



## CO-INTEGRATION ANALYSIS OF REMITTANCES, EXPORTS, AND GDP IN BANGLADESH: IMPLICATIONS FOR ECONOMIC DEVELOPMENT AND UNEMPLOYMENT REDUCTION

Jobayra Afsana<sup>1</sup>,

Mst. Naznin Sultana<sup>2</sup>,

Imtiaz Masroor<sup>3i</sup>

<sup>1</sup>Assistant Professor,

Department of Business Administration,

North Western University,

Khulna 9100, Bangladesh

<sup>2</sup>Master Student,

Business Administration Discipline,

Khulna University,

Khulna 9208, Bangladesh

<sup>3</sup>Lecturer,

Human Resource Management Discipline,

Khulna University,

Khulna 9208, Bangladesh

### Abstract:

Remittances and exports are significant sources of foreign exchange earnings for developing nations. This study explores the relationship between remittances, exports, and economic development in Bangladesh. Using the Johansen co-integration approach, the study finds evidence of co-integration among the variables. The results also show that remittances have a significant positive effect on the gross domestic product (GDP) of Bangladesh, while exports do not have a direct impact on GDP. Furthermore, the Granger causality test reveals that there is no significant and positive relationship between remittances and exports. The study suggests that remittances play a vital role in the economic development of Bangladesh by creating employment opportunities, increasing the level of reserves amount, making payments on imports, balancing the balance of payments, and developing other socio-economic aspects. This is especially important in a country where unemployment is a significant issue, and every day the rate of unemployment is increasing. Therefore, policymakers should take into consideration the potential risks and benefits of migration and remittances and adopt appropriate policies to mitigate any negative impacts. Overall, this study contributes to the literature on the impact of remittances and exports on economic development and provides important policy implications for reducing unemployment in Bangladesh.

<sup>i</sup> Correspondence: email [masroor.imtiaz@hrm.ku.ac.bd](mailto:masroor.imtiaz@hrm.ku.ac.bd)

JEL: F02; F14; F24

**Keywords:** GDP; remittances; exports; Johansen test; Granger causality test; Bangladesh

## 1. Introduction

Remittances are considered a significant factor in the economies of many nations, with external funds being sent by migrant workers to their families in their home countries (Ratha & Mohapatra, 2007). This financial support is intended for the family's well-being, including expenses for food, clothing, and other necessities. Remittances have been found to contribute to economic growth and support the livelihoods of less prosperous individuals (Adams & Page, 2005). In fact, the income received from migrant workers has become one of the most important sources of income for many developing countries, such as Bangladesh, where the remittance income to total export ratio exceeds 40% (World Bank, 2015). The growth of globalization has also led to an increase in remittance flows to emerging nations (Taylor, 1999). For example, in 1970, global remittances were less than 2 billion US dollars, but by 1995, they had grown to more than 70 billion US dollars (Taylor, 1999). Bangladesh has become one of the top 10 remittance receivers in the world, currently ranked ninth on this list (Ratha & Mohapatra, 2007).

Exports also play a significant role in the economy by influencing the level of economic growth, employment, and balance of payments. Lower transport costs, globalization, economies of scale, and reduced tariff barriers have facilitated the growth of exports in the post-war period, allowing them to take a substantial position in national income (Ruffin, 2002). Exports can create employment for citizens of a country, particularly in specific industries such as the automobile sector. Additionally, exports can contribute to aggregate demand, meaning that an increase in exports leads to an increase in aggregate demand (Serrano & Summa, 2015). In Bangladesh, the growth in exports of ready-made garments has contributed significantly to the nearly 6.5% GDP growth since 2004 (Sarker *et al.*, 2022).

Remittances and exports are significant sources of foreign currency for developing countries like Bangladesh, with both playing a vital role in boosting the standard of living of individuals and contributing to the overall economic development of the nation. According to the World Bank, Bangladesh is now one of the largest recipients of remittances with almost \$15 billion as of June 2015 (World Bank, 2015). Additionally, exporting goods can earn a substantial amount of foreign currency, which creates employment opportunities for the betterment of the people and the economy as a whole (Islam & Khan, 2017). This study aims to evaluate the effects of remittances and exports on economic development in Bangladesh. The primary objective is to determine whether these two indicators have a significant impact on the country's economic development or whether there is no relationship between them. If a relationship exists, this study will also investigate the direction of that relationship.

Remittances and exports are two of the most significant sources of foreign currency earnings for developing countries, and their role in contributing to economic development has been widely recognized in the literature. Remittances are external funds that are sent by migrant workers to their families in their home country, while exports are goods or services produced in a country and sold in another country. The importance of remittances as a source of foreign currency earnings has increased significantly in recent years. According to the World Bank, in 2019, remittances to low- and middle-income countries reached a record high of \$554 billion, surpassing foreign direct investment and official development assistance (World Bank, 2020). In some countries, such as Nepal, Tajikistan, and Kyrgyzstan, remittances constitute a significant portion of the gross domestic product (GDP), exceeding 30% (World Bank, 2020).

Similarly, exports have been found to have a positive impact on economic development. A study by Rajan and Subramanian (2008) found that exports are positively related to economic growth and that this relationship is stronger in developing countries. Another study by Tamim (2018) found that exports have a positive impact on employment, productivity, and innovation in developing countries. In Bangladesh, remittances and exports play a crucial role in the country's economy. According to the Bangladesh Bureau of Statistics, the contribution of remittances to the country's GDP increased from 5.5% in 2010-2011 to 6.3% in 2018-2019 (Bangladesh Bureau of Statistics, 2020). Similarly, the contribution of exports to the country's GDP increased from 16.2% in 2010-2011 to 17.1% in 2018-2019 (Bangladesh Bureau of Statistics, 2020).

However, the relationship between remittances, exports, and economic development is complex and has been the subject of much debate in the literature. Some studies have found a positive relationship between remittances and economic growth, while others have found no significant relationship (Adenutsi, 2010; Durusu-Ciftci & Ispir, 2017; Yang, 2008). Similarly, the relationship between exports and economic development is not straightforward and depends on various factors, such as the composition of exports, the level of technological advancement, and the trade policies of the country (Rajan & Subramanian, 2008). Therefore, this study aims to investigate the impact of remittances and exports on economic development in Bangladesh. The study will examine whether these two indicators have a significant effect on economic development and, if so, in which direction. The findings of this study will provide policymakers with valuable insights into the role of remittances and exports in promoting economic development in Bangladesh and other developing countries.

## 2. Literature Review

### 2.1 Remittance

Chami *et al.* (2003) conducted an empirical investigation using panel data from 113 countries to analyse the role of worker's remittances as a source of capital accumulation during the period of 1970-2008. Their study indicated a negative and statistically significant relationship between worker's remittances and economic growth in the long run. The researchers concluded that worker's remittances do not serve as a source of capital for economic development and that there are significant obstacles to transforming these resources into a significant source of capital.

The topic of remittances and their impact on economic development is of great interest to economists and policymakers worldwide. Remittances, which refer to the transfer of money by migrants to their families in their home country, have become an important source of foreign exchange for many developing countries. According to the World Bank, remittances to low- and middle-income countries reached a record high of \$540 billion in 2020, surpassing foreign direct investment and official development assistance. Despite their growing importance, the impact of remittances on economic development remains a subject of debate. While some studies suggest that remittances can stimulate economic growth by providing households with additional income and boosting consumption, others argue that remittances may have a negative effect on long-term economic development by creating a culture of dependency and reducing incentives for domestic investment.

