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THE IMPACT OF COVID-19 ON THE REMITTANCE INFLOWS IN BANGLADESH: AN ARDL APPROACH

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ABSTRACT

The key concern of this paper is to bring forth a contemporary estimation of the impact of the ongoing COVID-19 pandemic on remittance inflows in Bangladesh as well as to find out the scenario of whether the migration and exchange rate have impacted on the remittance inflows in Bangladesh based on the monthly data from January 2008 to December 2021. By introducing dummy variable in the Autoregressive Distributed Lag (ARDL) bound testing approach, it is found that the ongoing COVID-19 pandemic has a strong positive impact on the remittance inflows in Bangladesh in the long-run. Besides, there is a positive impact of exchange rate on remittance inflows in the long-run while a negative relationship between the remittance inflows and migration in the long-run in Bangladesh. For the healthiness of the model, various diagnostic tests along with normality and stability test were performed over the period.

Contribution/ Originality: The result of this empirical study has revealed the findings that during the Covid-19 pandemic the inflows of remittances increased along with migration and exchange rate have long-run relationships on remittance inflows in Bangladesh. These findings will be useful for policy makers as well as the governments to encourage the remittance inflow in their respective countries.

1. INTRODUCTION

Remittance inflows, the 2nd largest source of foreign earnings, play a significant role in measuring the overall soundness of the macroeconomic stability of Bangladesh. The inflow of remittance has a greater effect on increasing foreign exchange reserves, financial development, native investment, women empowerment, educational development, and development of different other social indicators in Bangladesh. Now, Bangladesh is one of the leading remittance earners among Asian countries. In 2020, around USD 21.75 billion remittance was received by Bangladesh, which ranked 3rd among the South Asian countries, followed by India (USD 83.15 billion) and Pakistan (USD 26.11 billion) (World Bank, 2020).

Remittances to Bangladesh first commenced in 1970s (Figure 1), when the Gulf countries started to import Bangladeshi employees to work in the oil exporting and the construction sectors. Remittances rose and reached around 3.08 percent of Bangladesh's GDP for the first time in 1987. Then, due to successive falls in oil prices and the resulting drop in construction work, the remittance inflows into Bangladesh started to decline.

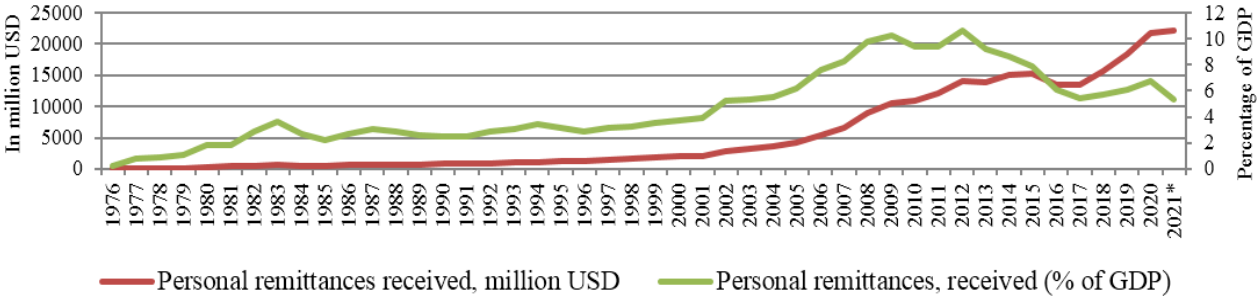

Figure 1. Remittance inflows to Bangladesh from 1976-2021.

Source: World Bank (2020).
Note: *data based on Bureau of Manpower, Employment and Training (BMET).

After that, the second phase of growth in remittance earnings of Bangladesh began to rise (5.22 percent of Bangladesh's GDP) in 2002 after the repercussions of the terrorist attacks of September 11, 2001. This surge in growth continued and was sustained until 2012, when it reached 10.59 percent. Then, the trend began to fall, but rose again in 2020 and 2021 amid the ongoing COVID-19 pandemic. For this fact, the main objectives of this study is to estimate the long-run COVID-19 impact on inflows of remittance in Bangladesh using Autoregressive Distributed Lag (ARDL) approach based on the monthly data from January 2008 to December 2021.

