Remittances and Economic Growth in Bangladesh: A Reassessment

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Abstract

The share of remittance in the GDP of Bangladesh has increased significantly in recent years. Most of the empirical studies have examined its impact on growth in different ways. Since the debate and controversy over remittances for economic growth continues to grow, the present study has focused on reexamining relationship between remittance and economic growth for 1981 - 2018 in Bangladesh context applying Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM) methods. The ARDL result suggests negative and significant association between remittances and economic growth in the long run but positive association in the short run. A unidirectional causality between remittances and economic growth is found from the Vector Error Correction Model (VECM) granger causality test meaning that remittance does lead to economic growth in Bangladesh.

Keywords: Remittance, Gross Domestic Product (GDP), Autoregressive Distributed Lag (ARDL), Error Correction Model (ECM), VECM Granger Causality

JEL Classification: J01, J61, O4

1. Introduction

Bangladesh has become the top remittance recipient in the world by exporting its surplus labor forces to countries like Saudi Arabia, Kuwait, United Arab Emirates, and Malaysia mostly since the early 1970s. The demand for migrant workers has actually risen dramatically due to the economic globalization in the 80s and in the 90s. This outward demand has created the opportunity for a major share of Bangladeshi labor (largely semi-skilled and low skilled) to go overseas as expatriates. Accordingly, remittance inflow not only lessens the unemployment rate but also addresses poverty for the home countries (ILO, 2014).Thus remittance becomes a vital source of financial inflow that leads to the economic growth of any country especially for a labor-intensive country like Bangladesh.

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Share of remittance income in Gross Domestic Product (GDP) has steadily risen in Bangladesh and reached 12% level by 2012 (World Bank, 2012). Figure-1shows that though remittance earnings were fluctuating, it was persistent over the years for Bangladesh. The share of remittance in GDP increased to 7.5% in 2015 from 6.7% in 2006.

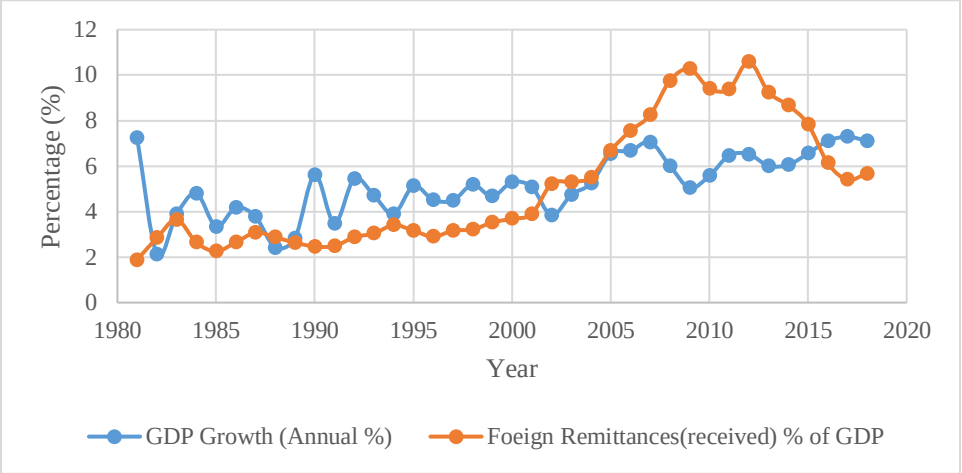


Figure 1: Relationship between GDP growth and remittances

It has also been observed that from 1976 to 2018, a total of 12,199,124 people have migrated overseas for employment (BMET, 2018). Bangladesh maintained its position and ranked as tenth globally in terms of receiving remittances with an amount of $15.5 billion in the fiscal year 2017- 2018 (World Bank, 2018). This has contributed to generating a large number of domestic employment, reducing household poverty thereby raising consumption level, and increasing the foreign exchange reserves that contributed to improving the current account situation. It also assists to invest not only in human capital but also in physical capital and, as a result, build up less vulnerability from any kind of shocks and overall economic development (Ministry of Finance, 2014).

According to Chami et al. (2008), a large proportion of remittance is generally consumed on obtaining education. This contributes to attaining faster rate of formation of human capital resulting in the increased level of total factor productivity and subsequently enhance short-term GDP growth. Moreover, remittances may negatively affect, in the long run, a country's GDP growth. For example, remittance inflow is a by-product of exporting workforce often skilled or semi-skilled that leads to decreased factor productivity and consequently affects economic growth negatively (World Bank, 2005).

Recent studies have argued both for and against the usefulness of economic growth and remittances. Relying on the debate of the association between the variables, two distinct views are originated. Some argue that a country's economic growth will be stimulated by reducing the poverty level by means of the inward flow of remittances while others argue that remittance retards the economy's growth through increasing

dependency on the remittance and making extreme consumption (Tolcha & Rao, 2016). Studies have raised concerns over the efficacy of remittances for economic growth.

The major objective of this research is reexamining the relationship between remittances and economic growth of Bangladesh for 1981–2018. Autoregressive Distributed Lag (ARDL) technique is applied in this research based on Cointegration and Error Correction Model (ECM). Vector Error Correction Model (VECM) granger causality test has been applied to determine causal relationship between remittances and economic growth. This paper also uses diagnostic tests such as the normality test (Jarque–Bera test), heteroscedasticity (ARCH) and serial autocorrelation (LM) test. CUSUM and CUSUM Square test have been applied for checking the stability of the model.