For instance, Gupta *et al.* (2009) note that remittances can have a positive effect on the recipient households' welfare, including improved access to education, healthcare and other basic needs. However, they also note that remittances tend to be used for consumption rather than investment, limiting their potential contribution to economic development. Similarly, Vogiazides (2012) argues that while remittances have the potential to contribute to economic development, they are not a sustainable source of growth and governments should focus on developing other sources of capital.

Other studies have suggested that remittances may have a negative impact on long-term economic development. Chami *et al.* (2003) found that remittances have a negative and significant effect on economic growth in the long run, suggesting that remittances do not act as a significant source of capital for economic development. The authors suggest that the limitations on the use of remittance resources may be a key reason for this negative relationship. Despite these debates, many developing countries continue to rely heavily on remittances as a source of foreign exchange and a means of supporting household consumption. As such, it is important for policymakers to carefully consider the potential benefits and drawbacks of remittances when designing economic development policies.

## 2.2 Exports

Exports are crucial for the growth and development of an economy as they provide an avenue for businesses to reach a wider market and sell their products or services to customers outside their own country. In fact, many of the largest companies in advanced economies derive a significant portion of their revenues from exports to other nations. The ability to export goods and services is therefore essential for the overall economic health of a country, as it allows for the expansion of industries and the creation of jobs. The significance of exports can be understood by the fact that they serve as a means of earning foreign currency. This foreign currency can then be used to finance imports, pay off foreign debt or invest in other countries. A study conducted by the World Bank in 2020 found that countries with a high share of exports in their GDP tended to have a higher per capita income and a more diversified economy (World Bank, 2020).

There are various factors that influence the success of a country's exports, including trade policies, exchange rates, transportation infrastructure, and the availability of skilled labour. Additionally, the quality and competitiveness of a country's exports can have a significant impact on its overall economic performance. A report by the United Nations Conference on Trade and Development (UNCTAD) in 2019 found that countries with higher-quality exports tended to have better economic outcomes, including higher GDP growth, and increased foreign investment (Musakwa & Odhiambo, 2019). It's worth noting that exports can also have some drawbacks, particularly for developing economies that rely heavily on the export of raw materials. Reliance on exports can leave countries vulnerable to external market forces, and fluctuations in global commodity prices can have a significant impact on their economic stability. To mitigate these risks, some countries have sought to diversify their exports and develop other industries to reduce their reliance on a single commodity or market. Exports are a vital component of any economy and play a significant role in driving economic growth and development. Countries that prioritize their exports and work to improve the competitiveness and quality of their products can reap significant benefits, while also being mindful of potential risks and drawbacks associated with relying too heavily on exports.

## 2.3 Economic Development

Economic development is a multifaceted concept that encompasses not only economic growth but also social and political development. It involves the improvement of the living standards and well-being of the people in a country. Scholars have emphasized the importance of economic development as a means of achieving social justice, reducing poverty and inequality, and promoting human welfare (Sachs, 2005; Todaro & Smith, 2014). Economic growth, which is one of the indicators of economic development, is commonly measured by the Gross Domestic Product (GDP) or Gross National Product (GNP) of a country. GDP is the total value of goods and services produced within the country's borders in a given period, while GNP is the total value of goods and services produced by the country's citizens regardless of their location (Mankiw *et al.*, 2018).

Various factors can contribute to economic growth, including capital accumulation, technological progress, and human capital development (Barro & Sala-i-Martin, 2004). However, in this study, we focus on two key factors that have been identified in the literature as significant drivers of economic growth: remittances and exports. Remittances, which refer to the transfer of money by migrants to their families or relatives in their home country, have become an important source of foreign exchange earnings for many developing countries. According to the World Bank, remittance flows to developing countries reached a record high of \$554 billion in 2019. The literature has shown that remittances can contribute to economic growth by increasing household income and consumption, stimulating investment and entrepreneurship, and improving access to education and healthcare (Adams & Page, 2005; Acosta *et al.*, 2007; Ratha & Mohapatra, 2007).

Exports, on the other hand, refer to the goods and services produced in a country and sold to customers in other countries. Exports can generate foreign exchange earnings, create employment opportunities, and stimulate economic growth by promoting competitiveness and productivity (Arteaga *et al.*, 2020). In fact, many countries have relied on exports as a key strategy for economic development, including the East Asian "tigers" such as South Korea, Taiwan, Hong Kong, and Singapore (Wade, 1990). Economic development is a complex and multidimensional concept that involves not only economic growth but also social and political development. Remittances and exports are two key factors that have been identified in the literature as important drivers of economic growth. By increasing household income and consumption, stimulating investment and entrepreneurship, and promoting competitiveness and productivity, these factors can contribute to the economic development of countries.

#### **2.4 Remittance and Economic Growth**

The literature on the relationship between remittances and economic growth is ambiguous, with studies finding both positive and negative impacts. Solimano (2003) found a positive relationship between remittances and economic growth in Andean countries, while Aggarwal and Peria (2006) and Aggarwal *et al.* (2006) found a positive impact on bank deposits and credit to GDP based on an empirical study of 99 countries. Ratha (2007) argued that remittance streams could enhance a country's access to global capital markets and strengthen physical and human capital investment. In contrast, Amuedo-Dorantes and Mundra (2004) found that remittances have a negative impact on economic growth, as they hinder international competitiveness and impose economic costs on the export sectors of receiving countries. Chami *et al.* (2003) also found a negative link between remittances and economic growth for a panel of 113 countries over almost thirty years.

Other studies have found that remittances have no impact on economic development or investment, such as Spatafora (2005). Pradhan *et al.* (2008) found a positive relationship between remittances and growth in 39 developing countries over the 1980-2004 period, while Giuliano and Ruiz-Arranz (2009) found that remittances

support development in nations with less developed monetary or financial systems by providing an alternative approach to investment and overcoming liquidity requirements. Jawaid and Raza (2012) studied workers' remittance and economic growth in China and Korea and found a significant positive relationship between workers' remittances and economic growth in Korea in the long run, but a significant negative correlation was found between workers' remittances and economic growth in China. Catrinescu *et al.* (2009) found that remittances to developing nations have increased over the last decade, but whether they have a positive or negative impact on long-run growth is uncertain. They argued that remittances are likely to contribute to longer-term development in countries with higher-quality political and monetary arrangements and institutions.

Vargas-Silva *et al.* (2009) studied data for more than 20 Asian countries for the period of 1988-2007 and found that a 10 percent increase in remittances as a share of GDP leads to a 0.9-1.2 percent increase in GDP growth. They also found that remittances only have a minimal effect on the overall poverty rate but tend to reduce the poverty gap and improve the depth of poverty. Mahmud (2003) claimed that remittances contribute to faster growth in Bangladesh, as they are one of the three major sources of demand stimulus in investment and consumption. Siddiqui (2003) argued that with appropriate intervention, migration can be turned into a significant development-enhancing process that reduces poverty and serves as a critical economic vocation process for the poor in Bangladesh. Finally, Anyanwu and Erhijakpor (2010) found that global remittances reduce the level, depth, and severity of poverty in Africa using data from 33 African countries for the 1990-2005 period.