The remainder of the paper appears as follows: the next section presents about the overview of Covid-19 and its impact on remittance inflows and migration in Bangladesh, section three reviews the existing literature review; the fourth section represents data and methodology. After that, section five illustrates the results and lastly section six explores concluding remarks.

2. COVID-19: IMPACT ON REMITTANCE INFLOWS AND MIGRATION IN BANGLADESH

The ongoing COVID-19 pandemic has shaken the world economy. The remittance receiving countries especially the developing countries are more directly affected due to drop of the international migration flow and uptick remittance sending costs globally. In Asia and the Pacific region, the remittance inflows declined to USD 314 billion in 2020 from USD 321 billion in 2019 (ADB Briefs, December 2021). It is expected that the growth in remittance inflows will recover at 6.7 percent (USD 21.2 billion) in 2021 (ADB Briefs, No 204, December 2021). However, at the beginning of Covid-19 in March 2020, the trend of remittance inflows started to gain pace in Bangladesh. Bangladesh received USD 21741.80 million remittances in 2020 which was 18.60 percent higher than that of the previous year. Moreover, Bangladesh received a amount of USD 22072.49 million in 2021 which was 1.52 percent higher than that of the previous year but 20.40 percent higher than 2019. The trend of remittance inflows in Bangladesh before and after Covid-19 shows in Figure 2.

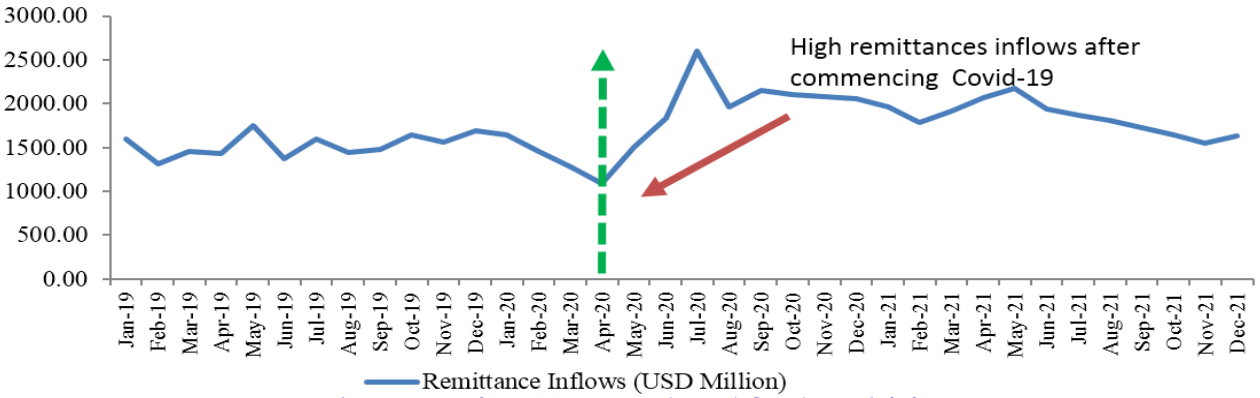

Figure 2. Pre and post COVID-19 remittance inflows in Bangladesh.

During the last six months (July-December) of 2020, Bangladesh received 37.60 percent more remittances compared than that of the same period of 2019 (MET, BB). This upward trend of remittance inflows in 2020 and 2021 is mainly aided by migrant workers whose remit more money for their families to provide financial support during the global pandemic. After the commencement of COVID-19 in March 2020, the migration fall greatly and no workers migrated from Bangladesh during April, May and June in 2020 due to domestic and world-wide strict lockdown.

