

Remittance Inflows and Sustainable Economic Growth in Bangladesh: An ARDL Bounds Testing Approach

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Abstract

As Bangladesh moves beyond LDC status, identifying the key drivers of sustained economic growth has become highly important. Remittance is one of the major sources of foreign exchange for Bangladesh and plays an important role in supporting household welfare and macroeconomic stability. However, its long-run contribution to economic growth remains an important empirical question. This study examines the impact of remittance on economic growth in Bangladesh using annual data from 1985 to 2024. The study applies the Autoregressive Distributed Lag (ARDL) model to analyze both short-run dynamics and long-run relationships. GDP per capita growth is examined in relation to remittance, investment, exports, foreign direct investment (FDI), and exchange rate. The Augmented Dickey-Fuller (ADF) test is used to check stationarity, while the ARDL bounds test is applied to examine cointegration. An Error Correction Model (ECM) is also used to analyze short-run adjustment. The findings show a strong and significant positive long-run relationship between remittance and economic growth. Investment and exports also contribute positively, while FDI is insignificant. Exchange rate depreciation negatively affects growth. The study suggests that remittance can support sustainable growth if it is productively invested and supported by economic diversification policies.

Keywords: Remittances, Economic Growth, Foreign Direct Investment, Exchange Rate Dynamics, Macroeconomic Stability

Introduction

Remittances have become one of the largest external sources of finance to the developing economies, bigger than and in most instances competing with foreign aid and in some ways, more stable than foreign direct investment. In the case of Bangladesh, where the labor migration have long been a traditional activity and the number of the overseas labor force is high, the remittance inflows have been entrenched in the national economy. Although their role in the household welfare and foreign exchange earnings is quite familiar, the larger issue of whether remittances will create long term macroeconomic growth is a topic of policy and academic concern. The chapter offers background, theoretical context, research questions and objectives which form the basis of the current study.

Background of the Study

The growing globalization of the world economy has radically changed the course of development of most developing countries, especially with the expansion of international labor migration and the continuous rise of the level of remittances (Hossain et al., 2025). Remittances as monetary returns that migrant workers send to their countries of origin have grown to be among the critical and dependable external funds of low-and middle-income countries. Remittances, in contrast to other capital flows like foreign direct investment or portfolio flows which happen to change very quickly and are quite sensitive to global market conditions, are stable and resilient in economic declines. This stability has transformed remittances in a supplementary income transfer into one of the essential aspects of the macroeconomic structure in the situation of Bangladesh. The inflows have overtime contributed greatly in raising the foreign exchange reserves, keeping the balance of payment constant and sustaining the domestic economic activity in the country as well thus making it a critical element in the overall economic performance of the country (World Bank, 2024).

Remittance Trends and Economic Context in Bangladesh

The dependence of remittances in Bangladesh is the fact that this nation had long enough experience with labour migration and the fact that it increased exponentially at the end of the twentieth century and the first part of the twenty first century (Sen et al., 2025). Unemployment and the growing population of laborers in the nation resulted in migration of large number of Bangladeshi workers to other nations and most of them were the countries in Middle East, Southeast Asia where they got more opportunities in terms of their economic benefits. The



dividends returned by these workers in their home countries have led to an ever and ever-increasing flow of foreign exchange to the local economy. This flow has not only contributed towards the sustenance of the household income but also towards the provision of the macroeconomic stability of a buffer against foreign shocks. At the same time, Bangladesh has reported a consistent record of economic growth trajectory, in regard to enlarged GDP per capita, positive social pointers, and slow structural transformations (Ahmad, 2024). Whereas the fact that the remittances increased at the same pace with the development of the economy tends to suggest that remittances are influencing the economic progress positively, there is some underlying pattern that is seen in the respective process, which should be an object of analytical interest.

Theoretical Framework & Key Issues

At the microeconomic level, the remittances are required in the effects of raising the well-being of the homes by providing them the financial right to consume, which improves the higher quality of living. By the remittances being received by the families, they find it possible to spend more on the basic commodities and services like food, medical, education and shelter. The advantage of such expenditures is that the human capital is developed which has been admittedly one of the key factors to have the economic growth in the long term. In addition to that, the remittances might also act as the initial capital of small scale entrepreneurial venture so that they can not only multiply the source of income of households, but also reduce the effects of economic shocks. The problem is, however, on eased transfer of these micro-level gains to larger macro-economic costs is not self-evident. Consumption even though it causes demand and economic action in the short-run will not lead to long run growth unless it is reinforced by productive investment and production changes. This distinction serves as the reason to view the need to see an alteration in the scale of the remittances and their implementation in the economy (Majumder & Donghui, 2016).

Pattern of remittance income allocation is therefore among the indicators of the total impact of the remittance income on the growth of the economy (Uddin et al., 2026). The context of incorporating high percentage of remittances in most developing states like Bangladesh can be used to spend on consumption, rather than investment in the long run. Although this form of spending is needed in transforming the standard of living and poverty reduction, it would limit the fact that remittances might be better readers in capital formation and structural transformation. On the contrary, when the remittances are injected in productive activities such as education, business construction or assets accumulation; they can increase productive capacity of the economy and in fact they can facilitate the sustainable development. The extent to which remittances are used to invest is pegged on a variety of factors and these factors are: Access to financial services, access to good opportunities to invest and finally the overall economic climate. According to the empirical evidence, higher growth effects are more significant in the economies with the developed financial systems and conducive policy regimes (Akter et al., 2024).

Remittances have indirect impacts as well as they interact with other macroeconomic variables which have increased economic growth (Uddin et al., 2026). The process is dependent on the influences of investment, export performance, foreign direct investment and the exchange rate dynamics which are all important variables. These aspects can be complemented through the assistance of remittances wherein liquidity is increased, and credit limits are improved and demand is promoted within the country. Yet they too can lead to a certain amount of macroeconomic issues unless they are properly managed. One of these problems is that the likelihood of appreciation of the exchange rates can arise because of the high outlays of the foreign currency that will reduce the competitiveness of the export sectors. The specified phenomenon applies to the case of Bangladesh specifically where the industry of ready-made garments, export-oriented development, in particular, has been a vital element in the economical enhancement. Any detrimental impact of the export competitiveness will have social implications on the end-term economic performance, (Afrouse & Rahman, 2025).

Along with the macroeconomic reasons, other factors that determine the impact of remittance in economic growth are institutional and the socio-economic factors (Begum et al., 2026). The ultimate success of remittances in the development of a particular nation is largely pegged on the macro climate, in which the remittance is taken and used. These are the variables that affect the spread of income of remittance, in other words, the financial inclusion, level of education and mode of governance, which affect the income of remittances. Remittance will be under-invested and will be rather consumed in the cases of financial system not being developed and formal financial services being absent as well. On a similar note, education and skills deficiency might limit the capacity to remittance income utilization in productive investment among the households. The existence of these structural frustrations in Bangladesh can terminate the value of remittance advantage as an economic change in a long-run that demonstrates the value of additional policies to make healthy use of these remittances (Hossain, 2025; Shirin, 2025).