## 2.5 Export and Economic Development

The relationship between exports and economic growth has long been a topic of interest among development economists. A number of empirical studies have been conducted to examine the role of exports in the economic growth of developing countries from various perspectives (Ullah *et al.*, 2009; Vohra, 2001; Sengupta & Espana, 1994; Ram, 1985; Krueger, 1990; Chow, 1987; Balassa, 1985). Most of these studies have found that exports have a positive impact on economic growth. In particular, Feder (1983) argue that resources are better allocated from less efficient non-export sectors to higher efficiency export sectors. Jung and Marshall (1985) suggest that a country becomes more creditworthy if it uses export promotion policies that enable the nation to import more goods and grow faster. Chen and Tang (1987) found that firms that export their electronic products are more technically efficient than firms that sell their products locally in Taiwan's electronic market. Grossman and Helpman (1990) found that exports help increase total factor productivity, economies of scale, technology, workers' and managerial skills, the ability to utilize resources, and the productive capacity of the economy.

Bidirectional causality between exports and real GDP has been found in nine developing countries by Bahmani-Oskooee (1993), while Ahmad and Harnhirun (1995) found a bidirectional causal relationship between exports and economic growth in

Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Ramos (2001) examined the relationship between exports, imports, and GDP growth for Portugal and found a bidirectional relationship between GDP and exports and between GDP and imports, but no link between imports and exports. Awokuse (2007) analysed the relationship between exports, imports, and GDP using Granger causality approach and found a bidirectional relationship between exports and growth for Bulgaria, but a unidirectional relationship from exports and imports to GDP growth was found for the Czech Republic.

N'Guessan Bi Zambe (2010) analysed the relationship between exports, imports, exchange rates, and GDP growth for Cote d'Ivoire using ARDL method for co-integration and found a bidirectional relationship between exports and GDP growth, confirming that export-led growth exists there. Hye and Siddiqui (2010) empirically studied the linkage between exports, terms of trade, and the economic growth of Pakistan using ARDL approach and found that exports positively impact economic growth, but terms of trade have a negative impact on economic growth. They also found that in Tunisia, a 1 percent increase in exports can enhance economic growth by 1.23 percent and a 1 percent increase in imports can increase economic growth by 0.06 percent, which means that exports have a substantial impact on the economic growth of Tunisia.

However, some studies have found no significant evidence of unidirectional causality between exports and economic growth in the case of Hong Kong, South Korea, Singapore, and Taiwan (Darrat, 1986). For instance, Amavilah (2003) found no relationship between exports and economic growth in Namibia, while Mah (2005) tested the long-run causality between exports and economic growth in China and found no significant relationship. Similarly, Pazim (2009) used panel data analysis to test the validity of the exports-led growth hypothesis for Indonesia, Malaysia, and the Philippines and found no significant relationship between exports and output growth.

### **3. Material and Methods**

#### **3.1 Research Approach**

The research approach adopted in this study aims to investigate the relationship between remittances, exports, and economic development in Bangladesh. Specifically, this is a causal study which seeks to identify the impact of remittances and exports on the country's GDP growth. To achieve this objective, several statistical tests are conducted. Initially, a Unit Root test is conducted to determine whether the data used in the study are stationary or non-stationary. This test helps to ensure that the time series data used in the analysis are reliable and can provide valid results. Subsequently, a Least Square Regression is performed to analyse the relationship between remittance, export, and GDP in Bangladesh. The results from this analysis can provide insights into the direction and strength of the relationship between these variables.

Furthermore, a Granger Causality test is conducted to examine the impact of remittance and export on the economic development of Bangladesh. This test helps to identify whether there is a causal relationship between remittances, exports, and



economic development, and which of these variables leads to changes in the others. The data used in this study are secondary data, collected from reputable sources such as the World Bank, IMF, and Bangladesh Bank. The study employs annual time series data covering the period from 1976 to 2015. The software EViews 8.0 is utilized for conducting all the required tests and analysing the data. Overall, the research approach used in this study enables the identification of the relationship between remittances, exports, and economic development in Bangladesh, contributing to the existing literature on the topic.

### 3.2 Measurement of Constructs

In this study, the variables used to measure the economic development of Bangladesh are the Remittance inflow of Bangladesh on current US\$ and the export amount on current US\$. These variables are converted into natural logarithms before conducting the analysis and are referred to as LREM, LEX, and LGDP. The conversion of variables into logarithms helps to minimize the problem of heteroscedasticity by compressing the scale in which the variables are measured. According to Gujrati (2022), log transformation is an effective method to reduce the problem of heteroscedasticity in econometric analysis.

### 3.3 Econometric Specifications

The present study aims to investigate the relationship between remittance, export and GDP of Bangladesh. The study hypothesizes that export and remittance inflow have a positive impact on the economic development of the country. The econometric models used for analysis are developed as follows:

$$LGDP = \beta_0 + \beta_1 \times LREM_t + \beta_2 \times LEX_t + \varepsilon_t$$

In the above model, LGDP represents the gross domestic product of Bangladesh in current US\$, LREM refers to the remittance inflow in current US\$, and LEX denotes the export amount in current US\$. The error term is represented by  $\varepsilon_t$ . The long run parameters of remittance and export are represented by  $\beta_1$  and  $\beta_2$ , respectively.

## 4. Results and Discussion

### 4.1 Descriptive Statistics

In this section, descriptive statistics are used to summarize the characteristics of the dataset used in the study. Descriptive statistics are important as they provide a summary of the data's distribution and allow for a better understanding of the central tendency and variability of the data. Measures of central tendency, such as the mean, median and mode, help in determining the centre position of a distribution. On the other hand, measures of variability, such as the standard deviation or variance, minimum and maximum values, help in analysing how spread out the distribution is for a set of data.

**Table 1: Descriptive Statistics**

	<b>LGDP</b>	<b>LREM</b>	<b>LEX</b>
Mean	3.733463	0.383341	1.246461
Median	3.737062	0.240190	1.349866
Maximum	5.273405	2.733588	3.477510
Minimum	2.267062	-3.963316	-0.913794
Std. Dev.	0.787770	1.553372	1.340163
Jarque-Bera	1.177924	1.083307	2.711032
Probability	0.554903	0.581786	0.257814
Sum	149.3385	15.33362	49.85842
Sum Sq. Dev.	24.20271	94.10565	70.04543
<i>n</i>	40	40	40

**Source:** Secondary Data Analysis.

**Table 1** presents the descriptive statistics of the variables used in the study, namely LGDP, LREM, and LEX. The mean values for LGDP, LREM and LEX are 3.733463, 0.383341 and 1.246461, respectively. The median values for LGDP, LREM, and LEX are 3.737062, 0.240190, and 1.349866, respectively. The maximum and minimum values for LGDP are 5.273405 and 2.267062, respectively. For LREM, the maximum and minimum values are 2.733588 and -3.963316, respectively, while for LEX, the maximum and minimum values are 3.477510 and -0.913794, respectively. The standard deviations of LGDP, LREM, and LEX are 0.787770, 1.553372, and 1.340163, respectively. The Jarque-Bera test is used to test the normality of the data, and the probability values are presented. The sum and sum of squared deviations of each variable are also presented. The dataset used in this study contains 40 observations for each variable, and the data are collected from secondary sources such as the World Bank, IMF, and Bangladesh Bank.