The remaining sections of this paper have been structured as follows. After the introduction, review of relevant literature has been presented in Section 2. Empirical Analysis of the study are provided in Section 3. Estimated Results have been discussed in Section 4. Conclusion of the study has been provided in Section 5.

2. Literature Review

Numerous research papers have been studied for analyzing the relationship between remittance and economic growth. There are some ambiguous conclusions in these research studies. Some found that remittances have a positive contribution to enhancing economic growth while some other studies found negative association between the variables for some specific countries. But in most cases, positive and significant relationship have been found between economic growth and remittance.

Multiplier effect of remittance has been estimated by Stahl and Habib (1989) and found that migrants' remittances increased the rate of savings that subsequently, boost economic growth then. For the period of 1976-1988, they calculated the multiplier for Bangladesh to be 1.24.

Taylor (1992), Faini (2001), Mahmud (2003), Siddique (2004), Goschin (2014), and Okwu (2016) reported that positive contributions of remittance to economic growth. Moreover, Taylor (1999) found that migrants' remittances boost Mexico's Gross National Product. On the contrary, Chami et al. (2003) showed an inverse but significant association between the variables while Barajas et al. (2009), Rao and Hassan (2012) found an insignificant result. Meanwhile, no association is found between remittances and GDP growth by Spatafora (2005).

Researching some selected countries of Latin America and the Caribbean on the basis of income level Ramirez and Sharma (2008) reported that the growth of GDP persists in a positive way due to the growth of remittances by using the Fully Modified OLS (FMOLS) techniques. In the same register, Abida and Sghaier (2014) applied Generalized Method of Moment (GMM) techniques and found positive effect of remittance on economic growth.

At the macroeconomic level, Javid (2012) has tested the consequences of migrants' remittances on poverty rate and economic growth and come up with the findings that the growth of the economy is positively and significantly related to remittances. The

study has also concluded that in terms of poverty reduction, remittances have a significant impact which might lead to several amenities for the impoverished people in Pakistan. This can also happen in case of international migration.

In the case of human capital investment, Tolcha (2016) has conducted a research in Ethiopia and reported positive association between remittances and economic growth in the long run while the relationship is negative in the short run. The author has also investigated the variables namely GDP, secondary school enrollment, remittances, investment, and government expenditure. Without the secondary school enrollment all the variables impact GDP growth of a country positively in the short-run. Recently, Azizi (2018) has tested the impacts of inward remittances on secondary school enrollment and supply of labor in some third world countries and found that migrants' remittances have a noteworthy effect on the outcomes of health and education, such as raising rate of school enrollment and completion rate, in developing countries.

The results of numerous studies, undertaken in Bangladesh context, on the association between remittance and economic growth are mixed and inconclusive. Rahman et al. (2006) and Rahman (2009) found an indistinct relationship between the variables while Ahmed (2010) found negative impact on economic growth. In addition, Siddique et al. (2010) tested Granger causality between the variables for the three countries namely Bangladesh, Sri Lanka and India. A unidirectional causality is found between the variables in Bangladesh and a bidirectional causality is found for Sri Lanka while no causal association is found for India. Meanwhile, Paul and Das (2011) found an inverse association between the variables in the short run while it was positive in the long run. Majumder (2016) has conducted research on the effect of money supply, remittance, and international trade on GDP group rate in the time series framework for the period 1975-2013 and found that the relationship between the variables is significantly positive for Bangladesh.

Therefore, due to the mixed results, this paper re-investigates the relationship between remittances and economic growth for Bangladesh for the period 1981–2018.

3. Definition of Variables, Sources of Data, and Specification of the Model

3.1 Definition of Variables

Annual GDP growth rate is used as an indicator for economic growth, remittances received as a percent of GDP is taken as a measure of remittance, investment is used as a proxy variable of gross fixed capital formation as a percent of GDP. Household final consumption expenditure as a percent of GDP is taken as a proxy for consumption expenditure, government final consumption expenditure as a percent of GDP is taken as a proxy for government expenditure and index of human capital per person based on the years of schooling and returns to education is taken as a proxy variable for human capital of Bangladesh.

3.2 Sources of Data

All the data, except human capital, have been taken from the WDI of the World Bank. Time series data for 1981-2018 for human capital have been collected from the Federal Reserve Economic Data (FRED).

3.3 Specification of the Model

The long-run effects of remittances (REM) and Investment (INV), Consumption Expenditure (CONS), Government Expenditure (GE) and Human Capital (HC) on economic growth (GDP) is estimated by equation (1) below.

$$GDP_t = \beta_0 + \beta_1 REM_t + \beta_2 INV_t + \beta_3 CONS_t + \beta_4 GE_t + \beta_5 HC_t + \varepsilon_t \quad (1)$$

Here, t (1981, 1982,...,2018) denotes time period. Let $A = \beta_1, \beta_2, \beta_3, \beta_4, and\ \beta_5$ denote elasticity of economic growth (GDP) with respect to foreign remittances(REM), investment (INV), consumption expenditure(CONS), government expenditure (GE) and human capital (HC).