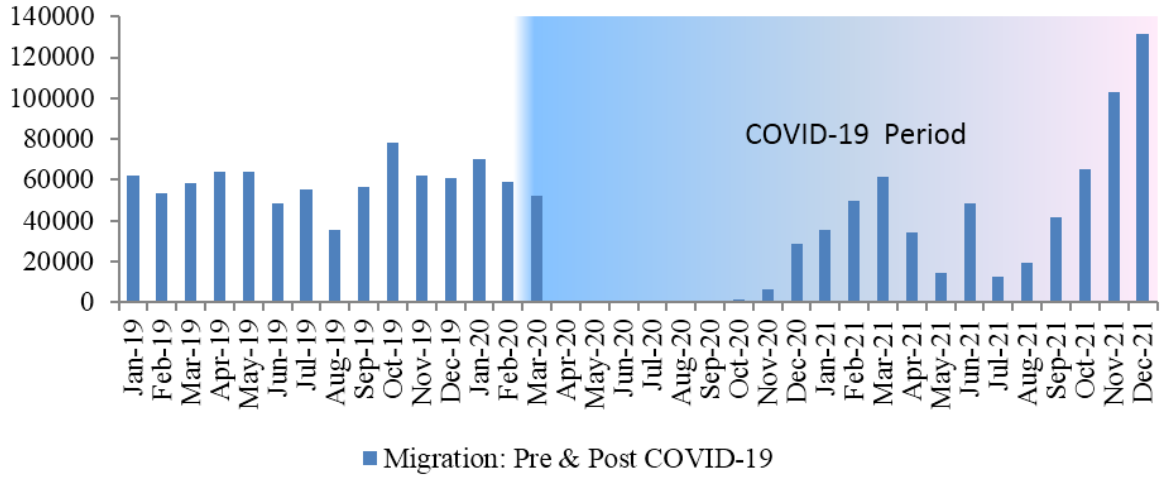

Figure 3. Migration outflows from Bangladesh before and after Covid-19.

According to Bureau of Manpower, Employment and Training (BMET), Bangladesh (Figure 3), the total numbers of migrations in 2020 were 68.91 percent lower than that of the previous year. Likewise in 2021, it was 11.85 percent lower than that of the 2019. Rather, the migration trend in 2021 was quite inspiring than the previous year as the global economies travel restrictions ease day by day.

3. LITERATURE REVIEW

Excessive poverty and slow economic growth always become a barrier for the developing countries of the world. To overcome these impedes remittances played a dominant role as it is an important part of foreign capital flows and GDP. This is one of the main reasons that remittance has always attracted the attention of scholars.

Over the past few years, in many developing countries of the world, a large portion of remittances has been used for consumption purposes rather than productive investment. Durand, Parrado, and Massey (1996) using a multiplier model explained that the inflow of migra-dollar in Mexico stimulates economic activities by significantly increasing investments, income and level of employment not only for the specified communities but also for the nation as a whole. However, using a unified model Chami, Fullenkamp, and Jahjah (2003) suggested remittances can tend to be compensatory in nature and harm economic growth as it can create incentives to moral hazard problems.

Studies done by Adams (2005) and Taylor, Mora, and Adams (2005) find a significant positive impact on poverty reduction for two different developing countries which are Guatemala and Mexico concluding that remittances reduce the severity as well as the level of poverty. Koechlin and Leon (2007) provide an inverted U-shape relationship between income inequality and international remittance using the cross-section panel data for 78 countries. Using interactive terms on regression analysis, they also confirmed that a country can quickly reach the inequality decreasing section in the inverted U-shape curve with the higher level of educational development and higher levels of financial development. In line with this, Ratha (2009) indicates that poverty will be reduced by 3.5 percent if there is a 10 percent increase in remittance inflows. On the contrary, Barajas, Chami, Fullenkamp, Gapen, and Montiel (2009) did not find any robust evidence that remittance has any direct effect on economic growth as well as poverty reduction. There are also several studies related to the impact of remittance and various

macroeconomic variables. Mamta and Rabbi (2014) using annual data for 1971 to 2018 investigates the effects of remittances on the external trade competitiveness explaining that an increase in the workers' remittances significantly appreciates the real exchange rate while decreasing the external trade competitiveness for Bangladesh.