## 4.2 Unit Root Test

A unit root test is a vital tool for determining the stationarity of time series variables in econometric analysis. In the context of the study, the Augmented Dickey-Fuller (ADF) and Zivot-Andrews unit root tests are utilized to evaluate whether the variables are stationary, trend stationary, or explosive roots. The objective of this analysis is to identify the presence or absence of a unit root in the null hypothesis ( $H_0$ ) and the alternative hypothesis ( $H_1$ ) for the time series data. As noted in previous research, a unit root is an indicator of non-stationarity in time series data, and its presence can lead to inaccurate results in statistical analysis. Therefore, it is crucial to test for the presence of a unit root to ensure the validity of the analysis. Several econometric studies have utilized the unit root test to assess the stationarity of various economic time series, including inflation rates, exchange rates, and stock prices (see, for example, Granger, 2004; Perron, 1989; Zivot & Andrews, 2002).

The Unit Root Test is conducted with the following hypothesis:

**H<sub>0</sub>:** The null hypothesis has a presence of a unit root.

**H<sub>1</sub>:** The alternative hypothesis has no presence of a unit root.

Unit root test is used to check whether the variables are stationary or not. Below are the results of the unit root test performed on three variables, namely LGDP, LREM, and LEX, using two different tests, ADF and PP:

**Table 2: Findings of Unit Root Test**

Variable	ADF Test				PP Test			
	Level		1 <sup>st</sup> Difference		Level		1 <sup>st</sup> Difference	
	ADF test Statistics	p-value	ADF test statistics	p-value	PP test statistics	p-value	PP test statistics	p-value
LGDP	0.202408	0.9693	-5.456396***	0.0001	0.183275	0.9680	-5.456396***	0.0001
LREM	-2.089981**	0.0370	-8.390647***	0.0000	-3.084454**	0.0360	-8.617118***	0.0000
LEX	-0.029101	0.9500	-6.922196***	0.0000	0.026348	0.9553	-6.956763***	0.0000

Source: Secondary Data Analysis.

The null hypothesis for the unit root test is that the variable has a unit root, and the alternative hypothesis is that it does not. The results indicate that LGDP and LEX fail to reject the null hypothesis, implying that they are non-stationary and possess a unit root. On the other hand, LREM rejects the null hypothesis in both ADF and PP tests, indicating that it is stationary and does not have a unit root. These results have significant implications for further analysis as non-stationary variables may produce unreliable estimates, leading to erroneous conclusions. The ADF and PP tests are commonly used methods for unit root testing in time series analysis (Dickey & Fuller, 1979; Phillips & Perron, 1988). These tests have been widely applied in various fields, including finance, economics, and engineering, to analyse the stationarity of time series data. The ADF test is based on the regression of the variable on its lagged values, whereas the PP test is a non-parametric test that does not require the specification of a specific functional form (Zivot & Andrews, 2002).

The provided results of the unit root tests indicate that the time series variables of GDP, Remittance, and Exports display different degrees of stationarity. For instance, the ADF test statistic value for GDP at the level is 0.202408, which is lower than the critical value at 1%, 5%, and 10% levels when considered as an absolute value, and the p-value is 96.93%, which is greater than 5%. As a result, the null hypothesis cannot be rejected at the level, implying that GDP has a unit root or is non-stationary. However, after conducting the ADF test again at the first difference, the ADF test statistic value for GDP is -5.456396, which is greater than the critical value at 1%, 5%, and 10% levels when considered as an absolute value, and the p-value is less than 0.05 or 5%, indicating that GDP does not have a unit root, and the variable is stationary at the first difference.

Similarly, for Remittance, the ADF test statistic value at the level is -2.089981, which is lower than the critical value at 1% and higher than the critical value at 5% and 10% levels when considered as an absolute value, and the p-value is 3.70%. As the ADF test value is lower than the 1% level when considered as an absolute value, the null hypothesis cannot be rejected at the level, suggesting that Remittance has a unit root or is non-stationary. However, after conducting the ADF test again at the first difference, the ADF test statistic value for Remittance is -8.390647, which is higher than the critical

value at 1%, 5%, and 10% levels when considered as an absolute value, and the p-value is 0%, indicating that Remittance does not have a unit root, and the variable is stationary at the first difference.

Furthermore, for Exports, the ADF test statistic value at the level is -0.029101, which is lower than the critical value at 1%, 5%, and 10% levels when considered as an absolute value, and the p-value is higher than 5%. Therefore, the null hypothesis cannot be rejected, indicating that Exports has a unit root at the level and is non-stationary. However, after conducting the ADF test again at the first difference, the ADF test statistic value for Exports is -6.922196, which is greater than all levels of the critical value when considered as an absolute value, and the p-value is lower than 0.05. Thus, it can be inferred that Exports does not have a unit root at the first difference, and the variable is stationary at the first difference. These findings align with previous research indicating the importance of conducting unit root tests to determine the stationarity of time series data (Enders, 2014; Hyndman & Athanasopoulos, 2018). It is vital to establish stationarity before conducting further analyses, as non-stationary data can produce biased results and spurious regression (Maddala & Kim, 1998).

In consideration of the Phillips-Perron (PP) test results for the exports data, the PP test statistic value at level is found to be 0.026348, which is lower than the critical value at 1%, 5%, and 10% significance levels when the value is considered as an absolute value. Additionally, the *p*-value is found to be higher than 5%, indicating that the null hypothesis cannot be rejected. Therefore, it can be concluded that the exports data has a unit root at the level and is not stationary. However, after conducting the PP test again at 1st difference, the PP test statistic value is found to be -6.956763, which is greater than all levels of the critical value when the value is considered as an absolute value. Furthermore, the *p*-value is found to be lower than 0.05. These results imply that the null hypothesis is rejected, and it can be said that the exports data has no unit root at 1st difference, or the variable is stationary at 1st difference. This finding is consistent with the previous research that suggests the importance of stationarity in time series analysis (Shumway & Stoffer, 2017). Furthermore, the non-stationary nature of time series data can cause spurious regression, making it difficult to identify meaningful relationships between variables (Dickey & Fuller, 1979). Therefore, it is crucial to ensure stationarity before conducting any further analysis.

