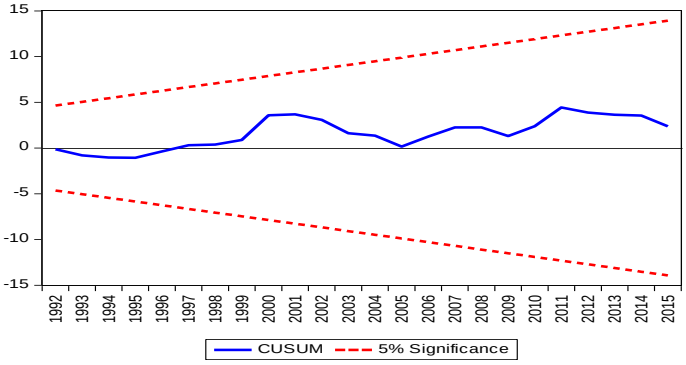

Figure .2 Cumulative sum of squares recursive residuals (CUSUM square)

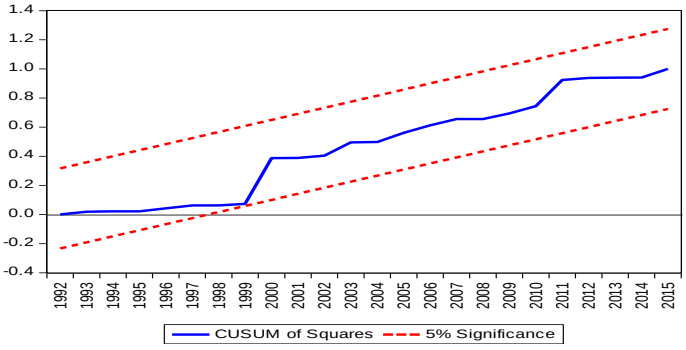

Figure one and two shows the graph of CUSUM and CUSUM Square. Brown et al. (1975) stated that the stability of the coefficients can be checked through CUSUM and CUSUMSQ. The plot graphs of CUSUM and CUSMSQ statistic remains within the bounds at 5% significance level, which showed that the coefficients in the model are stable. The CUSUM and CUSUMSQ show that all coefficients in the model are stable.

5. CONCLUSION AND RECOMMENDATIONS

This paper has empirically explored the effect of exchange rate, remittances inflow, inflation and consumption on economic development of Bangladesh using annual time series data from 1979-2018. In this study ARDL model was used and according to the analyzed results of the ARDL the coefficient of exchange rate and remittances inflow are negative but have statistically significant effect on economic growth of Bangladesh. However inflation and consumption have positive but statistically significant effect on economic development of Bangladesh. GDP (current US$), worker remittances, received (% of GDP), Official exchange rate (LCU per US$, period average), Inflation, consumer prices (annual %), Household final consumption expenditure, etc. (% of GDP). Annual time series data is utilized for the period of 1979 to 2018 according to the data availability. The data source is world development indicator (WDI) indicators, World Bank (2018). In this study our dependent variable is economic growth (measured by gross domestic product) while exchange rate, remittances, Inflation and consumption are independent variables. Data is transformed in logarithmic form as it provides efficient, better and consistent results Ehrlich, I. (1996). First, we checked the stationarity of our data through ADF and PP test, both tests indicated that none of our study variables are stationary at second difference but all variables are stationary at level and first difference. We have checked long run relationship through bound testing and pointed out that long run relationship exists in our variables. Autoregressive distributed lag (ARDL) short and long run results show that remittances have negative but statistically significant on economic development of Bangladesh. R square value showed that 99 percent variation dependent variable is explained by independent variables in our study. CUSUM and CUSUMSQ graphs showed that all coefficients of variables in the model are stables. Different literature has documented a positive association between remittances and growth, and argued in favor of different channels through which this may occur, including investment in both human and physical capital, and through consumption smoothing. This study found that most of the household expenditures are made using remittances due to which remittances have negative impact on economic development of Bangladesh. From a policy point of view, for

a sustained economic growth governments have to mobilize and encourage remittances, which are granted savings and investment even in a case of crises due to an altruistic motivation of the migrants.

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