Moreover, the recent pandemic is inevitably affecting the remittance-dependent countries as there is a fall in global remittances, as well as travel restrictions and sending remittance to the home countries affecting the economic growth of the developing world. So, to have a clear idea the researchers are now studying the impact of COVID-19 in the remittance inflows for various countries. Chen, Chand, and Singh (2020) examine the impact of the COVID-19 pandemic on the remittance inflows to Samoa using monthly data from May 2012 to July 2020. The study found that the pandemic has a positive effect on long-term remittance inflows to Samoa from Australia and New Zealand while the United States has a negative impact. According to them, the reason behind this case is the effects of the pandemic have been more serious in the United States than Australia and New Zealand.

Despite the challenges, some countries showed an increase in the remittance inflows during the pandemic. A study done by Abdirahman, Rodriguez, Nguyen, Morales, and Louis (2021) for the top recipient remittance country- Mexico and heavily dependent on the remittance- Haiti showed an increase in the inflow of remittances for both countries. There was a 10% and 14% increase in the inflows of remittance for Mexico and Haiti respectively. They also proposed different policies to enhance remittance flow for two different countries- Mexico should consider feasible solutions proposed by labor economists while Haiti should focus on developing infrastructure and capacities to make the productive use of remittances. To exert the potential impact of the COVID-19 pandemic (Awode, Akpa, & Okwu, 2021) examined the link among remittance, its volatility and some macroeconomic variables for seven African countries with the highest remittance-GDP ratio. However, their study showed that remittance volatility has a negative as well as insignificant impact while remittance itself has a positive significant impact on the macroeconomic variables. Furthermore, they also suggested that COVID-19 can have negative macroeconomic consequences but it cannot significantly affect the macroeconomic fundamentals in most remittance-dependent African countries. Murakami, Shimizutani, and Yamada (2021) explored the potential impacts of the COVID-19 pandemic for the Philippines on the welfare of the remittance-dependent households using a dataset collected before the outbreak of the corona virus. In this study, after confirming the association of remittances with the welfare of households, they used the revision of the GDP projections for the year of 2020 before and after the pandemic to get a clear idea about the potential impacts on households caused by the pandemic. She concluded that in one year of the pandemic, the inflow of remittances will decline by 14-20% along with the 1-2% decrease in per capita household spending. Among all South-Asian countries, ADB and World Bank projected that Pakistan might be one of the worst affected countries and the remittance will fall drastically during the period of the pandemic. Contrary to all those predictions a study done by Ahmed (2020) showed that compared to 2019 the amount of remittance increased around 6.4 percent in 2020. More surprisingly during the pandemic period for March-August, the inflows of remittance increased by 15.58 percent in 2020 than the same period in 2019.

As the Migrant workers played a very significant role in the remittance inflows of Bangladesh during the pandemic it has become the most important research topics for the researchers. However, these migrant workers are economically and socially in a dire situation due to the effect of the pandemic. Karim, Islam, and Talukder (2020) showed a significant number of migrant workers are facing the drastic impacts of COVID-19 such as unemployment, isolation, poor quality of living along social discrimination while their families in the home country are facing financial problems due to the reduced cash flow. Examining the impact of COVID-19 on migrant workers and remittance flows of Bangladesh Chowdhury and Chakraborty (2021) showed that, the remittance flows to Bangladesh raise dramatically by around 54% in July 2020 from December 2019. Although there was 67% decline in employment was recorded the annual increase of remittances has been recorded 18.5% in 2020 compared to the last year (Website of Bangladesh Bank and BMET). This is due to the proactive measures by the government of Bangladesh and repatriation of funds by migrants in fear of future uncertainties. On the contrary, a scenario