This is because remittance-economic growth relation is a multi-layered issue which has received varying perceptions in literature. Despite multiple studies that indicate that remittances positively impact the welfare of various countries, by increasing the level of activity in the economy, alleviating poverty, fostering investment, other branches of the literature reveal possible negative effects, including creating dependency, decreased participation in the labor market, and the threat of macroeconomic imbalances. Such hostile images imply that the



impact of remittance is something that is directly targeted to a scenario and that it is contingent upon a series of economic and institutional considerations. The interdependence between remittances and development will be somewhat desired especially in Bangladesh where the remittances make a colossal percentage of national income in order to create development strategies. A very critical analysis with consideration of the benefit and the possible risks of the inflows of remittances are therefore much required to see both sides of the coin.

Research Questions

To address the complexities of the remittance-growth relationship in Bangladesh, this study seeks to answer the following three core questions:

1. What are the short-run and long-run effects of remittance inflows on Bangladesh's GDP growth?
2. Do remittances primarily drive economic growth through household consumption or through productive capital investment?
3. How do remittance inflows interact with exchange rate dynamics and export competitiveness in the context of Bangladesh?

Objectives of the Study

This study aims at providing a detailed empirical study on the impacts of remittance on economic growth in Bangladesh with the setting of macro economy. By doing so it includes some of the macroeconomic variables that it wants to capture, namely investment, exports, foreign direct investment and exchange rates, in a bid to capture the bigger economy on which remittances affect. The research will be introduced as interacting with each other and hence an extension of the small analysis of remittance inflows but rather analyze their interaction with other notable variables of economic performance as already highlighted by the research work (Akter et al., 2024; Afrouse & Rahman, 2025). To do so, the paper uses Autoregressive Distributed Lag (ARDL) model that enables one in exploring the short run phenomenon along with the long run equilibrium relationship that exists between the variables (Pesaran et al., 2001). It is a methodological context which can best suit the understandable effects of remittances on economic growth in the long-term and how to create channel to actualize the effects. In addition, we will analyze the relative significance of remittances as compared to other macroeconomic variables, which will provide a more comprehensive picture of the effect remittances have on the growth process. Finally, the paper will work toward providing evidence based conclusions on the question whether remittances are a contributor to sustainable economic growth or whether they are mostly instrumental in the short run to support consumption which is a highly controversial issue in the literature (Majumder & Donghui, 2016), and to what extent the utility that remittance provides, is predetermined by the macroeconomic and institutional setting in Bangladesh.

Significance of the Study

The topicality of the analysis can also be explained by the creation of the economical level that can be felt by Bangladesh at the specified point in time. The necessity to continue its growth pattern has become one of the priorities as the country is on the course of leaving the Least Developed Country category. Although the role played by remittances had been limiting the balance in the economy of the previous years, the future of the remittances could be shaped by the dynamics of the world economy, changes in the migration trends as well as the alteration in the trend of the labour market in the countries where remittance activities are being undertaken. This brings serious concerns about the sustenance of the economy which has been based on the reliance of the economy on the remittance and the necessity to possess diversity in the economic growth sources. It is only upon having understood the role of the remittances in this bigger picture that one can develop the conception of the remittances policies that can play a positive role in resiliency and sustainable development.

Study Scope and Limitations

This study will concentrate on the impacts of remittance inflows on a macroeconomic setting of economic development of Bangladesh. Key macroeconomic variables that are analyzed towards identifying their total effect on GDP growth are, investment, exports, foreign direct investment, exchange rate as well as remittances in the analysis. It is estimated with the help of the secondary time-series data and can utilize the model of Autoregressive Distributed Lag (ARDL) in order to determine both short-term and long-term relationship between the variables. The article is narrowed down to the economy of Bangladesh and research does not consider cross-country analysis. In addition, secondary data is a weakness to the analysis due to the availability of secondary data and data reliability. It also omits micro-level household survey data information which can also further explain the patterns of remittances utilization at individual level. Even more so, structural and institutional features come straddling and are brought out at the theoretic but do not quantify these empirically due to the limitations of data. Despite these limitations, the study will be able to provide useful information on the significance of remittances in the macro economy and can be applied in deciphering the impact of remittances on economic growth in Bangladesh.



Literature Review

The chapter is a review of the available literature on the relationship between remittances and the economic growth in Bangladesh. Since Bangladesh is one of the largest recipients of remittance inflows in the world, a critical insight into the impact that these funds have on macroeconomic performance is critical to the academic literature as well as policy implications. The review relates on empirical research, theoretical framework and methodology to provide a comprehensive evaluation of the remittance-growth nexus. It also outlines the research gaps that are available and finally gives the conclusion of the main findings towards the end of the literature.

Conceptual Review

Remittances have guaranteed economic growth and macroeconomic stability in Bangladesh particularly during the past thirty years. Bangladesh belongs to the developing countries, which at present, experience the greatest flows of remittance money, and with the flow of migrant income, the country registered an impressive growth in foreign exchange reserves, elimination of poverty and improvement of the economic performance of the country. The inflows have not only accumulated the balance of payment, but it has also been utilized at a reasonable extent to domestic consumption, savings and investment. This predisposed the problem of relationship between economic growth and remittances as a controversial topic within the line of empirical economic research.

Empirical Review

The abundance of literature provides once again a solid fact that the relationship between the remittances and the economic growth in Bangladesh exists. Majumder & Donghui (2016), in analyzing the Remittance inflows and gross domestic product using the Autoregressive Distributed Lag (ARDL) model, discovered that there is a strong relationship between Remittance inflows and gross domestic product in their long-run equilibrium. They conclude that the remittances play a monumental role in the growth of the economy through increasing the level of household income that is converted to expenditure and savings. This propagation of consumption manufactures multiplier and supplementary production and activity of the economy. The same applies to Islam (2020), which also applied both the models of the time-series economic modeling, and concluded that the inflows of remittance had the positively significant effect on the GDP growth, which supports the argument that remittance is one of the driving factors of economic growth in Bangladesh.

Theoretical Review

These five theoretical foundations justifying the relationship between remittance and economic growth are grounded in a framework of interrelated structures that delivers a unique outlook considering which the macroeconomic effect of an impending remittances influx in an economy can be factored. The Keynesian theory of multiplier, the neoclassical theory of growth, the role of the Dutch Disease theory, financial development hypothesis and the human capital theory are the major sources of information of the current research.

Keynesian Multiplier Framework

The theoretical account of growth implications of remittances is most imminent on the Keynesian multiplier theory. Based on this method, an exogenous transfer of income to an economy triggers aggregate demand by raising household consumption expenditure that triggers multiplied rounds of economic actions that enhance a multiplier of the initial income impact in the economy. The ARDL-based study by Majumder and Donghui (2016) explicitly uses this rationale in their analysis on Bangladesh and discover that the remittance inflows stimulate the household incomes that in turn are transformed into consumption and savings in triggering multiplier effect on aggregate output. Similar is found in the context of Islam (2020) who also puts his empirical results into this framework of consumption driven demand where he validates that remittances do have a statistically significant positive impact on GDP growth. Although Keynesian approach is good in explaining the short-run growth dividend of remittances, it, on its part, fails to explain how or when these gains can result in long-run structural development.

