NEXUS OF ECONOMIC GROWTH AND WORKER REMITTANCES; IN CASE OF SRI LANKA

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Abstract: **Remittances are considered as one of the important sources of the foreign currency earnings in a country as it has significant importance in terms of minimizing the issues related to the Balance of Payment (BOP) thereby improving the external position of a country.**

This study examines the impact of remittances on the economic growth in Sri Lanka by employing the annual data from the period 1975 to 2021. The study was motivated by the conflicts stimulated from the literature on remittances role in GDP in other countries. With the current financial situation in Sri Lanka, identifying the impact of remittances and provide a considerable perception to policy makers to reinforce adapt policies and regulations to entice remittances inwards.

The analysis mainly based on the multivariate regression analysis and the cointegrated test is carried out to determine whether the variables have long run relationship. The test results confirmed that the variables have a long run relationship. Therefore, the Vector Error Correction ($\mathcal{E}_{t-1}$) is added to the short-run model and coefficient value of the error term is estimated to determine the speed of adjustment towards the long run equilibrium. The empirical analysis is mainly based on the estimating long -run model for the log variables and the short-run model with error correction term. The estimated results suggest that in the short run and long run remittances have a significant effect on countries' GDP. Accordingly, effects of, Government Expenditure, Exchange rate and Household expenditure are also verified by the regression and the derived model.

In the long run, a 1% increase in remittances can make 1.02% increase in GDP whereas government expenditure and household consumption also affect GDP growth positively. Nevertheless, the exchange rate has a negative impact on GDP.

As per the derived shot run model, 1% increase in remittances can cause 0.17% growth in GDP whereas household consumption also affect positively. However, increase in exchange rate and government expenditure may cause negative effects on GDP growth.

Keywords: **Economic Growth, Worker Remittances, GDP growth.**

1. INTRODUCTION

1.1 Background

The importance of remittances on economic growth has been increasing in Sri Lanka due to the twin crisis known as Balance of Payment (BOP) crisis and Foreign Exchange crisis. The ongoing worse economic crisis in country further worsening the lack of foreign currency. Since the country mainly depends on the worker remittances, any negative impact on receipts of worker remittances has a significant impact of financing the trade deficit of the country. The recent Covid-19 pandemic also had many numerous impacts on worker remittances and therefore the economy confronted further vulnerable situation.

Being highly dependent economy on external debt, these foreign exchange receipts are immensely important for repayment of loans, stability of the domestic currency as well. Further, remittances have positive impact on development as well as poverty reduction (Maheswaranathan, 2019)

Increased quality and quantity of goods and services that people consume in a country is expected from economic growth of the country. As the economy grow, quality of life in aspect of access to quality food & water, education, health services & medicine, entertainment, happiness other basic needs which cannot be measured in monetary terms, are intended to grow.

To take quantifiable measures on country's economic growth, 'Real Gross Domestic Product ' is the commonly used method by economists worldwide. GDP is the most comprehensive measure of global economic performance which measures total market value of goods and services produced domestically in given period (Federal Reserve Bank of San Francisco, 1999). GDP measures the monetary value of consumed goods and services which are produced within the borders of the country in each time frame (IMF, 2020).

Remittances are recognized as one of the United Nations sustainable Goals (SDG) and the lifeline of many economies. Remittances can be defined as monetary transfers by workers living in other countries to their families in their home country. In 2021, increase In remittances by 7.3 % in low-middle income countries as given a robust return to economic growth despite of economic shocks caused by covid pandemic and boarders closure. (World Bank, 2021).

Remittances can be directly used by foreign worker's family to consume food, health services, education, and other essential consumptions. It is apparently helpful for struggling families in developing countries to get access to their basic needs. Remittances supports to mitigate poverty in micro level, and by investing in social welfare projects and foreign direct investments (FDI) to improve quality of life and as navigator to economic growth in macro level. It is observed in long run remittances have favorably affected in Economic growth in many countries. In contrast to foreign loan or any kind of foreign financial aid, receiver of remittances are not obligated to pay back with interest and also, since it is directly received by actual beneficiary, any intermediary obstacles are least interfered. The study conducted with data of 80 developing countries to examine the long run relationship with remittances and real GDP has an encouraging finding. It could prove that 10% increase in remittances and result 0.66% permanent growth in real GDP. Even though the amount is comparatively low when compared to foreign financial aids , it is less detrimental to economic growth (John NanaFrancoisa, 2022).

1.2 Objective:

Currently Sri Lanka is in financially uncertain stage where country's economy is highly vulnerable to external shocks. In that case immediate policy measures to be taken to address reduce fiscal deficit and debt obligations, to reestablish external stability and to alleviate negative impact on people. (World Bank, 2022) in that case policy makers must look for viable options to reinstate debt sustainability.