analysis done by Das and Sutradhar (2020) to evaluate the impact of COVID-19 on the economy of Bangladesh showed that there is a negative impact of the pandemic on remittance inflows. Despite the pandemic, the remittance flows remained resilient and it is found that in many developing countries the remittance flow has increased compared to the prior year, showing the evidence that when times are difficult in the home country, immigrants felt more urge to send money to the families to survive the downturn of the economy in the home country, however, this trend will not sustain over time if there is a recession in the host countries due to the pandemic (Quayyum & Kpodar, 2020). Several kinds of research measure the impact of remittance inflows during the COVID-19 pandemic in the economy of Bangladesh. These studies did not explain the link among COVID-19 pandemic, remittance inflows, migration and exchange rate. Moreover, to our knowledge, there had been no previous models for analyzing the impact of COVID-19 pandemic on remittance inflows into Bangladesh using ARDL bounds test. This study aims to show the impact of COVID-19 pandemic on remittance inflows along with migration and exchange rate.

4. METHODOLOGY

4.1. Data and Model Specification

The primary goal of this study is to determine the impact of the COVID-19 pandemic on remittance inflows into Bangladesh. The following is the model's specification:

$$Rem_t = \alpha_0 + \beta_0 X_t + \varepsilon_t \quad (1)$$

Here, Rem_t depicts remittance inflows. X_t is the control variable vector. The exchange rate and outbound migration flow, which are determinants of remittance flow, are included in this vector.

The monthly time series data from January 2008 to December 2021 is represented by t in this equation. As the inflow of remittance is greatly impacted during COVID-19 pandemic, monthly data portrays a clear picture of remittance dynamics as well as other control factors. In the remittance inflows model, this impact is reflected by using a dummy variable. From March 2020 to December 2021, COVID-19 existence is indicated by 1 and absence by 0. The augmented form of Equation 1 is as follows after including the dummy variable:

$$Rem_t = \beta_0 + \beta_1 mig_t + \beta_2 ex_t + \beta_3 dum_t + u_t \quad (2)$$

This Equation 2 represents the relationship among remittance inflows, migration, exchange rate, and dummy variable. Now, taking logarithm in both sides of the equation-

$$lrem_t = \beta_0 + \beta_1 lmig_t + \beta_2 lex_t + \beta_3 dum_t + u_t \quad (3)$$

Here, the Equation 3 indicates the log form of all aforementioned variables. The coefficients of β_1 and β_2 show the elasticity of migration, and exchange rate respectively. β_0 and u_t represent the intercept and stochastic disturbance term respectively. Hence, our focus will be on the magnitude of β_1, β_2 and β_3.

Econometric software Eviews-10 is used to formulate the estimations. Data have been collected from the various issues of Monthly Economic Trends published on the Bangladesh Bank website (Appendix Table A).

4.2. Estimation Process

4.2.1. Stationary Test

At the very beginning of running Autoregressive Distributed Lag (ARDL) approach, we conduct stationary test to make out the appropriate integration order. ARDL method can be applied on the mixture of level stationary or I(0) and first difference stationary or I(1). Meanwhile, if the estimated variables are 2nd difference stationary or I(2), in that case ARDL model will not be applicable. Augmented Dicky Fuller (ADF) test, Phillips-Perron (PP) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test have been applied to test the unit root under the study.

4.2.2. Cointegration Testing using ARDL Approach

After performing unit root test, we use ARDL bound test to investigate the impact of COVID-19 on remittance inflows and other variables in Bangladesh under the study. By employing this method, long run relationship and short run dynamics can be segregated for this estimated model. Pesaran and Shin (1999) first established the ARDL bound test and then, developed by Pesaran, Shin, and Smith (2001). This model has some advantages that given below:

1. This model allows the variables with a combination of I(0) and I(1).
2. It accepts dummy variable, while critical values for bound test will not be invalid yet (Narayan, 2004).
3. It can extract the long run and short run components concurrently (Narayan, 2004).
4. In case of small sample size, it is applicable.