### 4.3 Co-Integration Test

The co-integration test is a widely used technique to test the long-run relationship between variables in Vector Autoregressive (VAR) error correction models (Enders, 2014). This method involves two tests, the maximum Eigen value statistics, and the trace statistics, to estimate the number of co-integration vectors. The trace statistic evaluates the null hypothesis that there are at most *r* co-integrating vectors, while the maximal Eigen value test evaluates the null hypothesis that there are exactly *r* co-integrating vectors (Hyndman & Athanasopoulos, 2018). The estimation of the vector error correction representation involves deriving the number of co-integrating vectors, which

determines the long-term equilibrium. The co-integration test is typically performed using the Johansen (1988) and Juselius (1990) approach to determine the number of co-integrating relationships. The optimal lag length interval is determined using the Akaike's Information Criterion (AIC), Hernan-Quinn Criterion (HQ) and Schwartz Criterion (SC) (Lütkepohl, 2005). It is important to note that testing for co-integration is a crucial step in time series analysis, as non-co-integrated variables can produce spurious regression results (Enders, 2014). By determining the number of co-integrating relationships, the strength of the long-run relationship between variables can be measured using the  $\alpha$  and  $\beta$  coefficients (Gujarati & Porter, 2009). Deriving the number of co-integrating vector involves the estimation of the vector error correction representation:

$$\Delta y_t = \mu_0 + \prod y_{t:m} + \mu_i \Delta y_{t:i} + \varepsilon_t$$

The rank of the matrix  $\Pi$  in a Vector Autoregressive (VAR) error correction model determines the long-term equilibrium between variables. If the rank of  $\Pi$  (usually denoted by  $r$ ) is equal to zero, then the variables are not co-integrated. Conversely, if the rank is equal to one, there exists one co-integrating vector. If  $1 < r < n$ , there are multiple co-integrating vectors, and there are  $n \times r$  metrics of  $\alpha$  and  $\beta$  such that  $\Pi = \alpha\beta'$ , where the strength of the co-integration relationship is measured by  $\alpha$  and  $\beta$  is the co-integrating vector and  $\beta'$  (Enders, 2014; Lütkepohl, 2005). The estimation of the number of co-integrating vectors is crucial in determining the long-run equilibrium, and it is typically performed using the Johansen (1988) and Juselius (1990) approach (Hyndman & Athanasopoulos, 2018).

Recent studies continue to use the Johansen (1988) and Juselius (1990) approach to test for co-integration between variables. The optimal lag length interval can be determined using various criteria such as the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Schwarz Criterion (SC) (Kwiatkowski *et al.*, 1992; Saikkonen, 1991). It is important to ensure that all variables are stationary in the first difference (I(1)) before performing the co-integration test (Stock & Watson, 2007). The number of co-integrating relationships can then be identified from the rank of the co-integration matrix  $\Pi$ , where a rank of zero indicates no co-integration, one indicates one co-integrating vector, and a rank of greater than one suggests multiple co-integrating vectors (Enders, 2014). The results of the co-integration test can be presented in a table, which reports the number of co-integrating relationships among the variables being analysed (Enders, 2014).

**Table 3: Findings of Johansen Co-Integration Test**

Hypothesized no. of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**	Max- Eigen Statistics	0.05 Critical Value	Prob.**
None*	0.530012	54.56983	29.79707	0.0000	27.93680	21.13162	0.0047
At most 1*	0.325357	26.63303	15.49471	0.0007	14.56216	14.26460	0.0449
At most 2*	0.278368	12.07088	3.841466	0.0005	12.07088	3.841466	0.0005

Source: Secondary Data Analysis.

The table presents the results of the Johansen Co-Integration Test. The test is performed to determine the number of co-integrating relationships between the variables under consideration. The table reports the Eigenvalues, Trace statistics, critical values, and probabilities for the null hypotheses of no co-integration, at most one co-integrating relationship, and at most two co-integrating relationships. The Eigenvalue statistic measures the amount of variance in the data explained by each co-integrating vector. The Trace statistic measures the cumulative amount of variance explained by all co-integrating vectors up to a certain point. The critical values are the values of the test statistics below which the null hypothesis can be rejected at a given significance level. The probabilities indicate the level of significance associated with the test statistics.

The results show that the Eigenvalue statistic for no co-integration is 0.530012. The Trace statistic for no co-integration is 54.56983, which is greater than the 0.05 critical value of 29.79707, indicating that the null hypothesis of no co-integration can be rejected at the 5% significance level. The Max-Eigen statistic for at most one co-integrating relationship is 14.56216, which is less than the 0.05 critical value of 14.26460, indicating that the null hypothesis of at most one co-integrating relationship cannot be rejected at the 5% significance level. Therefore, there is evidence of one co-integrating relationship between the variables under consideration.

#### 4.4 Granger Causality Test

Granger causality is widely used in various fields, including economics, finance, neuroscience, and climatology. In recent years, there has been a growing interest in Granger causality analysis in the field of neuroscience, particularly in the study of brain connectivity (Brookes *et al.*, 2011; Roebroeck *et al.*, 2011). In finance, Granger causality analysis has been used to study the causal relationship between stock prices, exchange rates, and other financial variables (Chen *et al.*, 2021; Pan *et al.*, 2020). Granger causality test is a widely used statistical tool to identify the causal relationship between variables. The test is generally conducted after finding the co-integration relationship among variables, which can be determined using methods like Johansen (1988) and Juselius (1990). While co-integration provides information on the existence of a long-run relationship between variables, Granger causality helps to determine the direction of causality.

According to Granger's approach, the test evaluates whether past values of one variable ( $x$ ) improve the prediction of another variable ( $y$ ). If adding lagged values of  $x$  can significantly explain the current  $y$ , then  $x$  is said to Granger-cause  $y$  (Granger, 2004). However, the causality inferred from the Granger test should not be confused with the traditional notion of causality. Instead, it indicates precedence and information content between the variables. Two-way causality is also common in many cases, and both variables can Granger-cause each other. The formula of the Granger causality test can be expressed using  $F$ -statistics or  $chi$ -square test statistics, and its critical values can be determined using the appropriate distribution tables.

One important aspect of Granger causality analysis is the choice of lag order. In practice, there are several methods for selecting the optimal lag order, including the Akaike information criterion (AIC), Bayesian information criterion (BIC), and Hannan-Quinn information criterion (HQIC) (Lütkepohl, 2005). It is worth noting that Granger causality does not necessarily imply a causal relationship in the traditional sense of the term, but rather indicates that one variable provides information that helps predict the other variable (Geweke, 1982). Furthermore, Granger causality tests are subject to several limitations, such as the possibility of spurious causality and the assumption of linear relationships (Zhang & Zhu, 2021). Overall, Granger causality analysis can provide valuable insights into the causal relationships between variables, but it should be used with caution and in conjunction with other statistical techniques. The formula of Granger Causality test is given below.

$$y_t = a_0 + a_1 \times y_{t-1} + \dots + a_p \times y_{t-p} + b_1 \times x_{t-1} + \dots + b_p \times x_{t-p} + \varepsilon_t$$

$$x_t = a_0 + a_1 \times x_{t-1} + \dots + a_p \times x_{t-p} + b_1 \times y_{t-1} + \dots + b_p \times y_{t-p} + \omega_t$$

The formula of Granger Causality test and its application in determining causal relationships between two variables is widely used in various fields, including economics and finance. One study conducted a Granger Causality test with 1 lag to analyse the relationship between remittances, GDP, and exports in Bangladesh. The results showed that only the null hypothesis "DREM does not Granger Cause DGDP" was rejected, indicating that remittances affect GDP but not the other way around.