Due to Covid pandemic and border closure, Sri Lanka's some of the main sources namely exports, and tourism sector has plunged downwards. According to world bank Sri Lanka also having twin deficit over decades. That is fiscal deficit and deficit on current account of balance of payments. (World Bank, 2022) . in that case other than traditional sources of income Sri Lanka needs to encourage more practical sources of income immediately. Objective of this study is to examine the importance of remittance in rehabilitation and sustainable growth in economy and to suggest necessary policy measures to encourage remittances as a feasible option towards prospers of the country.

2. LITERATURE REVIEW

In this section experimental and recent study on relationship between GDP and Remittances are reviewed systematically. Many economists consider remittances has Immerging importance to developing countries. so increased number of literatures to analyses flow of remittances and its effect to countries' economical activities can be found. The focus on existing literature is ranging from poverty reduction (Ratha, D, 2011)to institutional development.

No adequate literature can be found on between remittances and GDP in Sri Lanka context. a study done in 37 African countries it is found that remittances helped to boost economic growth backed by alternative solutions for finance investments and liquidity despite of less developed financial systems in those countries. (Fayissa & Nsiah, 2010) . Findings of to the study done for Korea, positive long run relationship between remittances and economic growth is proved while Findings of China shows adverse relationship to same variable. In that case Korea is suggested to imply more friendly regulations to attract more remittances while China is cautioned against low labour force participance locally causing less productivity in the country . (Jawaid & Raza, 2012) . it seems to be remittances are more important variable. Because in the study (Kandil & Mirzaie, 2008) real GDP growth is not identified with FDI inflows except Jordan. But remittance inflow invigorate output growth in Jordan and price inflation is decreased in Egypt and Tunisia.

Most of the literature are concentrated on remittances, their investment options, and the long-term gain. Nevertheless, remittances are basically involved in direct consumption. In general remittances supports countries economic growth and people's welfare. it Is observed in many countries unofficial money transfers have become attractive with their low cost compared to official method. But the remitted funds transferred via unofficial way may not contribute to country's economy and social wellbeing in a direct manner.in that case remittance via official methods should be encouraged to get the maximum use of remittances. Currently India and Pakistan pay comparably higher interest rates and income tax is alleviated for remitters who use official methods. (Rao & Hassan, 2011). However, according to their findings increased remittances showed no economic growth but only responded to FDI and

It is observed that remittances directly help to alleviate poverty by increased level of recipient's income and living standards (R.Adams, 2005).in some literature some has identified negative relationship of remittances. 1st fact is that , since recipients can get more income than they work in local context, where they do not want to participate in country's labor force ,consequently as due to the shortage of skill workers, country make seek foreign expertise where their funds outflows as wage to foreign workers. (Ratha, D, 2011). This was further confirmed by the study (Samir Jahjah, 2003) which cross-country's economics growth can have adverse impact by diminishing work force, consequently another study (Giuliano & Ruiz-Arranz, 2009) suggest that this moral hazard only applicable when country's financial development is low. Findings of the study to understand the level of impact of economic growth backed by remittances shows that there is no relationship between remittances and growth in developing countries (Feeny, Iamsiraroj, & McGillivray, 2014). In contrast study based on Asian region with data of more than 20 countries indicated that remittances positively affected home country GDP per capita. As for the statistics 10% increase in remittances caused 0.9-1.2% and alleviate poverty gap by 0.7-14%. (Vargas-Silva, Jha, & Sugiyarto, 2009) furthermore a study conducted for Pakistan stated that remittances not only facilitated economic growth but also improvement of social and economic conditions of beneficiary country. (Qayyum, Javid, & Arif, 2008)

3.   METHODOLOGY

This analysis is mainly based on secondary data. Annual data from the period 1975 to 2021 is extracted from the world bank for the purpose of this analysis.

With the pandemic situation and loss of jobs of Sri Lankans who worked overseas has affected the remittances inflow adversely. And currently Sri Lanka is experiencing economic catastrophe. This study expects to find out the relationship between remittances and Economic growth. Sri Lanka needs to focus on to increase inflow to plan to overcome the current financial situation. The main purpose of this study is to analyses the impact of remittances on economic growth in Sri Lanka. For this analysis, five main variables including Gross Domestic Product (GDP), Worker Remittances (R), Government Expenditure (GE), Exchange Rate (ER) Household Expenditure (CE) are selected as the most significant variables to the model as explained in the below.