The general form of ARDL method based on the conditional unrestricted error correction model (ECM) under the study is in the following:

$$\Delta lrem_t = \beta_0 + \sum_{i=1}^{n} \varphi i \Delta lremt - i + \sum_{i=0}^{n} \gamma i \Delta\ lmigt - i + \sum_{i=0}^{n} \delta i\ \Delta lext - i +$$

$$\theta_1 \Delta lremt - 1 + \theta_2 \Delta lmigt - 1 + \theta_3 \Delta lext - 1 + u_t \quad (4)$$

Here, n implies lag number and Δ depicts the first difference. Thus, the null hypothesis for Equation 4 is conducted by F-test for the joint significance of the lagged variables coefficients will be following:

$H_0: \psi_0 = \psi_1 = \psi_2 = 0$

$H_1: \psi_0 \neq \psi_1 \neq \psi_2 \neq 0$

Pesaran et al. (2001) developed two sets of critical values for F-test. One set is for lower critical bound and the other set is for upper critical bound. However, if F-test value is smaller than lower critical bound, there will be no long run association. Similarly, if F-test value exceeds upper critical bound, then there will be long run relationship among the variables. And finally, if F- test value falls within the upper bound and lower critical bound, the result will be indecisive for the underlying regressors in that case. Whenever, there is an evidence of cointegration, the next step is the estimation of long run relationship of the following ARDL (q,r,l) model.

$$lrem_t = \beta_0 + \sum_{i=1}^{q} \varphi 1 i \Delta lremt - i + \sum_{i=0}^{r} \gamma 1 i \Delta\ lmigt - i + \sum_{i=0}^{l} \delta 1 i\ \Delta lext - i + u_{1t} \quad (5)$$

Where, q,r and l are the optimum lag number of the variables.

Lastly, the short run relationship has been constructed from the error correction model in the following:

$$\Delta lrem_t = \beta_0 + \sum_{i=1}^{n} \varphi 2 i \Delta lremt - i + \sum_{i=0}^{n} \gamma 2 i \Delta\ lmigt - i + \sum_{i=0}^{n} \delta 2 i\ \Delta lext - i + \omega\ ECM_{t-1} + u_{2t} \quad (6)$$

Here, ω implies the speed of adjustment and ECM_{t-1} depicts the error correction term.

The mentioned Equation 6 can be augmented by using dummy variable as critical value of the bound tests will still be valid.

5. RESULT ANALYSIS

5.1. ARDL Model Estimation

The results of Augmented Dicky Fuller (ADF) test, Phillips-Perron (PP) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test have been displayed in appendix Table B. This is inferred that lrem and lmig variables are level stationary, that is I(0).While, lex variable is first difference stationary or I(1) attained from ADF test, PP test and KPSS test. Thus, the mixture of I(0) and I(1) for the regressors demonstrates that ARDL method can be applied under the study. After that, the next step is bound test for co-integration. Maximum lag length is 2

obtaining from lag selection criteria (Appendix Table C). The constant term has been used which has significant impact on dependent variable. Thus, F-statistics getting from ARDL bound test (2,0,0,2) is shown in the Table 1.

Table 1. Result of ARDL bound test.

Variable	F-statistics	Result
Lrem lmig lex dummy	8.193*	Cointegration

Note: * Significant at 1% significance level.

Since the computed value of F-test exceeds the upper bound (Appendix Table D) at 1% level of significance, there is an evidence of cointegration, that is, the variables of the estimated model have long run relationship.

5.2. Scenario of Long Run Relationship

Using ARDL approach, the estimated long run relationship among the variables is given Table 2:

Table 2. Long run coefficients.

Dependent Variable: lrem			
Variable	**Coefficient**	**t-statistics**	**Probability**
lmig	-0.068*	-3.490	0.001
lex	2.495*	9.833	0.000
dummy	0.179**	2.595	0.010
C	-3.078*	-2.822	0.005

Note: * and ** depict 1% & 5% level of significance.