The Neoclassical Growth Model and Capital Accumulation

The theoretic approach of neoclassical growth model is a complement to the first theoretical approach by offering the idea of capital accumulation in advancing the long-run economic growth. In this context, the idea of remittances is not just a production source of consumption but can also be the productive investment channel. By making inflows to physical capital formation (such as small enterprises, housing, or productive investments) the recipients in other words increase the stock of capital in the economy, which increases the output per worker in the long run. The results of Akter et al. (2024) which use the ARDL model to calculate the results of the analysis using Bangladeshi data confirm the existence of such a channel of capital accumulation and show that remittances have a positive effect on investment and export activity in addition to GDP growth. It also means that by itself, remittances are not able to achieve the indefinite growth without the additional boosts in the total factor productivity and institutional quality (Gujarati and Porter, 2009; Stock and Watson, 2020).

Financial Development Hypothesis

Financial development hypothesis is the notion that remittances will yield greater dividends in form of growth in a country where there is adequate development of the financial operations to assimilate savings among the



households into productive investment. In remittances where recipients have formal banking and credit markets they are more likely to be intermediated into capital formation as opposed to consumption. Direct evidence of this dynamic, as presented by Miah and Bhattacharjee (2024), is that the policy of cash incentive on formal remittance transfers by the government in Bangladesh boosted inflows in formal banking channels significantly improving the productive use of the foreign exchange. Providing evidence based on the statistics in 103 third-world economies, Azizi (2021) also supports the idea that the role of remittances in poverty reduction and enhancing the growth of the recipient country largely depends on the financial and human capital context of the latter.

The Dutch Disease Framework

The theory which has the most significant theoretical value against the hopeful attitude towards remittances as an expansive driver is the Dutch Disease hypothesis. The basic concept is that the ongoing inflow of inflows in foreign currency will result in the appreciation of the real exchange rate such that domestically produced tradeable goods will become expensive to trade internationally rendering them uncompetitive. Afrouse and Rahman (2025) very clearly appeal to this scheme when they write about Bangladesh by claiming that long-term inflows of remittances would run the risk of appreciation of the exchange rate and competitiveness loss in the ready-made garments industry. This apprehension is empirically supported by Chowdhury and Rabbi (2014) whose analysis in terms of Vector Error Correction Model has statistically significant evidence of real appreciation of exchange rates that can be attributed to the inflows of remittances, and the negative effects on the competitiveness of external trade. The situation is furthered by the fact that the causal relationship between remittances and output in Bangladesh is shown to be one way only by Paul et al. (2011) implying that the exchange rate feedback mechanisms might reduce net growth benefit of remittance inflows over the course of time.

Human Capital Theory and Socio-Institutional Conditionality

Human capital theory, which is the theory of remittances growth in the long-run is based on whether remittances-investment in education results in productive human capital. This transmission is not automatic though in Bangladesh. Hossain (2025) reveals that social-cultural exclusion (of women to higher education) is a major constraint to human capital returns on investing in education financed by remittances, which is echoed by Shirin (2025). At the institutional level, Khan (2025) suggests institutional governance shortcomings in the institution of secondary and higher education known as the Directorate of Secondary and Higher Education, and Rahman (2025) presents the lack of structure in the autonomous learning capabilities of the Bangladeshi students, as another limiting factor at the structural level. All these socio-institutional conditions are pointing at the fact that any further rise in remittance financed educational spending do not have a direct predictive value in terms of a commensurate rise in productivity that the long-run growth demands.

Theoretical Positing of the Current Research

The above reviewed frameworks all attest to the fact that the remittance-growth connection is neither straightforward nor linear. The present study operationalizes the key theoretical channels distinguishable in each of these traditions, by including investment, exports, FDI, and the exchange rate into an ARDL bounds testing model (Pesaran et al., 2001), and contextualizes its empirical results, in the wider context of socio-institutional relations outlined by Hossain (2025), Khan (2025), Rahman (2025), Shirin (2025).

Review of Methodologies

The results of these studies are also more credible by the approach the methodology used in the greater part of these studies. The ease provided on the treatment of the variables of varying orders of integration namely $I(0)$ and $I(1)$ is the superiority of ARDL model in remittance-growth nexus analysis. The approach allows the researcher to test both short-run and long-run equilibrium relationship on one framework. ARDL bounds testing procedure is particularly useful in arriving at a relationship between variables which is cointegrating to ensure that the result is not spurious. At that, the ARDL technique employed by Majumder and Donghui (2016), Islam (2020), and Akter et al. (2024) provides a valid a priori that the empirical relationship between remittances and economic growth in the long-run is stable in Bangladesh.

The government policy also takes the center stage to dictate the influence of remittances to the economic growth. The Bangladesh government has learnt how important the remittance inflows are and as a consequence, it among numerous other policy interventions, has developed a set of policy interventions that are focused on encouraging the use of formal mechanisms of transfers. One such initiative is the most vivid, which is cash incentives on remittance transfers. A comparison of the usefulness of this policy made by Miah and Bhattacharjee (2024) through applying ARDL Bound testing has found that the incentive improved significant remittance inflows through official banking channels. This has contributed towards the enhancement of foreign exchange reserves, transparency of finance and reduced reliance on the informal channels such as hundi. Their research however indicates that it is a slow process of having to adapt to external shocks as it is exhibited in the error correction term. The adjustment rate is a pointer that though the economy responds supportive to policy interventions, it is time consumed to in the long run regain equilibrium after buoyancy of the flow of remittances.



Research Gap

Insufficient Integration of Macroeconomic Variables

Even though there has been an increased literature of empirical studies that explore the relationship between remittance and growth nexus in Bangladesh, there are still some glaring gaps that the current study attempts to fill. Most of the available literature such as the work of Majumder and Donghui (2016), Islam (2020), and Akter et al.(2024) have been focused largely on making the direct positive linkage between remittance inflows and GDP growth by way of consumption and capital formation. Although these contributions are helpful, a common element is that these contributions do not give enough attention to the macroeconomic interactions at large, spanning investment, exchange rate dynamics, and export performance on a unified platform. The current research paper fills this gap directly and sets all these variables into an ARDL bounds testing framework through the data of 1985 to 2024 in annual data to provide an econometric evaluation of the relationship between remittance and growth in Bangladesh in a comprehensive and up-to-date way.