4. Econometric Methodology, Results and Discussion

4.1 Unit Root Tests

To examine stationary of the variables, the presence of unit root has to be checked. From the analysis of the characteristics of non-stationary variables, it is seen that spurious regressions can occur if Ordinary Least Square (OLS) techniques is applied with non-stationary variables. So it is necessary to check stationary before estimation. Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests are applied here to check stationarity of the variables.

The form of ADF test with trend and intercept is given below:

$$\Delta y_t = \alpha + \delta_t + \beta y_{t-1} + \sum_{i=1}^{k} \gamma \Delta y_{t-1} + u_t (2)$$

Where $\Delta y_t$is the first difference of y, $u_t$is the error term and α, δ, β, and γ are parameters.

The Phillips-Perron (PP) test for checking stationarity of variables is as follows:

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + u_t \quad (3)$$

Where u_t is I(0) and may have heteroscedasticity issue.

The PP tests will modify the test statistic $t_n = 0$ and $T_{\pi'}$ to correct autocorrelation and heteroscedasticity in u_t.

Table-1: Summary of Unit Root Test Results

ADF Test at Level with trend and intercept			Phillip Perron Test at Level with trend and intercept		
Variable	T-Statistic	P-Value	Variable	T-Statistic	P-Value
GDP	-4.645610***	0.0039	GDP	-10.37163***	.0000
REM	-0.978227	0.9346	REM	-0.978227	0.9346
INV	-2.863421	0.1860	INV	-2.464392	0.3427
CONS	-3.535648*	0.0505	CONS	-3.535648*	.05051
GE	-2.181911	0.4848	GE	-1.821680	0.6738
HC	-3.177456	0.1099	HC	-1.682933	0.7382

Note: ***P, **P, and *P indicate significant at 1%, 5% and 10% levels

ADF Test at 1st Difference with trend and intercept			Phillip Perron Test at 1st Difference with trend and intercept		
Variable	T-Statistic	P-Value	Variables	T-Statistic	P-Value
ΔGDP	-3.456706***	0.0000	ΔGDP	-8.7361***	0.0000
ΔREM	-4.730969***	0.0029	ΔREM	-4.730969***	0.0029
ΔINV	-4.010633***	0.0038	ΔINV	-4.184245***	0.0016
ΔCONS	-5.551285***	0.0000	ΔCONS	-7.680398***	0.0000
ΔGE	-5.030014***	0.0013	ΔGE	-4.999647***	0.0014
ΔHC	-5.189885***	0.0009	ΔHC	-5.188087***	0.0009

Note: ***P, **P, and *P indicate significant at 1%, 5% and 10% levels

ADF and Philip Perron test results suggest that except GDP and CONS all the variables are integrated of order 1, i.e.I(1). GDP and CONS are found I(0). So, a mixed strategy is present here. In the absence of any I(2) series and based on this ADF and PP results, the condition for autoregressive distributive lag (ARDL) bound testing cointegration approach is met.

5.2Lag Length Criteria

To establish the appropriate association amid the variables optimal number of lag should be identified. After estimating the ARDL model based on Akaike Information Criterion (AIC), long-run association among variables shall be estimated.

Table-2: Lag Length Selection Criteria

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	317.1075	NA	4.75e-17	-17.72043	-17.40936	-17.61305
1	589.5565	420.3499	1.43e-22*	-30.48894*	-28.00038*	-29.62989
2	652.9182	72.41337*	9.01e-23	-31.30961	-26.64357	-29.69889

* Indicates lag order selected by the criterion.

LR: Sequential modified LR test statistic (each test at 5% level)

FPE: Final Prediction Error

AIC: Akaike Information Criterion

SC: Schwarz Information Criterion

HQ: Hannan-Quinn Information Criterion

Table 2 represents different lag length using Vector Auto Regression (VAR).It is found that the optimum lag order will be 1on the basis of the minimum value of the AIC.

5.3 Johansen Co-Integration Test

Johansen and Juselius (1990) test have been applied here to see if there is any cointegrating relationship among the variables. Likelihood Ratio (LR) test, suggested by Johansen (1988), is applied to determine the order of r.

$$\lambda_{trace}(q,n) = -T \sum_{i=q+1}^{k} \ln(1-\hat{\lambda}i) \quad (4)$$

Where r= 0,1,2,……k-1, T is the number of observations used for estimating λ_i. The maximum eigen value (LR) test statistics suggested by Johansen is:

$$\lambda_{max}(q,q+1) = -T\, ln\{1-\lambda\_(q+1)\} \quad (5)$$

The outlined statistics either does not reject the null hypothesis that there is 1 co-integrating relation between the variables (r≤ 1) or reject the null hypothesis of co-integration among the variables (r=0).