The estimated coefficients for the long run relationship are significant for the variables lmig, lex and dummy. The coefficient of lmig is 0.068 which is negatively signed. It indicates that 1% increase in migration in the long run will fall remittance at 0.06%. This is statistically significant. In practice, increase in migration does not simultaneously increase the remittance inflow in the long run. The earnings of migrants depend on the job that they are employed. In some cases, migrants who are working abroad, may dismiss from their job. Sometimes, newly migrated workers do not get their priori contracted job. Besides, disgraceful job, prejudice and discrimination in the host countries reduce the workers' income capacity. Also, socio-economic condition of the host countries is mostly affected the migrant workers' income and hence in remittance flow. Thus, in the long run, increase in migration will not positively hit the remittance inflows in Bangladesh. Lex coefficient is 2.495, that is positive and significant. This coefficient shows that a 1% increase in exchange rate will result in a 2.5% increase remittance in the long run. It is confirmed that depreciating exchange rate will encourage more remittance inflows. The coefficient of dummy is 0.179 that holds the expected sign which is positive and significant. This is indicative of the ongoing COVID-19 pandemic impact in the long run on remittance inflows in Bangladesh. From the starting of COVID-19 pandemic to till now, remittance inflows in Bangladesh has been increasing. This is because migrants remit more money for their families to provide a cushion against economic hardship during the global pandemic. Apart from this, globally travel restriction helps to transfer money from informal channel to channel. Noteworthy, Bangladesh government provides various incentives in transactions.

5.3. Short Run Dynamics

The following Table 3 represents the short run dynamics of the estimated ARDL framework (2,0,0,2):

Table 3. Estimates from error correction mechanism.

Variable	Coefficient	t-statistics	Probability
D (LREM (-1))	-0.394	-6.199	0.000
D(DUMMY)	-0.068	-0.713	0.477
D (DUMMY (-1))	-0.252	-2.647	0.009
CointEq (-1)	-0.458	-6.483	0.000

From the above results, the lagged value of remittance has significant negative effect on remittance itself. This is because workers' remittance less in corresponding month than that of the previous month.

Though COVID-19 dummy has insignificant impact on remittance inflows, but the lagged value of COVID-19 dummy has significant positive impact on remittance inflows in the short run. Additionally, coefficient of error correction term holds the significantly correct sign with -0.458. It implies that economy will correct the disequilibrium and converge to the equilibrium at 46% rate in a year.

We conclude that the impact of COVID-19 on remittance inflows is time variant. The result shows that COVID-19 has led to increase remittance flow to Bangladesh in the long run, while this pandemic leads to drop remittance earnings in Bangladesh in the short run.

5.4. Diagnostics Test

To test the healthiness of the estimated ARDL model, several statistical tests have been performed which are presented in the following Table 4.

Table 4. Diagnostics test results.

Test	X^2	Probability
Breusch-Godfrey Serial Correlation LM Test	0.316	0.337
ARCH Heteroskedasticity Test	0.319	0.323
Jarque-Bera test for Normality	2.408	0.300

The above table shows that there is no serial correlation and heteroscedasticity in the estimated model. This model is normal too.

5.5. Stability Test

The stability of the model has been shown in Figure 4 of the cumulative sum (CUSUM) and the cumulative sum of square (CUSUMSQ).