The Underexplored Exchange Rate Channel

One such gap in the current literature is related to the mechanism of the exchange rate dynamics in mediating the effects of remittances on economic growth. Afrouse and Rahman (2025) highlight the Dutch Disease hypothesis, where excessive inflows of remittances sustained over a long period of time can find their way to the real exchange rate and increase the value of the real exchange rate, thus undermining the competitiveness of the Bangladesh manufacturing and garment industries in exports. Chowdhury and Rabbi (2014), applying the methods of Johansen cointegration, Vector Error Correction Model to the data set obtained within the period of 1971 and 2008, prove this worry is, in fact, justified, as the remittance inflows are known to remarkably appreciate the real exchange rate and undermine the competitiveness in external trade operations. In a similar study, Paul et al. (2011), use of the ARDL bounds testing strategy makes an observation of a complex relation between remittances and output in the long-run which concludes that the causal relation between remittances and growth is not always causally in one direction as is normally assumed. Overall, these results combine to indicate that the exchange rate channel is a highly important and under-researched facet of the relationship between remittance and growth in Bangladesh that requires the use of more recent data to capture the major currency devaluation strains and macroeconomic upheavals of the 2020s.

The Contested Role of Foreign Direct Investment

The contribution of foreign direct investment to the nexus of remittance and growth is another areas of controversy in the literature. Although a few studies consider FDI a complement to remittances, scholars such as Al Mamun and Kabir (2022), based on ARDL bounds tests, ascertain that FDI is a negative and not a positive stimulating factor to the economic growth of Bangladesh between periods of 1976 and 2019. This is as opposite to the traditional belief that FDI triggers growth by transfer of technology and capital accumulation. The current research will be part of this debate by revisiting FDI as one among a host of macroeconomic determinants of growth incorporating a via-extended dataset to 2024, thus reflecting the structural changes in the composition and effective impact of foreign capital flows that previously could not be featured in the previous research.

Socio-Institutional Barriers to Human Capital Development

Outside the macroeconomic factors, there is a second large gap that relates to the socio-institutional circumstances that influence the success of remittances as a growth engine in the long run. Hossain (2025) shows that socio- cultural traditions, especially those that limit access by women to forms of higher education seem to be deep-rooted barriers to the development of human capital and narrow the growth-promoting potential of remittance-funded investment in education. This is further supported by Shirin (2025) who demonstrates that by this means, women are still limited to participate in the education sector with perennial negative effects of the outcome to the productivity of the economy due to patriarchal norms. These deficits are further enhanced by institutional weaknesses in the education system of Bangladesh. Khan (2025) outlines such critical issues of governance failure in the Directorate of Secondary and Higher Education, such as the effective lack of qualified teachers in the institution, dysfunctional administrative constraints, which all lead to poor quality education. Rahman (2025) also reiterates that there are widespread shortcomings in the autonomous learning abilities of Bangladeshi students, which indicates that the caliber of learning, rather than access to schooling is a binding limit on the returns of human capital to remittance-financed schooling. The cross-country evidence provided by Azizi (2021) based on the data of 103 developing countries confirms that the poverty-reducing impact of remittances depends greatly on the human capital environment of this country.

Distributional Consequences and Regional Inequality

A third gap is that of the distributional implications of the remittance inflows. Although Azizi (2021) concludes that remittances have large effects on poverty headcount and poverty severity, the effects of remittances on income inequality are much less clear. In a synthesis, providing a comprehensive review of more than 130 empirical studies (Meyer and Shera, 2017), there is no consensus that remittances are causing an increase or a decrease in the level of inequality since gains might be concentrated to households who already have the migration networks and financial resources to obtain the gains. Although the distributional dynamic is of policy importance in Bangladesh, where regional economic inequalities are still high, there is little and inconclusive literature that specifically analyzes the nexus between remittances, inequality and regional development.



Contribution of the Present Study

With these gaps in mind, the current study adds to the literature by using the ARDL bounds testing model with the latest data (1985-2024), a wider range of macroeconomic variables in a single econometric model, and placing the results of the empirical investigation in the context of socio-institutional integrity, described by Hossain (2025), Khan (2025), Rahman (2025).

Methodology

Methodological Framework

The following part is the entire section dedicated to the methodology we plan to employ to examine the effect of remittances on the economic development of Bangladesh. We have opted to go through a quantitative econometric methodology, which simply implies that we will resort to time-series analysis to delve into the volatile association between GDP per capita development and a number of macro variables such as remittances, investment, export development, foreign direct investment (FDI) and move of exchange rates. Such design is rather ubiquitous in economics since it allows us to measure and manipulate economic variables using powers of statistics and econometric software. We will be able to establish the nature and direction and strength of the relationship between these variables using the quantitative approach- just as that of other scholars such as Gujarati and Porter (2009). There is confusion and perplexity in the way economic growth can be spurred by a combination of structural and macro factors. The importance of money that flows in and especially remittances is paramount in determining the performance of most of developing economies. Despite the fact that the macroeconomic variables considered in the model, like investment, exports, foreign direct investment and exchange rate among others are considering, remittances are the main explanatory variable of interest in this study given that the study will specifically focus on demonstrating the influence of remittances on economic growth in the country of Bangladesh. The amount of household income in Bangladesh and the foreign exchange of migrant workers states a significant role. The remittance money is spent on consumption, saved, and invested which have the impact on the national growth.

Nevertheless, the remittances are not adequate. There are other macro variables that occupy significant positions among these and they include capital formation, international trade performance, FDI and exchange rate. It is because of that reason that we need a strong econometric model which will assist in determining the combined effect of these variables on development. That is why we will rely on the Autoregressive Distributed Lag (ARDL) framework, which is one of the tools of macro research. The ARDL model provides us with a dynamic perspective that approximates long-run equilibrium relations in addition to small fluctuations within the variables on the short term (Pesaran et al., 2001).

The important benefit of ARDL is its ability to incorporate variables that are integrated with different orders i.e. $I(0)$ and $I(1)$ but that is all with respect to $I(2)$. It is particularly appropriate to this time series data that we have in this macro study. Another addition to the ARDL model is the Error Correction Model (ECM), which informs us of the speed at which the short-term disequilibrium is contributed by the long term equilibrium. This allows us to decompose the short run permanent variation and bring out the long-run structural relationship between the variables. The macro data we are using in this analysis are 1985 to 2024 annual data on Bangladesh. With this timeframe, we are able to pick up long-run facts and transformation of the Bangladeshi economy.

Overall, our current approach to research is a systematic and high quality concentration of actions to examine determinants of growth and to determine the role of remittances in the macro performance of Bangladesh.

Research Strategy and Empirical Design

Our quantitative, explanatory, and correlational research method is grounded on secondary time-series data. The core of it is that it designs it ex- post facto, i.e., We are going to examine the past information instead of conducting controlled experiments (Creswell, 2014). The fact that we cannot just start switching a light on the economy has prompted me to use historical data to know how remittances, exports and exchange rates have interplayed over time. The explanatory component will enable me to ask the research question, which is what effects are these macro variables on GDP per capita growth. We seek statistical correlations of GDP per capita growth and the other variables. We will also compare these aspects with respect to growth and be able to use econometric tools in a correlational analysis. This method enables me to close on the change in the wobble of the growth in GDP per capita due to change in remittances, investment, exports, FDI, and exchange rates. Our design uses the time-series econometrics; it is the most effective in capturing the variables development and their interactions at various times (Stock and Watson, 2020). We are seeking to identify both long run equilibrium variables as well as short run variations within them.