Table-3: Summary of Johansen and Juselius (1990) Co-integration test

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	5% Critical Value	P-Value
None*	0.952080	289.9988	125.6154	0.0221
At most 1*	0.883396	186.6995	95.75366	0.0294
At most 2*	0.772187	113.6346	61.81889	0.0345
At most 3	0.539577	63.34073	47.85613	0.2562
At most 4	0.472804	36.96996	29.79707	0.6312

Trace test indicates 3 co-integrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
** MacKinno-Haug-Michelis (1999) p-values

Hypothesized No. of CE(s)	Eigen Value	Max-Eigen Statistic	5% Critical Value	P-Value
None*	0.952080	36.74826	34.68787	0.0170
At most 1*	0.883396	17.94945	28.45834	0.0360
At most 2*	0.772187	12.89333	20.16132	0.0276
At most 3	0.539577	5.810358	15.46260	0.6377
At most 4	0.472804	0.672788	4.468416	0.4121

Max-eigenvalue indicates 3 co-integrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
** MacKinno-Haug-Michelis (1999) p-values

Both Trace and Eigen value test results (in **Table 3)** indicate the presence of 3 co-integrating equations among the variables at the 5% level. This paper has conducted the Autoregressive Distributed Lagged (ARDL) bound test co-integration approach as well for getting a better result as well as corroborating with Johansen Co-Integration test result.

5.4 Bound Testing Approach for Co-integration

Granger (1981) and Engle and Granger (1987), Pesaran and Shin (1999) has developed the ARDL method to detect the long - run (LR) association amid the time series regarding non-stationary and stationary data series. This approach is a mixture of short-run and long-run coefficients. To examine the LR association and observe the relations amid the variables of interest, this paper has used ARDL bound testing cointegration approach developed by Pesaran et al. (2001).

Haug (2002) has claimed that for the small sample data set a better result can be obtained from ARDL method to the cointegration approach. As this study has small sample data set, the ARDL test will be a better choice rather than traditional approaches.

For this study, the unrestricted error correction model (UECM) is applied which considers the appropriate lags (Laurenceson & Chai, 2003). Therefore, for proper adjustment of the orders of the ARDL model, the following UECM is used in this study.

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^{p} \varphi_i \Delta GDP_{t-i} + \sum_{i=0}^{q} \beta_{1i} \Delta REM_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta INV_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta CONS_{t-i} + \sum_{i=0}^{q} \beta_{4i} \Delta GE_{t-i} + \sum_{i=0}^{q} \beta_{5i} \Delta \mathrm{HC}_{t-i} + \lambda_1 GDP_{t-1} + \lambda_2 REM_{t-1} + \lambda_3 INV_{t-1} + \lambda_4 CONS_{t-1} + \lambda_5 GE_{t-1} + \lambda_6 HC_{t-1} + \varepsilon_t \quad (6)$$

Here, $(\varphi, \chi, \sigma, \gamma, \theta, \omega \; and \; \delta)$ represents the short, and (λ_1,λ_2,λ_3,λ_4,λ_5, λ_6) represent the long run parameters. The null hypothesis (showing no-co-integration between variable) is

H_0: $\lambda_1 = \lambda_2 = \lambda 3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$

Whereas, the alternative hypothesis (showing co-integration between variables) is

H_1 : $\lambda_1 \neq \lambda_2 \neq \lambda 3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq 0$

Pesaran et al. (2001) and Narayan (2005) calculated the approximate critical values for the F-statistics. Cointegration amid the variables found if F-statistics value is greater than the upper bound. Moreover, no LR association among the variables is found if F-statistics value is lower than the lower bound. On the other hand, the inconclusive results will be found if F-statistics value is within both bounds. To expedite the LR association amid the variables, therefore, this paper relieson the lagged error correction term (ECM_{t-1}).

Table 4: ARDL Bound Test Results

Test Statistic	Value	Significance	Lower Bound	Upper Bound
			I(0)	I(1)
F-Statistic	13.52704	10%	2.20	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

From the ARDL bounds test result showed in **Table 4,** it shall be said that a long-run association amid the variables exists since the value of F- statistic 13.52704 is greater than the upper bound at 1%, 2.5%, 5% and 10% critical values**.** These results corroborated with trace test and the maximum eigen value of Johansen co-integration results which indicated 3 cointegrating equations. Here, we conclude that economic growth is co-integrated with remittances, consumption expenditure, investment, government expenditure, human capital, when it is taken as the dependent variable.

5.5 Short-run and Long-run Dynamics

Due to the presence of cointegrating association among the variables, the LR effects of increases in the remittances, investment, consumption expenditure, government expenditure and human capital on economic growth is found by estimating the following model:

$$GDP_t = \alpha_0 + \sum_{i=1}^{p} \varphi_i \, GDP_{t-i} + \sum_{i=0}^{q} \beta_{1i} \, REM_{t-i} + \sum_{i=0}^{q} \beta_{2i} \, INV_{t-i} + \sum_{i=0}^{q} \beta_{3i} CONS_{t-i} + \sum_{i=0}^{q} \beta_{4i} \, GE_{t-i} + \sum_{i=0}^{q} \beta_{5i} \, \mathrm{HC}_{t-i} + \varepsilon_t \quad (7)$$

Since LR association among variables is present there, the short-run (SR) relationships are examined by estimating the following error correction model:

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^{p} \varphi_i \, \Delta GDP_{t-i} + \sum_{i=0}^{q} \beta_{1i} \, \Delta REM_{t-i} + \sum_{i=0}^{q} \beta_{2i} \, \Delta INV_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta CONS_{t-i} + \sum_{i=0}^{q} \beta_{4i} \, \Delta GE_{t-i} + \sum_{i=0}^{q} \beta_{5i} \, \Delta \mathrm{HC}_{t-i} + \delta ECM_{t-1} + \varepsilon_t \quad (8)$$

ECM $_{t-1}$ is the one period lagged error term that can be derived from the long run equation. It is anticipated that the coefficient of ECM $_{t-1}$ would be negative and significant. If it is positive, the adjustment will be explosive. ECM $_t$ has been well-defined in the following equation:

$$ECM_t = GDP_t - \hat{\alpha}_0 - \sum_{i=1}^{q} \hat{\lambda}_{1i} \, REM_{t-i} - \sum_{i=1}^{q} \hat{\lambda}_{2i} \, INV_{t-i} - \sum_{i=1}^{q} \hat{\lambda}_{3i} \, CONS_{t-i} - \sum_{i=1}^{q} \hat{\lambda}_{4i} \, GE_{t-i} - \sum_{i=1}^{q} \hat{\lambda}_{5i} \, HC_{t-i} \quad (9)$$

The empirical results of the LR and SR equations are displayed in **Table 5.**

Table 5: Estimation Results of Long Run and Short Run Equations

Variables	Long Run	Short Run
Constants	-23.981*** (0.000)	-16.415*** (0.000)
REM	-0.74934* (0.059)	
INV	0.23294** (0.017)	
CONS	0.72874** (0.042)	
GE	0.08921** (0.046)	
HC	1.9814*** (0.007)	
ΔREM		0.43504*** (0.000)
Δ*INV*		0.2354*** (0.000)
ΔCONS		0.8913*** (0.000)
ΔGE		0.3651*** (0.000)
ΔHC		2.5863*** (0.000)
ECM_t		-0.2401*** (0.000)

Note:.***P, **P, and *P indicate significant at 1%, 5% and 10% levels. The p-values are in parenthesis

The LR results in **Table 5** shows that, for a 100% increase in investment, consumption expenditure, and government expenditure, economic growth will increase by 23%, 73%, and 9% respectively which are significant at the 5% level. Moreover, for a 100% increase in human capital investment, GDP growth will upsurge by 198% which is significant at the 1%level. A negative but significant association between remittances and economic growth is also found in the LR, showing that for a 100% increase in remittances, economic growth will decrease by 75% which is significant at the 10% level.

The SR results indicate that remittance, investment, consumption expenditure, human capital, and government expenditure have significant positive impacts on economic

growth. Table 5 also indicates that at any significance level the coefficient ECM(-1) is statistically significant; thus, the speed of adjustment for SR to the LR equilibrium is significant. The value of the ECM(-1) is – 0.24. It is negative, suggesting that when GDP growth is beyond or beneath its equilibrium level, within the first year it will adjust by about 24.01%. The full convergence process will happen within 2 and half years to long-run equilibrium; therefore, the speed of adjustment is significant in case of any shock to economic growth in Bangladesh.

5.6 Sensitivity Test and Analysis

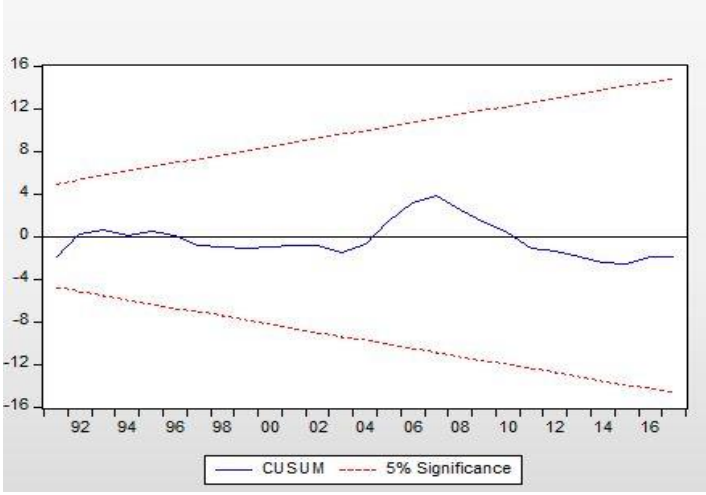
In order to ensure stability of the LR and SR parameters of the ARDL method, normality, serial correlation, and heteroscedasticity are checked by using Jarque–Bera, LM, and ARCH with diagnostics tests respectively. The results are showed in table 6 below:

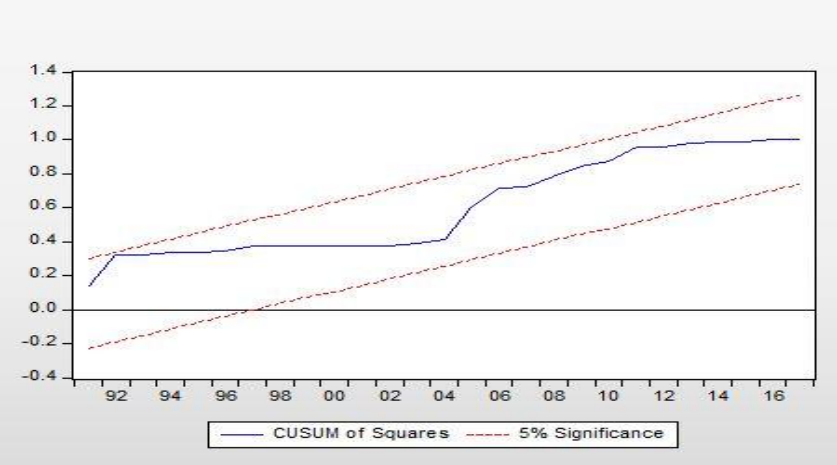
Table 6: Sensitivity Test

Sensitivity Analysis	Coefficients
Serial Correlation	0.4298 (0.6555)
Normality	0.939345 (0.625207)
ARCH	1.731908 (0.1972)

The diagnostic test from **Table 6**, the LM serial correlation test, normality and Autoregressive Conditional Heteroscedasticity (ARCH) clearly show that there does not exist autocorrelation, heteroscedasticity and multicollinearity and also it is normally distributed.

Figure 2: CUSUM and CUSUM Square Test





CUSUM and CUSUMSQ tests demonstrate stability of the estimated ARDL model both for the LR coefficients and the SR dynamics. **Figure 2** indicates that the straight lines in the figure representing the 5 % critical bounds used to check for the stability of the parameter. The line graph lies within appropriate bounds, 5% in this case, support the stability of parameter.

5.7. Vector Error Correction Model (VECM) Granger Causality

Cointegration only indicates the presence of causality among variables but does not specify the direction of it. Hence, Engle and Granger causality test procedure is applied to detect the causal association among the variables. Due to the existence of a cointegration relationship, the ECM has been added with the amplified form of the Granger causality test and structured in a multivariate p[th] order VEC framework. For detecting a LR relationship this study relies on the error correction term (ECM_{t-1}). An error correction equation can be derived as:

$$\begin{bmatrix} \Delta\,\mathrm{GDP}_t \\ \Delta\,\mathrm{REM}_t \\ \Delta\,INV_t \\ \Delta\mathrm{CONS}_t \\ \Delta\mathrm{GE}_t \\ \Delta\mathrm{HC}_t \end{bmatrix} = \begin{bmatrix} C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5 \\ C_6 \end{bmatrix} + \sum_{j=1}^{k} M \begin{bmatrix} \Delta\mathrm{GDP}_{t-j} \\ \Delta\mathrm{REM}_{t-j} \\ \Delta\mathrm{INV}_{t-j} \\ \Delta\mathrm{CONS}_{t-j} \\ \Delta\mathrm{GE}_{t-j} \\ \Delta\mathrm{HC}_{t-j} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \\ \lambda_4 \\ \lambda_5 \\ \lambda_6 \end{bmatrix} \mathrm{ECM}_{it-1} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \end{bmatrix} \qquad (10)$$

$$\text{Where, } M = \begin{bmatrix} \psi_{11j}\psi_{12j}\psi_{13j}\psi_{14j}\psi_{15j}\psi_{16j} \\ \psi_{21j}\psi_{22j}\psi_{23j}\psi_{24j}\psi_{25j}\psi_{26j} \\ \psi_{31j}\psi_{32j}\psi_{33j}\psi_{34j}\psi_{35j}\psi_{36j} \\ \psi_{41j}\psi_{42j}\psi_{43j}\psi_{44j}\psi_{45j}\psi_{46j} \\ \psi_{51j}\psi_{52j}\psi_{53j}\psi_{54j}\psi_{55j}\psi_{56j} \\ \psi_{61j}\psi_{62j}\psi_{63j}\psi_{64j}\psi_{65j}\psi_{66j} \end{bmatrix}$$

Where, $ECM_{t-1}$is the error-correction term and $\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}, \varepsilon_{4t}, \varepsilon_{5t}, and\ \varepsilon_{6t}$ are error terms.

Table 7: Results of VECM Granger causality

	ΔGDP	ΔREM	ΔINV	ΔCONS	ΔGE	ΔHC	ECM(-1)
	F-statistics						t-statistics
ΔGDP		2.5869*** (0.0003)	7.1598*** (0.000)	21.112*** (0.000)	4.7947*** (0.000)	6.2961*** (0.000)	0.4372 (0.365)
ΔREM	1.23153 (0.2751)		0.42331 (0.5198)	1.02411 (0.0023)	0.56914 (0.4560)	0.13306 (0.0012)	9.612*** (0.000)
ΔINV	0.18580 (0.6692)	2.99716* (0.0928)		0.21966 (0.0324)	1.06599 (0.3094)	5.88538** (0.0209)	3.5939 (0.663)
ΔCONS	2.20059 (0.1474)	1.76214 (0.1935)	13.3017*** (0.000)		5.01474** (0.0320)	10.9994** * (0.0022)	1.5927 (0.738)
ΔGE	1.39873 (0.2454)	0.04225 (0.8384)	4.28253** (0.0464)	5.66843** (0.0232)		5.01943** (0.0319)	2.7334 (0.6112)
ΔHC	0.33660 (0.5657)	0.75979 (0.3897)	0.48499 (0.4910)	0.19976 (0.6578)	1.35411 (0.2527)		0.7521 (0.684)