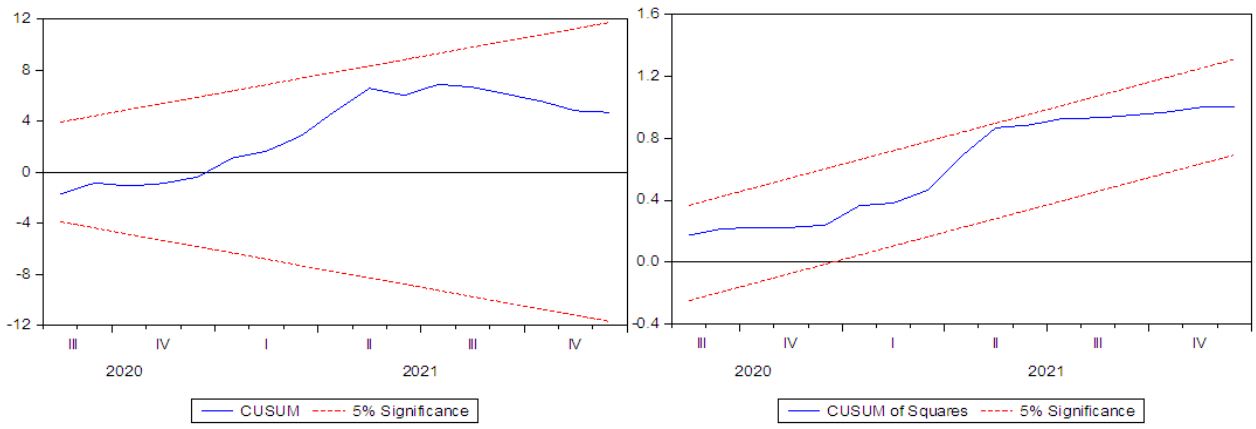

Figure 4. CUSUM and CUSUMSQ test.

Both graphs show that the residuals of the estimated line lie in between the upper and lower lines. It indicates the estimated model is stable.

6. CONCLUDING REMARKS

The prime aim of this paper is to trace out the impact of the COVID-19 pandemic on remittance inflows in Bangladesh. To estimate this impact, ARDL bounds test method has been applied. The results indicate strong evidence that the ongoing COVID-19 pandemic has positive long run impact on remittance inflows in Bangladesh. Furthermore, the study finds negative relationship between remittance inflows and migration in the long run,

which means an increase in migration, will tend to lower remittance inflows in Bangladesh during the COVID-19. Also, the results reveal that there is positive relationship between the exchange rate and remittance inflows in the long run, which means depreciating the exchange rate will encourage more remittance inflows in Bangladesh. In addition, the coefficient of error correction term holds a significant sign, which implies that the economy will converge to equilibrium at 46% rate in a year. To get more reliability of the estimated ARDL model, several statistical tests are applied and suggest that the above model is stable and normal. Thus, these results illuminate the findings that the upsurge of remittance inflows in Bangladesh has been mostly impacted by the world-wide ongoing COVID-19 pandemic. Similarly, migration and exchange rate have long-run relationships on remittance inflows in Bangladesh. Amid COVID-19 pandemic effect on the whole economy, Bangladesh government and the Bangladesh Bank have taken some measures to encourage the remittance inflows and well being of expatriates. After all, this study is not beyond the limitations. One of the pitfalls of the study is that we do not know about the total stock of migration in Bangladesh or the total number of returnees that back to home. The study is used only the overseas employment instead. Another backdrop is that the study discusses only about the demand side of the economy. This does not include the supply side term.

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Authors' Contributions: All authors contributed equally to the conception and design of the study.

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APPENDIX

Table A. Description of variables and sources of data.

Name of Variable	Depiction	Notation	Sources
Remittance Inflows	Remittance (USD Million)	rem	Monthly Economic Trends, BB
Migration	Number of persons	mig	Monthly Economic Trends, BB
Exchange rate	Weighted Average Exchange Rate TK/USD (End Period)	ex	Monthly Economic Trends, BB

Table B. Unit root test.

Test	Step	LREM	LMIG	LEX
ADF	Level	-3.980735*	-10.92290*	-2.196762
	1st difference	-22.77395	-10.87342	-5.480322*
	Integration	I(0)	I(0)	I(1)
PP	Level	-7.004650*	-11.64720*	-1.776455
	1st difference	-37.58823	-10.97666	-10.45242*
	Integration	I(0)	I(0)	I(1)
KPSS	Level	0.160311*	0.092281*	0.146178
	1st difference	0.182069	0.089446	0.066772*
	Integration	I(0)	I(0)	I(1)

Note: *denotes significant at 5% level.

Table C. Lag selection criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	143.4741	NA	2.08e-06	-1.732598	-1.656041	-1.701512
1	875.2627	1418.124	2.86e-10	-10.62438	-10.24160*	-10.46896*
2	899.5857	45.92666*	2.58e-10*	-10.72777*	-10.03876	-10.44801

Note: * indicates lag order selected by the criterion.

Table D. Critical values of bounds test.

Critical Values	Lower Bound I(0)	Upper Bound I(1)
1%	3.65	4.66
5%	2.79	3.67
10%	2.37	3.2