Sampling Technique

The sampling method we will be doing is a basic census of what is available each year annually on the variables of interest which is typical in time-series econometric studies. The data we have includes 1985-2024, which includes 40 observations of each variable annually. The observations have the limitations of time-series work since



the macro data is released every year or quarterly. The ARDL method however is effective despite having a relatively small number of observations, thus it can be used in this annual macro data analysis (Pesaran et al., 2001). On the whole range that is available, our analysis will cover the entire historical development of the selected macro variables.

Data Sources and Variable Specification

The research is based solely upon secondary sources of data. All the data involved in the empirical analysis were taken in the World Bank database of World Development Indicators (WDI). The World Development Indicators give internationally comparable macroeconomic information on the countries of the world and are extensively applied in both policy and academic research. The database stores trustworthy information about the main indicators of the economy, including GDP, trade flows, investment, exchange rates and remittances (World Bank, 2024).

The dependent variable in the empirical analysis is an aspect that is measured with a combination of the explanatory variables to determine the factors of economic growth.

Dependent Variable

1. *GDP per capita (gdppcg)*: The dependent variable that is used in this research is the growth of GDP per capita (gdppcg) as the percentage growth rate of the GDP per capita per year. It is a common example of a variable that is utilized throughout the literature as the proxy of economic growth since it indicates the changes in the average level of income and the overall economic results (World Bank, 2023).

Independent Variables

The independent variables to be used to capture the major macroeconomic determinants of growth will be as follows:

1. *Remittances (lnrem)*: This is a measure of various personal remittance inflows that the country obtains. It is accumulated into its natural logarithmic form to eliminate skewness, to overcome the possibility of heteroscedasticity, and enable readers to interpret elasticity of the estimates of the coefficients (Gujarati and Porter, 2009).

2. *Investment (investmentg)*: The growth rate of gross capital formation is used as a proxy of investment, as an annual percentage change. This indicator reflects growth of physical capital as it is another major cause of economic growth in both neoclassical and endogenous model of growth.

3. *Exports (exportg)*: This variable is an annual growth of exports of goods and services. Export growth is incorporated in order to represent the contribution of external demand and trade openness in spurring economic activity and productivity in the economy.

4. *Foreign Direct Investment (lnfdi)*: This variable is the net inflows of foreign direct investment. It is converted to natural logarithmic form to stabilize variance and give the coefficients meaning as percentages as is customary in econometrics. FDI should result in an improvement of the growth in terms of technology transfer and capital accumulation.

5. *Exchange Rate (lnexchange)*: Exchange rate is considered to be a proxy variable of both external competitiveness and macroeconomic stability. To ensure proportional changes are captured and absorption of heteroscedasticity elements in the regression model the variable is transformed to take the natural logarithmic form.

The selected variables are transformed through logarithmic conversion to eliminate instability of variances that would otherwise lead to elasticity coefficients interpretation.

Econometric Estimation Strategy

This study uses the empirical analysis, which takes several sequential econometric steps.

Unit Root Test

The initial step entails carrying out the Augmented Dickey-Fuller (ADF) unit root test in order to test the stationarity properties of the variables. One of the properties of time-series data is stationarity that cannot be violated by no means due to the fact that variables that are not stationary can generate the incorrect results of the regression.

ADF test is often employed in the determination of the presence of unit root in a time-series variable (Dickey and Fuller, 1979). The overall structure of ADF test may be written as:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \sum \gamma_i \Delta Y_{t-i} + \epsilon_t$$

Where Y_t represents time series variable and Δ denotes the 1st difference operator. The null hypothesis of this test (H_0) is that the variable has a unit root (it is not stationary), and the alternative hypothesis (H_1) is that the variable is stationary.

The test assists in identifying the sequence of incorporation of every variable, which is required prior to the application of ARDL modeling framework.



ARDL Bounds Testing Capital Approach

Upon identification of the stationarity property of the variables, the research utilizes the Autoregressive Distributed Lag (ARDL) model which was created by Pesaran, Shin and Smith (2001).

With ARDL model, it is possible to estimate short and long run relationships among the variables under a single equation model.

The overall specification of the ARDL applying in the present study may be formulated as:

$$gdppcg_t = \beta_0 + \sum_{i=1}^p \beta_{1i} gdppcg_{t-i} + \sum_{i=0}^q \beta_{2i} lnrem_{t-i} + \sum_{i=0}^q \beta_{3i} investment_{t-i} + \sum_{i=0}^q \beta_{4i} export_{t-i} + \sum_{i=0}^q \beta_{5i} lnfdi_{t-i} + \sum_{i=0}^q \beta_{6i} lnexchange_{t-i} + \epsilon_t$$

Following a dynamic lag selection process, the ARDL (1, 3, 0, 3, 0, 0) model was identified as the best-fitting specification. This configuration was specifically chosen to minimize information loss and satisfy all essential diagnostic requirements, ensuring the most reliable estimation of the long-run and short-run dynamics.

The following are the hypotheses tested to test the existence of a long-run relationship (cointegration) between the variables:

$$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0 \text{ (No Cointegration Exists)}$$

$$H_1: \lambda_i \neq 0 \text{ for at least one } i \text{ (Cointegration Exists)}$$

The ARDL model enables the inclusion of estimating the short-run dynamics as well as estimating the long-run equilibrium relationships (Pesaran et al., 2001).

Error Correction Model

In the case of a long-run relationship, ARDL model can be altered into an Error Correction Model (ECM).

The ECM models the process of adjusting between long-run equilibrium and short-run deviation.

The general ECM form is

$$\Delta gdppcg_t = \alpha_0 + \sum_{i=1}^p \alpha_i \Delta gdppcg_{t-i} + \sum_{i=0}^q \beta_i \Delta X_{t-i} + \lambda ECT_{t-1} + \epsilon_t$$

ECT_{t-1} is the lagged error correction term derived from the long-run relationship. The null hypothesis is that $\lambda = 0$ (No Adjustments), while the alternative hypothesis is that λ is negative and statistically significant ($\lambda < 0$), indicating a return to equilibrium. The ECM model is a representation of the correction of short run adjustments of the long run economic equilibrium in the short run.

Reliability and Validity of the Model

We have subjected the model to a set of diagnostic tests to make sure that the econometric model which we are working on is sound and sound. First, we conduct Breusch-Godfrey test of serial correlation to establish the occurrence of autocorrelation of the residues. Second, we conduct Breusch-pagan test with the aim of seeking heteroskedasticity. Third, we perform Sktest to understand whether the values of the residual are normally distributed or not. Finally, the CUSUM test enables us to find out whether the model that we have estimated is structurally-stable across time. The following diagnostic tests may be applied to confirm the fact that the econometric model meets the requirements of the classical regression analysis and produces the valid statistical estimates (Gujarati and Porter, 2009).