Note: ***P, **P, and *P indicate significant at 1%, 5% and 10% levels

Table 7 shows there exist short run bidirectional causality between consumption and government expenditure (ΔCONS⇔ ΔGE), investment and consumption expenditure (ΔINV⇔ ΔCONS). The study also finds one way causality from government expenditure (GE) to economic growth ($\Delta GE \Rightarrow$ ΔGDP), investment to economic growth (ΔINV⇒ ΔGDP), remittance to economic growth (ΔREM⇒ ΔGDP), consumption expenditure to economic growth (ΔCONS⇒ ΔGDP), human capital to economic growth ($\Delta HC \Rightarrow$ ΔGDP), investment to government expenditure ($\Delta INV \Rightarrow$ ΔGE), human capital to government expenditure ($\Delta HC \Rightarrow$ ΔGE), remittance to investment ($\Delta REM \Rightarrow$ ΔINV), investment to consumption expenditure ($\Delta INV \Rightarrow$ ΔCONS), human capital to investment ($\Delta HC \Rightarrow$ ΔINV), human capital to investment ($\Delta HC \Rightarrow$ ΔINV), human capital to remittance ($\Delta HC \Rightarrow$ ΔREM), and consumption to remittance ($\Delta CONS \Rightarrow$ ΔREM). Moreover, no short run causality is found between remittances and government expenditure.

The coefficient of ECM_{t-1} for remittances in the VECM granger causality equation shows that the speed of adjustment is 9.612 percent towards the long-run equilibrium. The rest of the coefficients such as economic growth, consumption expenditure, government expenditure, investment, and human capital are positively signed but statistically insignificant.

6. Conclusion

The current study focused on reexamining the relationship between economic growth and remittance of Bangladesh in a time series framework for1981 to 2018. It is found that the association between remittance and economic growth is negative and

statistically significant in the long run. Also a positive relationship exists in the short run between these two variables. The ECM coefficient has the appropriate sign and found significant which suggests that deviations from remittances to economic growth will adjust quickly. This study explored that due to the moral hazard problem remittances reduce GDP growth in the long run. Therefore, the government shall reduce the moral hazard problem by minimizing the problem of asymmetric information. For reducing the information gap different media can be helpful for the families of the remittance receivers to spread the knowledge that they should use the money mainly for investment purposes rather than consumption purposes. In addition, encouraging small businesses by opening up the environment for business and entrepreneurship especially for the remittance recipient families may be some solutions to the existing challenges in this regard. Additionally, imposing laws in the banking sector to motivate the families of the remittance recipients' to save more may be an effective impetus from the government's end. As external migration takes place, remittances recipient families become less productive as well as unproductive. To minimize the problem, the government can launch awareness programs through various media and increase their employment opportunities through skill development programs. This may make them productive and help them to contribute to increasing the economic performance of Bangladesh. In addition, remittances enhance the level of quality education as well as raises school enrollment and completion rates. Quality education makes prospective labor more productive that leads to economic growth also. So, the budget allocation for the education sector should be further increased to sustain the growth in Bangladesh.

References

Abida, Z., & Sghaier, I. M. (2014). Remittances, Financial Development and Economic Growth: The Case of North African Countries. *The Romanian Economic Journal*, *XVII*(51), 137-170.

Ahmed, M. S. (2010). Migrant Workers Remittance and Economic Growth: Evidence from Bangladesh. *ASA University Review*, *4*(1), 1-13.

Azizi, S. (2018). The impacts of workers' remittances on human capital and labor supply in Developing countries. *Economic Modelling*, *75*, 377-396.

Barajas, A., Chami, R., Fullenkamp, C., Gapen, M., & Montiel P. (2009). Do workers' remittances promote economic growth? Working Paper, WP/09/153, Washington DC: International Monetary Fund.

Bureau of Manpower Employment and Training (BMET). (2015). Statistical Reports, BMET (Bureau of Manpower, Employment and Training). Ministry of Expatriates Welfare and Overseas Employment Government of the People's Republic of Bangladesh. Retrieved from http://www.old.bmet.gov.bd/ BMET/stattistical Data Action (Accessed on 20-08-2019).

Chami, R., Fullenkamp, C., & Jahjah, S. (2003). Are Immigrant Remittance Flows a Source of Capital for Development? Working Paper, WP/ 03/189, Washington DC: International Monetary Fund.

Chami, R., Barajas, A., Fullenkamp, C., Gapen, M., & Montiel, P. (2008). Do workers' remittances promote economic growth? Working Paper, WP/09/153, Washington DC: International Monetary Fund.

Engle, R. F., & Granger, C. W. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrical, 55*(2), 251-276.

Faini, R. (2001). Development, Trade, and Migration. Washington D.C.: International Monetary Fund.

Goschin, Z. (2014). Remittances as an economic development factor. Empirical evidence from the CEE countries.*Procedia Economics and Finance, 10*(2014), 54 – 60.

Granger, C. (1981). Some Properties of time series data and their use in econometric model specification. *Journal of Econometrics*, 121-130.

Granger, C.W.J. (1988). Some Recent Developments in the Concept of Causality. *Journal of Econometrics, 39*, 199-211.