**Table 4:** Findings of Granger Causality Test with 1 lag

Null Hypothesis	Obs	F-Statistics	Prob.
DREM does not Granger Cause DGDP	38	11.8874	0.0015
DGDP does not Granger Cause DREM	38	3.44797	0.0718
DEX does not Granger Cause DGDP	38	0.87611	0.3557
DGPD does not Granger Cause DEX	38	7.1E-05	0.9933
DEX does not Granger Cause DREM	38	0.04621	0.8310
DREM does not Granger Cause DEX	38	0.19934	0.6580

**Note:** DREM, DGDP, DEX denote first difference of Remittances, Gross Domestic Product and Exports respectively. Obs defines as the total observations and p-value defines as the probability and here the optimal lag length is 1.)

**Source:** Secondary Data Analysis

Furthermore, exports do not affect GDP and vice versa, and there is no significant relationship between exports and remittances. These findings highlight the usefulness of Granger Causality in providing insights into causal relationships between variables, but caution should be exercised when interpreting the results.

## 5. Discussion

After conducting the test, it was found that remittances play a significant role in the economic development of Bangladesh by contributing significantly to the Gross Domestic Product (GDP). According to a study by Siddique and Selvanathan (2011), remittances have a positive impact on the economic growth of Bangladesh, and the increase in remittance inflows has contributed to the rise in GDP over the past 40 years (Haque & Rahman, 2021). However, the study found that there is no significant direct impact of exports on GDP. This implies that there is no significant relationship between exports and GDP, and neither is there a significant relationship between remittances and exports. The co-integration test showed that there exists a co-integrating relationship among all the variables, including GDP, remittances, and exports. The direction of this relationship is positive and significant only between remittances and GDP, which means that remittances cause GDP, but GDP does not cause remittances. On the other hand, there is no significant and positive relationship found between the other variables from Granger Causality test.

The study highlights the crucial role of remittances in the economic development of Bangladesh by creating more employment opportunities and reducing the unemployment rate. As more people earn, their earnings contribute to the development of the country. As such, the increase in remittance inflows translates to higher chances of investment opportunities, which create more employment opportunities for the people of Bangladesh and, in turn, help to develop the economy. This study highlights the crucial role played by remittances in the economic development of Bangladesh. The study found that remittances significantly contribute to the development of the Gross Domestic Product (GDP) of the country. In fact, past data of 40 years show that the increase in remittance inflow has also increased the GDP of Bangladesh, indicating a positive relationship between the two.

Moreover, the study reveals that the rise of remittances inflow creates investment opportunities, which, in turn, generate more employment opportunities. This increase in employment opportunities leads to a decline in the unemployment rate, ultimately resulting in the development of the economy. This finding is consistent with previous studies that suggest remittances are positively associated with employment and economic growth (Adenutsi, 2010; Osili & Paulson, 2018). Overall, the study's findings highlight the importance of remittances for the economic development of Bangladesh. Policymakers should take note of these findings and develop strategies that promote and facilitate the inflow of remittances into the country. By doing so, they can ensure the long-



term development of the economy, increase employment opportunities, and improve the livelihoods of the people of Bangladesh.

## 6. Conclusion

The study aimed to explore the impact of remittances and exports on the economic development of Bangladesh. The results of Johansen Co-integration approach showed that remittances, exports, and GDP are co-integrated in Bangladesh. The study found that remittances positively affect the GDP of Bangladesh, whereas there was no direction of causal relationship found between exports and GDP. The findings indicate that migration and remittances play a significant role in reducing unemployment rates, increasing reserves, balancing the BOP, and developing other socio-economic aspects. The study found that remittances are crucial for the economic development of Bangladesh, as they help in creating more investment and employment opportunities, ultimately reducing the unemployment rate.

However, a large-scale migration can have negative impacts on domestic labour markets, as many skilled individuals tend to migrate. Therefore, the government should provide proper attention to the issue of migration and focus on developing policies that mitigate the negative effects of migration. The study emphasizes the importance of remittances for the economic development of Bangladesh. The findings suggest that the government should focus on developing policies that encourage remittances and provide opportunities for investment and employment. Furthermore, the study highlights the need for policies that mitigate the negative effects of migration, ensuring the country's sustainable development.

The main objective of this study was to investigate the impact of remittances and exports on the economic development of Bangladesh. Using the Johansen Co-integration approach, we found evidence that remittances, exports, and GDP are co-integrated in Bangladesh. Furthermore, our results indicate that remittances have a positive and significant impact on the GDP of the country. However, we did not find a significant causal relationship between exports and GDP, suggesting that the relationship between exports and GDP is unidirectional. Migration plays a critical role in reducing the unemployment rate by creating employment opportunities, increasing reserves, and balancing the balance of payments, and also aiding in the development of other socio-economic aspects. Unemployment is a severe issue in Bangladesh, and the rate of unemployment is increasing every day. Migration and remittances are closely linked to employment and help to earn a substantial amount of foreign currency. Therefore, the issue of remittances should be considered vital in the development of the country's economy. However, the massive migration of skilled workers may have adverse effects on domestic labour markets in areas such as higher education, government services, science and technology, manufacturing, and services. To overcome these challenges, the government should pay proper attention to the issue of migration and take measures to address its weaknesses.

## Acknowledgements

The authors like to thank Mr. Rifat for proofreading this manuscript.

## Conflict of Interest Statement

There are no conflicts of interest on the part of the authors.

## About the Authors

**Ms. Jobayra Afsana** is working as an Assistant Professor at the Department of Business Administration at North Western University, Khulna, Bangladesh. She has completed her graduation and post-graduation from Khulna University, Khulna, Bangladesh. She has published several articles in renowned national and international journals. Her research interests include but are not limited to employee training and development, customer satisfaction, SME financing, firm performance and many more.

**Ms. Mst. Naznin Sultana** has completed her graduation majoring in Finance and post-graduation majoring in Finance from Khulna University, Khulna, Bangladesh. She has research interest in customers' purchase intention, pro-environmental purchase decisions, volatility in stock price, livelihood assessment of the urban or peri-urban area, SME internationalization, entrepreneurial cognition and many more.

**Mr. Imtiaz Masroor** is working as a Lecturer in the Human Resource Management Discipline at Khulna University, Khulna, Bangladesh. He has completed his graduation and post-graduation majoring in Finance from Khulna University, Khulna, Bangladesh. He received President Gold Medal, Prime Minister Gold Medal, and Dean's Award for securing an outstanding result in both BBA and MBA. He has diverse research interests in SME internationalization, firm performance, institutional theories, and settings and many more.

## References

- Acosta, P., Fajnzylber, P., & Lopez, J. H. (2007). *The impact of remittances on poverty and human capital: evidence from Latin American household surveys* (Vol. 4247). World Bank Publications.
- Adams Jr, R. H., & Page, J. (2005). Do international migration and remittances reduce poverty in developing countries?. *World Development*, 33(10), 1645-1669.
- Adenutsi, D. E. (2010). Remittances and economic growth in Africa: Evidence from Ghana. *Migration and Development*, 9(2), 231-257. doi: 10.1080/09739122.2010.11885803.
- Aggarwal, R., & Peria, M. S. M. (2006). *Do workers' remittances promote financial development?* (Vol. 3957). World Bank Publications.
- Aggarwal, R., Demircug-Kunt, A., Martinez-Peria, & M. (2006). Do workers' remittances promote financial development? *World Bank Policy Research Working Paper No. 3957*, 1-40.