Results and Discussion

It is in this chapter that we explore the real data we gathered and begin with a cursory glance at the numbers to a complete the econometric analysis. The ARDL model was used to unpack the relation between the economic growth and big macro drivers. The findings are divided into descriptive statistics, stationarity tests, cointegration analysis, and the long run and short run dynamics and finally conclude with what it alludes to the economy.

Descriptive Statistics

Table 4.1 presents the descriptive statistics of the variables used in the study for the period 1985-2024, comprising 40 annual observations.

Per-capita growth of GDP (gdppcg) is the main dependent variable. The average is 3.826 per cent over the sample, the minimum growth value was 0.261 and maximum 6.973. Therefore the general trend is positive but we are experiencing slow years. Export growth (exportg) is the least stable: it has an average of 10.741 percent with a massive standard deviation of 17.106. The swings range of a severe decrease of -17.502% to an overwhelming increase of 85.613. The volatility of such kind indicates that the economy is highly vulnerable of external demand and international shocks.



Table 4.1 Descriptive Statistics of the Variables (1985-2024)

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Gdp pcg	40	3.826	1.756	0.261	6.973
Lnrem	40	22.124	1.309	20.035	24.041
Investmentg	40	7.630	2.705	1.532	12.133
Exportg	40	10.741	17.106	-17.502	85.613
Lnfdi	40	18.847	2.782	12.421	21.764
Lnexchange	40	4.049	0.385	3.332	4.750

Source: Author's Calculation

The capital formation which is determined by growth in investment (investmentg) has an average of 7.630 which is between 1.532 to 12.133. The logarithms of the data (remittances lnrem), FDI (Lnfdi) and the exchange rate (lnexchange) exhibit smaller spreads - the log of the exchange rate has a small standard deviation of 0.385 that is pointing towards managed stability or slow change of a currency over time.

Visual Inspection of Variable Trends

Following the descriptive summary, it is essential to observe the historical behavior of the variables. Figures 4.1 through 4.6 present the time-series plots for the dependent and independent variables.

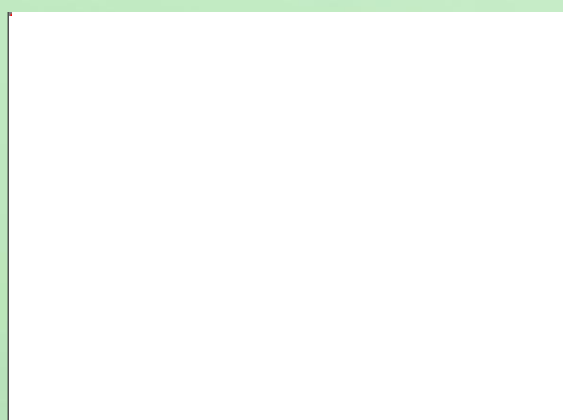


Fig-4.1: Tslne plots for Lnexchange



Fig-4.2: Tslne plots for Lnfdi

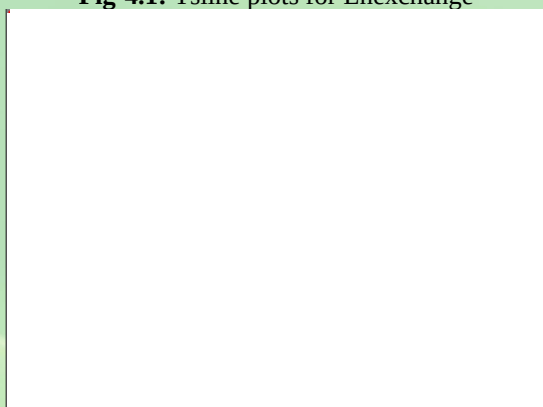


Fig-4.3: Tslne plots for exportg

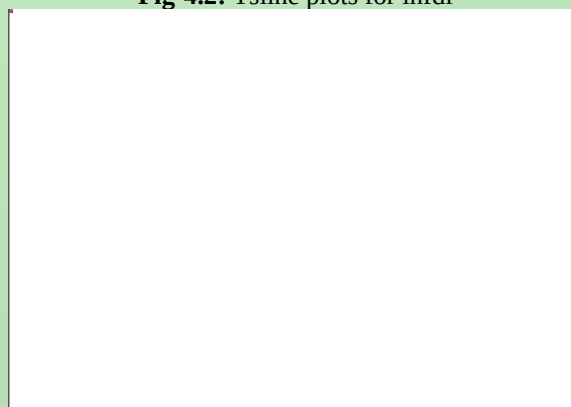


Fig-4.4: Tslne plots for investmentg



Fig-4.5: Tslne plots for lnrem



Fig-4.6: Tslne plots for gdp pcg



Graphical Investigation of Trends of Time-series

The graphical presentation of the variables between 1985 and 2024 provides a preliminary information on what the data entails prior to the actual econometric modelling.

1. *Growth and Volatility Patterns:* The per-capita GDP growth (gdppcg) plot affirms the overall positive trend although much fluctuation is evident with the sharp declines of the past few years. Likewise, the best level of instability is in the form of export growth (exportg), where step peaks, and declines occur, which corresponds with the large standard deviation indicated in the descriptive statistics.

2. *Trend Persistence:* The remittance (lnrem) and exchange rate (lnexchange) show this strong, persistent growth in the 40 years. The plots of these series do not seem to go back to a set mean, indicating that they have a stochastic trend and probably at the levels are not stationary.

3. *Investment and FDI Dynamics:* Investment growth (investmentg) exhibits a gradual but periodic trend, whereas Foreign Direct Investment (lnfdi) has a gradual increase with considerable changes in the later decades of the study.

4. *Implications to Cointegration:* A visual matching of a number of variables -so especially, the long-lasting upward trend of growth and remittances- gives it the first basis in justifying a potential co-integrating relationship. The following visual properties provide a sense of the necessity of using Augmented Dickey-Fuller (ADF) tests to ascertain a specific order of the efforts to integrate individual series.

Unit Root Test Results

To ensure that the regression results are not spurious, the stationary of the variables was examined using the Augmented Dickey-Fuller (ADF) Unit root test.

Table 4.2 ADF Unit Root Test Results

Variable	Level (P-value)	First Difference (P-value)	Results	Order
Gdppcg	0.2761	0.0000*	Stationary	I(1)
Lnrem	0.8996	0.0016*	Stationary	I(1)
Investmentg	0.0045*	---	Stationary	I(0)
Exportg	0.0008*	---	Stationary	I(0)
Lnfdi	0.6173	0.0000*	Stationary	I(1)
Lnexchange	0.9602	0.0003*	Stationary	I(1)

Source: Author's Calculation

The ADF tests reveals both the growth of investment (investmentg) and that of export (exportg) remain stationary in their levels (I(0)). p-values of their levels are 0.0045 and 0.0008, respectively, and we reject the pivot at both levels. Per-capita GDP growth (gdppcg), remittances (lnrem), FDI (lnfdi), and the exchange rate (lnexchange) do not stay stationary at their values, they become stationary following the first differentiation all with p-values less than 0.05. The result is a combination of I(0) and I(1) variables but none, I(2). This meets the ARDL bounds testing standard.