Haug, A. A. (2002). Temporal Aggregation and the Power of Cointegration Tests: A Monte Carlo Study. *Oxford Bulletin of Economics & Statistics, 64*(4), 399-412. doi:10.1111/1468-0084.00025

ILO. (2014). Reinforcing Ties: Enhancing Contributions from Bangladeshi Diaspora Members, International Labour Organization, ILO Country Office for Bangladesh.–Dhaka. Retrieved from https://www.ilo.org/dhaka/Whatwedo/ Publications/WCMS_308802/lang--en/index.htm (Accessed on 18-12-2019).

Javid, M., Arif, M., & Qayyum, D. A., (2012). Impact of Remittances on Economic Growth and Poverty. *Academic Research International, 2*(1), 433-446.

Johansen, S., (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and control*, *12*(2-3), 231-254.

Johansen, S. & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration-with application to the demand for money. *Oxford Bull, 52*, 169-210.

Laurenceson, J., & Chai, J. C. (2003). Financial reform and economic development in China. *Edward Elgar, Cheltenham, UK*.

Mahmud, W. (2003). Bangladesh: Development Outcomes and Challenges in the Context of Globalization. *Conference on the Future of Globalization at Yale University* (Oct 10-11); Available at: www.ycsg.yale.edu/activities/files/ Wahid.doc.

Ministry of Finance. (2014). Bangladesh Economic Review 2014. Economic Advisors' Cell, Finance Division, Ministry of Finance, Government of the People's Republic of Bangladesh.

Majumder, S. C.& Donghui, Z. (2016). Relationship between Remittance and Economic Growth in Bangladesh:an Autoregressive Distributed Lag Model (ARDL). *European Researcher, 104*(3), 156-167.

Narayan, P. K., (2005). The saving and investment nexus for China: evidence from cointegration tests. *Applied Economics, 37*, 1979-1990.

Okwu, A. T. (2016). Migrants' Remittances and Economic Growth in Africa: A Longitudinal Data Analysis. *Proceedings of 37th International Business Research Conference.*1 - 2 August 2016, Circus Circus Hotel, Las Vegas, USA

Paul, B. P. & Das, A. (2011). The Remittance-GDP Relationship in the Liberalized Regime of Bangladesh: Cointegration and Innovation Accounting. *Theoretical and Applied Economics, 18*(9), 41-60; Available at: http://store.ectap.ro/ articole/636.pdf.

Pesaran, M. H. & Shin Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium. Chapter 11. Cambridge: Cambridge University Press.

Pesaran, M.H., Shin, Y. &Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Economics*, *16*, 289-326.

Ramirez, M. D., & Sharma, H. (2008). Remittances and Growth in Latin America: A Panel Unit Root and Panel Cointegration Analysis. Yale Economics Department Working Paper No. 51, Available at SSRN: https://ssrn.com/abstract=1148225

Rahman, M., Mustafa, M., Islam, M., & Guru-Gharana, K. K. (2006). Growth and Employment: Empirics of Bangladesh. *Journal of Developing Areas*, *40*(1), 99-114.

Rahman, M., (2009). Contribution of Exports, FDI, and Expatriates' Remittances to Real GDP of Bangladesh, India, Pakistan and Sri Lanka. *Southwestern Economic Review*, *36*, 141-153.

Rao, B.B., & Hassan, G.M. (2012). Are the direct and indirect growth effects of remittances significant? *The World Economy*, *35*(3) 351–372.

Spatafora, N. (2005). Two current issues facing developing countries. World Economic Outlook, International Monetary Fund, Washington, DC.

Siddique, T. (2004). Efficiency of Migrant Workers' Remittances: The Bangladesh Case. Manila, The Philippines: Asian Development Bank.

Siddique, A., Selvanathan, E. A., &Selvanathan, S. (2010). Remittances and Economic Growth: Empirical Evidence from Bangladesh, India and Sri Lanka. Discussion Study, University of Western Australia, No. 10.27.

Stah, C. W., &Habib, A. (1989). The Impact of Overseas Workers' Remittances on Indigenous Industries: Evidence from Bangladesh. *The Developing Economies*, *27*, 269-285.

Taylor, J.E. (1992). Remittances and Inequality Reconsidered; Direct, Indirect and International Effects. *Journal of Policy Modeling,14* (2), 187-208.

Taylor, J. E. (1999). The New Economics of Labour Migration and the Role of Remittances in the Migration Process. *International Migration*, *37*(1), 63- 88.

Tolcha, T. D., & Rao, D.P. (2016). The Impact of Remittances on Economic Growth in Ethiopia. *Indian Journal of Commerce & Management Studies*, *7*(2), 1-15.

World Bank (2005). Remittances. Washington, DC, The World Bank, 1818 H Street, NW, Washington, DC 20433.

World Bank. (2012). "Bangladesh: Towards Accelerated, Inclusive and Sustainable Growth Opportunities and Challenges", Report No. 67991, Volume II: Main Report, June, 2012, Poverty Reduction and Economic Management Sector Unit South Asia Region, World Bank

World Bank (2018). Balance of Payments Manual (BPM). IMF, World Bank.