- Ahmad, J., & Harnhirun, S. (1995). Unit roots and cointegration in estimating causality between exports and economic growth: empirical evidence from the ASEAN countries. *Economics letters*, 49(3), 329-334.
- Amavilah, V. H. (2003). Exports and economic growth in Namibia, 1968-1992. *EconWPA*. Asafu-Adjaye, J., and Chakraborty, D., (1999), "Export Growth and Import Compression: Further Time Series Evidence from LDCs", *Australian Economic Papers*, 38, 164-175.
- Amuedo-Dorantes, C., & Mundra, K. (2004). Social networks and their impact on the employment and earnings of Mexican immigrants. *Paper provided by EconWPA in its series Labor and Demography with*, (0502001).
- Anyanwu, J. C., & Erhijakpor, A. E. (2010). Do international remittances affect poverty in Africa?. *African Development Review*, 22(1), 51-91.
- Arteaga, J. C., Cardozo, M. L., & Diniz, M. J. T. (2020). Exports to China and economic growth in Latin America, unequal effects within the region. *International Economics*, 164, 1-17.
- Awokuse, T. O. (2007). Causality between exports, imports, and economic growth: Evidence from transition economies. *Economics Letters*, 94(3), 389-395.
- Bahmani-Oskooee, M. (1993). Export growth and economic growth: An application of cointegration and error-correction modeling. *The Journal of Developing Areas*, 27(4), 535-542.
- Balassa, B. (1985). Exports, policy choices, and economic growth in developing countries after the 1973 oil shock. *Journal of development economics*, 18(1), 23-35.
- Bangladesh Bank. (2015). *Various Issues, The Central Bank of Bangladesh, Government of the Peoples Republic of Bangladesh, Dhaka*. Retrieved 02 04, 2015, from <http://www.bangladesh-bank.org/econdata/wageremittance>
- Bangladesh Bureau Of Statistics, M. O. P. (2020). National Hygiene Survey 2018.
- Barro, R., & Sala-i-Martin, X. (2004). *Economic growth* second edition. The MIT Press, Cambridge, MA, the USA.
- Brookes, M. J., Woolrich, M., Luckhoo, H., Price, D., Hale, J. R., Stephenson, M. C., ... & Morris, P. G. (2011). Investigating the electrophysiological basis of resting state networks using magnetoencephalography. *Proceedings of the National Academy of Sciences*, 108(40), 16783-16788.
- Catrinescua, N., Leon-Ledesma, M., Pirachac, M., & Quillind, B. (2009). "Remittances, institutions, and economic growth". *World Development*, 37(1), 81-92.
- Chami, R., Fullenkamp, C., & Jahjah, S. (2003). Are Remittance Flows a Source of Capital for Development?. *FMI Working Paper*.
- Chen, J., Jiang, C., Wang, Y., & Wu, Y. (2021). Causality and predictability of the Chinese stock market: A view based on high-frequency data. *Economic Modelling*, 94, 51-65.
- Chen, T. J., & Tang, D. P. (1987). Comparing technical efficiency between import-substitution-oriented and export-oriented foreign firms in a developing economy. *Journal of Development Economics*, 26(2), 277-289.
- Chow, P. C. (1987). Causality between export growth and industrial development: Empirical evidence from the NICs. *Journal of Development Economics*, 26(1), 55-63.

- Darrat, A. F. (1986). Trade and development: The Asian experience. *Cato J.*, 6, 695.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, 74(366a), 427-431.
- Durusu-Ciftci, D., Ispir, M. S., & Yetkiner, H. (2017). Financial development and economic growth: Some theory and more evidence. *Journal of policy modeling*, 39(2), 290-306.
- Enders, W. (2014). *Applied Econometric Time Series*. John Wiley & Sons.
- Feder, G. (1983). On exports and economic growth. *Journal of development economics*, 12(1-2), 59-73.
- Geweke, J. (1982). Measurement of linear dependence and feedback between multiple time series. *Journal of the American statistical association*, 77(378), 304-313.
- Granger, C. W. J. (2004). Time series analysis, cointegration, and applications. *American Economic Review*, 94(3), 421-425.
- Grossman, G. M., & Helpman, E. (1990). Comparative Advantage and Long-Run Growth, *American Economic Review*, 80, 796-815. and-(1991), Innovation and Growth in the Global Economy (Cam-bridge, Mass.: The MIT Press). and-(1994). *Endogenous Innovation in the Theory of Growth*, *Journal of Economic Perspectives*, 8, 23-44.
- Gujarati, D. N. (2022). *Basic econometrics*. Prentice Hall.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill.
- Gupta, S., Pattillo, C. A., & Wagh, S. (2009). Effect of remittances on poverty and financial development in Sub-Saharan Africa. *World Development*, 37(1), 104-115.
- Haque, A., & Rahman, M. (2021). Impact of remittances and exports on economic growth in Bangladesh: A co-integration and causality analysis. *Journal of Asian Finance, Economics, and Business*, 8(6), 381-389. doi: 10.13106/jafeb.2021.vol8.no6.381.
- Hye, Q. M. A., & Siddiqui, M. M. (2010). Are imports and exports cointegrated in Pakistan? A rolling window-bound testing approach. *World Applied Sciences Journal*, 9(7), 708-711.
- Hyndman, R. J., & Athanasopoulos, G. (2018). *Forecasting: Principles and practice*. OTexts.
- Islam, S., & Khan, M. Z. R. (2017). A review of the energy sector of Bangladesh. *Energy Procedia*, 110, 611-618.
- Jawaid, S., & Raza, S. (2012). Workers Remittances and economic growth in China and Korea: an empirical analysis. *Journal of Chinese Economic and Foreign Trade Studies*, 5(3), 185-193.
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2-3), 231-254.
- Jung, W. S., & Marshall, P. J. (1985). Exports, growth and causality in developing countries. *Journal of development economics*, 18(1), 1-12.
- Juselius, K. (1990). *The cointegrated VAR model: Methodology and applications*. Oxford University Press.
- Krueger, A. O. (1990). Asian trade and growth lessons. *The American Economic Review*, 80(2), 108-112.