ARDL Bound Test for Cointegration

The ARDL Bounds Test was conducted to determine whether a long-run equilibrium relationship exists among the variables.

Table 4.3 ARDL Bound Test for Cointegration

Test Statistics	Value	Significance	I(0) Bound	I(1) Bound
F-statistic	10.772	1 %	4.358	6.414
T-statistic	-6.817	1 %	-3.633	-5.178

Source: Author's Calculation

We got an F-statistic of 10.772. On comparison with the 1 per cent critical values, the statistic is way above the upper limit of 6.414. Also, the t-statistic = -6.817 is further in the negative as compared to the 1% limits (-3.633 to -5.178). Since both of the metrics are beyond the critical upper limits, we can reject the null hypothesis of no cointegration. In this way, there is institutionalized, meaningful long-term connection between these variables.

Long-Run Estimates

Having established cointegration, we came up with the long-run coefficients to appreciate the way each independent variable contributes towards GDP growth.

Table 4.4 Long-run Coefficients

Variable	Coefficient	Std. Error	t-statistic	P-value
Lnrem	2.0246	0.5763	3.51	0.002
Investmentg	0.1355	0.0555	2.44	0.022
Exportg	0.0750	0.0182	4.12	0.000
Lnfdi	0.1618	0.1309	1.24	0.228
Lnexchange	-4.5011	2.1741	-2.07	0.049

Source: Author's Calculation



The remittances are at the forefront, the coefficient of $\ln rem$ is 2.0246 which is significant at 1 percent ($P = 0.002$). Simply stated, a 1 percent increase in remittances will result to a robust 2.02 percent increase in the long-term growth of GDP. This transforms remittances to be one of the engines, driving domestic consumption and household investment.

The expansion of investment and export is also there. An increase in investment growth by one percent initiates GDP growth by approximately 0.1355 percent ($P = 0.022$). Again, an increase in the export growth by one percent initiates GDP growth by approximately 0.0750 percent ($P = 0.000$). This is part of the reason why capital formation and trade are some of the key long-term growth drivers.

The coefficient of FDI ($\ln fdi$) = 0.1618 which is not significant ($P = 0.228$). So FDI exists but fails in this situation to stimulate per-capita income growth in a predictable way- perhaps because of the lack of absorption capacity, or because of the type of foreign investment.

The impact of the exchange rate is massive in the negative. Its coefficient is -4.5011 ($P = 0.049$). Thus a depreciated currency reduces the growth in the long run drastically. In the economy where importation of capital goods, energy, or raw materials is highly depended on, a weak currency increases the cost of importation, stagnate business output, and damages performance in general.

Short-Run ARDL Estimates

So long-run estimates provide us with a panoramic view of where the economy is going to take in the long run and the short-run processes are everything to do with the gestures and procrastinations as the economy gets hit by some shock. Short-run we observe a complete host of ups and downs which are much more complicated than the long-run tendencies.

The coefficients on remittances are, thus, lagged drastically in the short-run. Although the first and second lags appear flat (P value (0.117 and 0.302)), the third lag throws the largest negative strike at -5.9401 and it is accompanied with the most significant p value = .002. Inherently, remittances are massive to long term growth, however, in short term you experience volatility or crowd-out effect. Equally, there is a consistent negative short run coefficient of all the lags of export growth which is -0.0462 ($P=0.009$), -0.0388 ($P=0.003$) and -0.0199 ($P=0.035$). This is used to emphasize the fact that short run changes in trade will be short-term contractionary responses followed by stabilizing in a positive long-run solution.

Table 4.5 Short-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	P-value
$\Delta \ln rem(-1)$	-2.7124	1.6679	-1.63	0.117
$\Delta \ln rem(-2)$	-1.7693	1.6766	-1.06	0.302
$\Delta \ln rem(-3)$	-5.9401	1.6819	-3.53	0.002
$\Delta exportg(-1)$	-0.0462	0.0161	-2.86	0.009
$\Delta exportg(-2)$	-0.0388	0.0119	-3.26	0.003
$\Delta exportg(-3)$	-0.0199	0.0089	-2.24	0.035
constant	-28.2359	6.5481	-4.31	0.000

Source: Author's Calculation

Evaluation of Model Fit

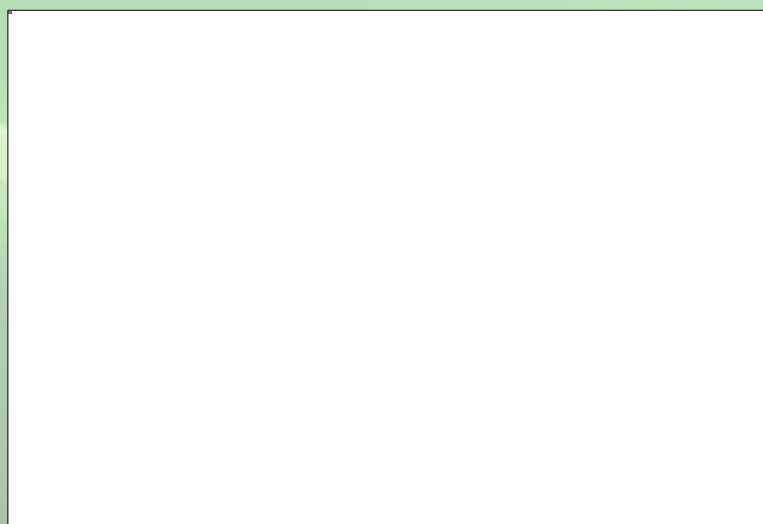


Fig-4.7: Gdppcg Actual vs. ARDL Fitted Values



To evaluate predictive performance of ARDL model fitted values are compared to the actual values of GDP per capita growth (gdppcg).

- *Historical Fit*: The fitted values tend to move in the general direction of the true growth path in general; nonetheless, there are apparent deviations throughout the sample period. Although the model reflects the overall trend within the series, the difference between the actual and fitted values points towards moderate fit but not a close fit or close to perfection.

- *Shock responsiveness*: The model is partially responsive to temporary fluctuations and turning points. The fitted series is comparatively more volatile than the actual series in some periods and in some other periods it is not as responsive especially when significant economic shocks occur where the difference between actual and predicted values become more dissimilar.

- *Reliability of Estimates*: It shows that the differences between actual and fitted values indicate that the model could be helpful in giving the overall information about the underlying long-run growth trend but overall goodness-of-fit is moderate. Thus, using the estimated coefficients, we can correctly interpret long-run relations but caution is required when using the coefficients in short-run predictions or, more specifically, accurate predictions.