- *Gross Domestic Product (Y)*

Gross Domestic Product is monetary value of final goods and services produced and sold by a specific country within a given time frame. Its is commonly know that low income has a strong relationship with remittances an GDP . So it is assumed that the effects of remittances can be directly observed by variable GDP.

- *Worker Remittances(R)-*foreign workers sending money or goods to their families who are living in their home country for their financial and social wellbeing.

- **Government expenditure- (GE)**

This refers to the money spent by the public sector to acquire goods and services related to countries health, education, transport, security, and other social wellbeing factors. It can be expected that the government can spend on enhancing social wellbeing facilities if the country experiences healthy remittance inflow.

- *Exchange Rate (ER)*

The rate one currency would sold/bought against another currency is change rate. In this study it is considered LKR value against USD. Exchange rate can be affected from not only remittances but also with inflation, interest rates, political stability, balance of trade and other external factors. External economic shocks affects the real exchange rate and impact of Exchange rate to the remittances are to be measured.

- **Household Expenditure- (CE)**

This implies the expenditure done by tenant household on individual consumption of goods and services including durable products like vehicles, electronic appliances, and furniture. Household consumption can be expected to grow as they receive remittances from their family members, hence their purchasing power increases.

Less consumption slows down the economy. Higher taxes and interest rates, wealth and demographic factors can cause downturn trend. consequently, higher consumption can cause growth in economy.

When only GDP and Remittances are considered to identify the normal pattern as in figure 1, linear trend is identified. so, it can assume that using linear regression model to be considered.
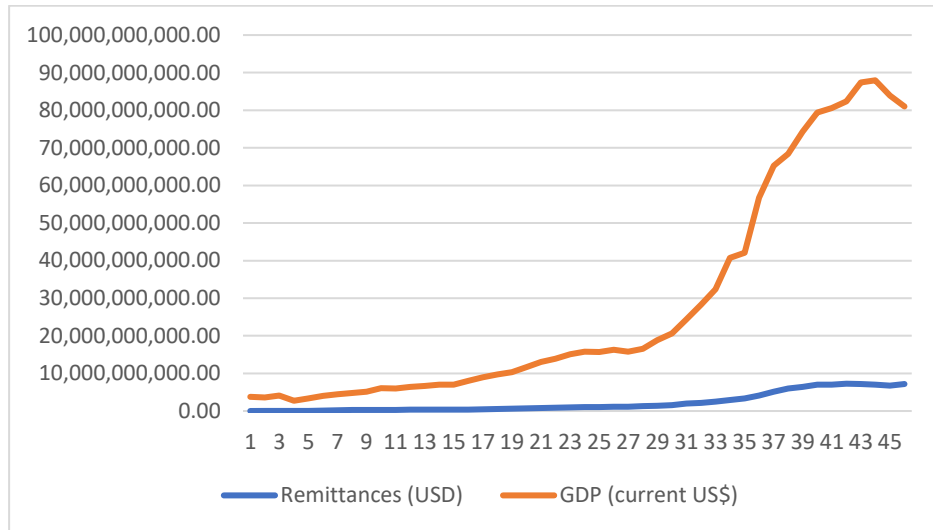

Figure 1 -Remittances vs GDP

According to the above variables and the economic relationship among the variables, the model specification is as follows,

<u>Model specification:</u>

$$GDP = \beta0 + \beta_1 R + \beta_2 GE + \beta_3 ER + \beta_4 CE$$

4. ANALYTICAL FRAMEWORK.

Main purpose of this study is to identify and analyze the relationship between the remittances and GDP, and other factors affecting the GDP. In the literature, impact of remittances on GDP has been analysed using the various models such as Vector Auto Regression (VAR), Structural VAR, Vector Error Correction Model (VECM) and Ordinary Least Square (OLS) Regression Analisis. However, it is noted that, many studies have used OLS to analyse the relationship between GDP growth and remittances and other macro-economic variables .Most of the empirical studies considered here claim that long run and short run equation could be derived with OLS. many studies to estimate the relationship between remittances and economic growth (Ramirez & Sharma, 2008), (Mokoswa, 2016), (ArefAssaf, 2015), (Shahzad, Ali, Rehman, & Abbasi, 2014) have adopted OLS. Ramirez & Sharma have used panel unit root and cointegration test and a fully modified OLS. Similarly, Shahzad used panal unit root test tocheck the stionarity of the variables, confirmed conintegtration with Pedroni,1999 test and long run coefficients have been estimated Fully modified OLS and Dynamic Ordinary Least square models. With emprical studies ,this study is conducted with used of OLS approach to provide the evidences -based analysis on effect of remitannces and other macroeconomic variables in Sri Lanka context

For this study, four main steps were carried out to form the model of the study. Firstly, testing for stationarity of data is done. Since the selected variables are not stationary at I(0),and they all are stationery at I(1), it is suspect the variables are cointegrated to each other implying that there is a long run relationship among the variables. Testing of cointegration made to check the existence of dependency / relationship in long run with other variables to determine the model to be used for long run. Since a cointegration is detected, VECM (Vector Error Correlation Model) is selected for the time series, to check whether the GDP is affected by considered variables in short run. As the fourth step, diagnostic test results were conducted to estimate the robustness of the derived model.