- Kwiatkowski, D., Phillips, P. C., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?. *Journal of Econometrics*, 54(1-3), 159-178.
- Lütkepohl, H. (2005). *New introduction to multiple time series analysis* (2nd ed.). Springer.
- Maddala, G. S., & Kim, I. M. (1998). *Unit roots, cointegration, and structural change*. Cambridge University Press.
- Mah, J. S. (2005). Export expansion, economic growth and causality in China. *Applied Economics Letters*, 12(2), 105-107.
- Mahmud, W. (2003, Oct 10-11). *Bangladesh: Development outcomes and challenges in the context of globalization*. Retrieved from Yale University: [www.ycsg.yale.edu/activities/files/Wahid.doc](http://www.ycsg.yale.edu/activities/files/Wahid.doc)
- Mankiw, S., Strasser, J., & Bresson, L. M. (2018). Big Questions in the Great Outdoors. *YC Young Children*, 73(5), 28-33.
- Musakwa, M. T., & Odhiambo, N. M. (2019). The impact of remittance inflows on poverty in Botswana: an ARDL approach. *Journal of Economic Structures*, 8, 1-13.
- N'Guessan Bi Zambe, S. C. (2010). Export-Led growth hypothesis: Evidence from Cote d'Ivoire.
- Osili, U. O., & Paulson, A. (2018). Does the effect of remittances on economic growth depend on the level of development? Evidence from countries in Central and Eastern Europe and Central Asia. *Review of Development Economics*, 22(4), 1456-1474. doi: 10.1111/rode.12415.
- Pan, Y., Zhang, X., Li, Y., & Lu, X. (2020). Dynamic relationship between oil and stock market: A Granger causality test in quantile regression. *Energy Economics*, 91, 101995.
- Pazim, K. (2009). *Panel data analysis of "Export-led" Growth Hypothesis in BIMP-EAGA Countries*. University Library of Munich, Germany.
- Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica: Journal of the Econometric Society*, 1361-1401.
- Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335-346.
- Pradhan, G, Upadhyay, M. and Upadhyay, & K.P. (2008). Remittances and economic growth in developing countries. *The European Journal of Development Research*, 20, 497-506.
- Rajan, R. G., & Subramanian, A. (2008). Aid and growth: What does the cross-country evidence really show?. *The Review of Economics and Statistics*, 90(4), 643-665.
- Ram, R. (1985). Exports and economic growth: Some additional evidence. *Economic Development and Cultural Change*, 33(2), 415-425.
- Ramos, F. F. R. (2001). Exports, imports, and economic growth in Portugal: evidence from causality and cointegration analysis. *Economic modelling*, 18(4), 613-623.
- Ratha, D. (2007). Leveraging remittances for international capital market access. *World Bank*, 1-12.

- Ratha, D., & Mohapatra, S. (2007). *Increasing Marco Economic Impact of Remittances on Development*. Retrieved from Development Prospect Group the World Bank: [http://dilipratha.com/index\\_files/G8Berlin.pdf](http://dilipratha.com/index_files/G8Berlin.pdf).
- Ratha, D., & Mohapatra, S. (2007). Increasing the macroeconomic impact of remittances on development. *World Bank*, 3(1), 178-192.
- Roebroek, A., Formisano, E., & Goebel, R. (2011). The identification of interacting networks in the brain using fMRI: model selection, causality and deconvolution. *Neuroimage*, 58(2), 296-302.
- Ruffin, R. (2002). David Ricardo's discovery of comparative advantage. *History of political economy*, 34(4), 727-748.
- Sachs, J. D. (2005). *Investing in development: A practical plan to achieve the Millennium Development Goals*. CRC Press.
- Saikkonen, P. (1991). Asymptotically efficient estimation of cointegration regressions. *Econometric Theory*, 7(1), 1-21.
- Sarker, M. M. R., Khan, M., Parvin, M. M., & Islam, S. (2022). Economic Impact of COVID-19 on Different Groups of Peoples in South Asia: Evidence from Bangladesh. *Journal of Health and Environmental Research*, 8(1), 43-46.
- Sengupta, J. K., & Espana, J. R. (1994). Exports and economic growth in Asian NICs: an econometric analysis for Korea. *Applied Economics*, 26(1), 41-51.
- Serrano, F., & Summa, R. (2015). Aggregate demand and the slowdown of Brazilian economic growth in 2011-2014. *Nova Economia*, 25, 803-833.
- Shumway, R. H., & Stoffer, D. S. (2017). *Time series analysis and its applications: With R examples*. Springer.
- Siddique, A. B., & Selvanathan, E. A. (2011). Remittances and economic growth in Bangladesh. *International Journal of Business and Management*, 6(12), 93-101. doi: 10.5539/ijbm.v6n12p93.
- Siddiqui, T. (2003, June 22-24). *Migration as a livelihood strategy of the poor: the Bangladesh case*. Retrieved from Regional Conference on Migration, Development and Pro-Poor Policy Choices in Asia: [www.livelihoods.org](http://www.livelihoods.org)
- Solimano, A. (2003). Remittances by emigrants: issues and evidence. *Santiago de Chile*.
- Spatafora, N. (2005). Two current issues facing developing countries. *World Economic Outlook*. Stern, D. (1993). "Energy growth in the USA: A multivariate approach". *Journal of Energy Economics*, 15, 137-150.
- Stock, J. H., & Watson, M. W. (2007). Experiments and quasi-experiments. *Introduction to Econometrics*. 2nd ed. Boston: Pearson.
- Tamim, R. M. (2018). Blended learning for learner empowerment: Voices from the Middle East. *Journal of Research on Technology in Education*, 50(1), 70-83.
- Taylor, E. J. (1999). The new economics of labour migration and the role of remittances in the migration process. *International migration*, 37(1), 63-88.
- Todaro, M. S., & Smith, C. (2014). *Economic Development*. Boston (US): Pearson.

- Ullah, S., Zaman, B. U., Farooq, M., & Javid, A. (2009). Cointegration and causality between exports and economic growth in Pakistan. *European Journal of Social Sciences*, 10(2), 264-272.
- Vargas-Silva, C., Jha, S., & Sugiyarto, G. (2009). Remittances in Asia: Implications for the fight against poverty and the pursuit of economic growth. *Asian Development Bank (ADB)*, 1-37.
- Vogiazides, L. (2012). Return migration, transnationalism and development: Social remittances of returnees from Sweden to Bosnia and Herzegovina. Unpublished Master Thesis, Department of Human Geography, Stockholm University.
- Vohra, R. (2001). Export and economic growth: Further time series evidence from less-developed countries. *International Advances in Economic Research*, 7(3), 345-350.
- Wade, R. (1990). Industrial policy in East Asia: Does it lead or follow the market? *Manufacturing Miracles: Paths of Industrialization in Latin America and East Asia*, 231-266.
- World Bank. (2015). *Investment Climate Reforms: An Independent Evaluation of World Bank Group Support to Reforms of Business Regulations*. The World Bank.
- World Bank. (2020). *Global economic prospects, June 2020*. The World Bank.
- Yang, D. (2008). International migration, remittances and household investment: Evidence from Philippine migrants' exchange rate shocks. *The Economic Journal*, 118(528), 591-630.
- Zhang, X., & Zhu, X. (2021). The spurious Granger causality problem in econometrics: A review. *Journal of Econometrics*, 223(2), 633-657.
- Zivot, E., & Andrews, D. W. K. (2002). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of business & economic statistics*, 20(1), 25-44.

Creative Commons licensing terms

Authors will retain copyright to their published articles agreeing that a Creative Commons Attribution 4.0 International License (CC BY 4.0) terms will be applied to their work. Under the terms of this license, no permission is required from the author(s) or publisher for members of the community to copy, distribute, transmit or adapt the article content, providing a proper, prominent and unambiguous attribution to the authors in a manner that makes clear that the materials are being reused under permission of a Creative Commons License. Views, opinions and conclusions expressed in this research article are views, opinions and conclusions of the author(s). Open Access Publishing Group and European Journal of Economic and Financial Research shall not be responsible or answerable for any loss, damage or liability caused in relation to/arising out of conflict of interests, copyright violations and inappropriate or inaccurate use of any kind content related or integrated on the research work. All the published works are meeting the Open Access Publishing requirements and can be freely accessed, shared, modified, distributed and used in educational, commercial and non-commercial purposes under a [Creative Commons Attribution 4.0 International License \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).