Error Correction Model

The Error Correction Model (ECM) provides the transition between short run equilibrium and long run equilibrium. The key parameter is the Error Correction Term (ECT) which informs us of how the system self corrects itself upon a shock.

We have an ARDL model with the coefficient of the lagged error correction term, which is (-1.060), in our estimation. Importantly, it carries the negative value and its significance is significant ($p = 0.000$). The magnitude gives a very high rate of the adjustment process; in fact the ECT has a 106 percent correction of shocks/annually. It indicates that the economy is very resilient and returns faster-than-usual after having gone overshoot in the recovery.

Table 4.6 Error Correction Term

Variable	Coefficient	Std. Error	t-statistic	P-value
ECT(t-1)	-1.060	0.156	-6.82	0.000

Source: Author's Calculation

Diagnostic and Stability Test

To ensure that our ARDL model had credible inferences that were useful in policy, we included a set of harsh tests of diagnostics.

The model was able to go through all the standard diagnostic tests:

1. *Serial Correlation*: The Breusch -Godfrey test result was 1.911 with $p=0.167$. The p-value is more than 0.05 so we accept the null hypothesis of no autocorrelation in that our residuals are not correlated with each other.
2. *Heteroskedasticity*: The test of Heteroskedasticity Breusch-Pagan test showed that the variance of the residual is a constant (homoskedasticity) = 0.090 ($p = 0.766$) and this proves that our standard errors are reliable.
3. *Normality Normality*: The Skewness/Kurtosis statistic (Sktest) is 1.020 ($p = 0.600$), which shows that terms of error are normally distributed.
4. *Multicollinearity*: The Variance Inflation Factor (VIF) was used to test those independent variables that were linearly dependent on each other. The mean VIF of the diagnostic was 10.38. Although this is slightly higher than the standard level of 10, high VIFs on the individual level of lnechange (41.63) and lnrem (41.32) are theoretically anticipated within the framework of exchange rate fluctuations and remittance inflows in Bangladesh. Being theoretically required by the ARDL specification, these variables are not dropped. The other predictors do not have a high VIF value which means that multicollinearity does not essentially corrupt the overall estimation of the model.

Table 4.7 Diagnostic Test Results

Test	statistic (P-value)	Conclusion
Serial Correlation	1.911 (0.167)	No autocorrelation
Heteroskedasticity	0.090 (0.766)	Homoskedastic
Normality	1.020 (0.600)	Residuals normal
Multicollinearity (VIF)	10.38(Mean VIF)	Acceptable (Mean VIF)
CUSUM	-----	Model stable

Source: Author's Calculation

Stability and Residual Analysis

The side-by-side presentation of the CUSUM and Residual plots provides a comprehensive visual validation of the ARDL model's reliability.



1. *Parameter Stability (CUSUM)*: The CUSUM plot confirms that the model's coefficients are stable over the 40-year period. As the recursive residuals remain within the 5% critical boundaries, there is no evidence of structural breaks in the long-run or short-run relationships.

2. *Error Randomness (Residuals)*: The residuals plot serves as a visual diagnostic for the model's error terms. The residuals fluctuate randomly around the zero-mean line with no discernible patterns, confirming that the model has captured all systematic movements in the data.

3. *Validation of Statistical Tests*: Together, these visuals support the formal diagnostic results reported in Table 4.7. The stable parameters and "white noise" residuals verify that the standard errors are not biased and that the p-values for key variables—such as remittances and the exchange rate—are statistically sound.

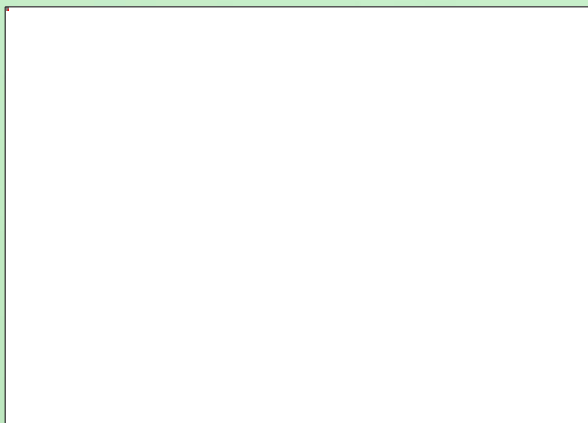


Fig-4.8: CUSUM plot of D.gdppecg

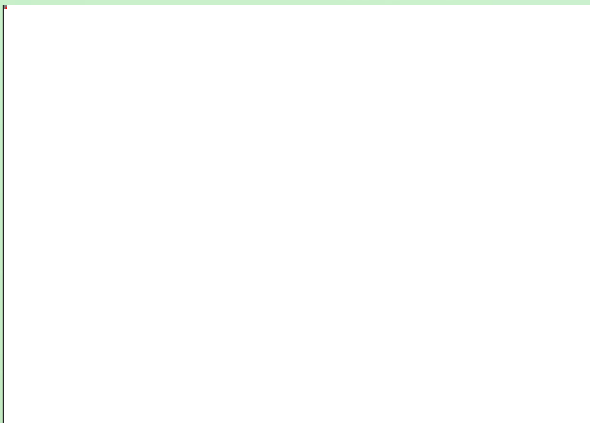


Fig-4.9: Residuals

Conclusion

In the current research, we would like to critically analyze the economic importance of remittances of the migrant workers to the national development of Bangladesh between 1985 and 2024. As Bangladesh nears the exit of Least Developed Country (LDC) status in 2026, macroeconomic stability drivers have never been as important as analyzing them now. It was aimed at tracing the effects of remittances and other important variables on the growth of GDP per capita; investment, increase of exports, foreign direct investment (FDI) and exchange rates.

In the case of the research design, we decided to use a correlational and explanatory research design using secondary time-series data. In analysis of this 40 year data we have used the Autoregressive Distributed Lag (ARDL) Bounds Testing model. The econometric tool is suitable with variables of mixed integration behavior—some of them have their levels, I(1) and others have been integrated by first differencing, which is characteristic of the macroeconomic indicators in the developing nations. Our pre-test activity was Augmented Dickey-Fuller (ADF) test to verify that there are no variables of order I(2) and would invalidate the ARDL method.

The empirical findings were supportive of a good long-run equilibrium of the variables. Descriptive statistics indicate that the average rate of GDP per capita has increased by 3.83 per cent throughout this period, whereas remittance inflows were a very stable and predictable source of external funds. The ARDL Bounds Test resulted in an F value of 10.772 which is way above the critical value of the significant level, which is 1 percent. Interestingly, the remittances became the best force in the economy with a long-run value of 2.0246. It implies that the growth in the GDP per capita is responsive to such an increase in 2.02% year per 1 percent rise in remittance inflows in the long run. The impact on the exchange rate was negative and that of investment and exports was minor and positive while FDI played an insignificant part on growth.

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