Therefore, the regression analysis is performed for long run as well as short run period. For the short run model error correction is added to identify the speed of adjustment towards the long run equilibrium. Finally, model diagnosis tests are carried out to confirm the validity of selected multivariate regression model.

Performing Unit – Root test to check the stationary status of the variables.

The widely used test to check the stationary is Augmented Dickey Fuller (ADF) . Giving the T- Statistics and P-values in table 1, the null-hypothesis can be rejected: each variable (Y , R ,GE,CE and ER) has unit root, and they stationary at first difference.

Standard Unit root test results using Schwarz info criteria for each variable are shown in table 1 & Table 2.

- **Variable GDP (Y)**

Considered Hypothesis are

$H_0 = Y$ has a unit root

$H_1 = Y$ has no unit root

According to the table 1, P value=0.1187 which is greater than α value (0.05) Null hypothesis cannot be rejected. Thus, Y is not stationary at I (0)

As per the test results shown in table 2, which was conducted by taking the logarithm differences, P value=0.0089 <α value=0.005. Null Hypothesis can be rejected. Y is Stationery at I (1).

- **Variable Remittances (R)**

Considered Hypothesis are

$H_0 = R$ has a unit root

$H_1 = R$ has no unit root

According to the table 1, the P value=1.0000 which is greater than α value (0.05) Null hypothesis cannot be rejected. Thus, Y is not stationary at I (0)

As per the test results shown in table 2, which was conducted by taking the logarithm differences, P value=0.0385 <α value=0.005. Null Hypothesis can be rejected. Y is Stationery at I (1).

- **Variable Government Expenditure (GE)**

Considered Hypothesis are

$H_0 = GE$ has a unit root

$H_1 = GE$ has no unit root

According to the table 1, P value=0.9854 which is greater than α value (0.05) Null hypothesis cannot be rejected. Thus, Y is not stationary at I (0)

As per the test results shown in table 2, which was conducted by taking the logarithm differences, P value=0.0000 <α value=0.005. Null Hypothesis can be rejected. Y is Stationery at I (1).

- **Variable Remittances Household Consumption Expenditure (CE)**

Considered Hypothesis are

$H_0 = CE$ has a unit root

$H_1 = CE$ has no unit root

According to the table 1, the P value=1.0000 which is greater than α value (0.05) Null hypothesis cannot be rejected. Thus, Y is not stationary at I (0)

As per the test results shown in table 2, which was conducted by taking the logarithm differences, P value=0.0000 <α value=0.005. Null Hypothesis can be rejected. Y is Stationery at I (1).

- **Variable Exchange Rate (ER)**

Considered Hypothesis are

$H_0 = ER$ has a unit root

$H_1 = ER$ has no unit root

According to the table 1, the P value=1.0000 which is greater than α value (0.05) Null hypothesis cannot be rejected. Thus, Y is not stationary at I (0)

As per the test results shown in table 2, which was conducted by taking the logarithm differences, P value=0.0000 <α value=0.005. Null Hypothesis can be rejected. Y is Stationery at I (1).

A summary of P values is illustrated in Table 01.

Stationarity at I (0)

Table 1-Unit root test results-I (0)

Variable	Code	T-statistics	P-value	Stationary
Gross Domestic Product	Y	-2.517018	0.1187	Not stationary
Remittances	R	4.443050	1.0000	Not stationary
Government Expenditure	GE	0.512233	0.9854	Not stationary
Household Consumption	CE	3.030679	1.0000	Not stationary
Exchange Rate	ER	2.940511	1.0000	Not stationary

Stationarity at I (1)

Table 2-Unit root test results – I (1)

Variable	Code	T-statistics	P-value	Stationary
Gross Domestic Product	DLY	-3.6349	0.0089	I (1)
Remittances	DLR	-3.0442	0.0385	I (1)
Government Expenditure	DLGE	-6.9137	0.0000	I (1)
Household Consumption	DLCE	-6.5618	0.000	I (1)
Exchange Rate	DLER	-7.2069	0.0000	I (1)

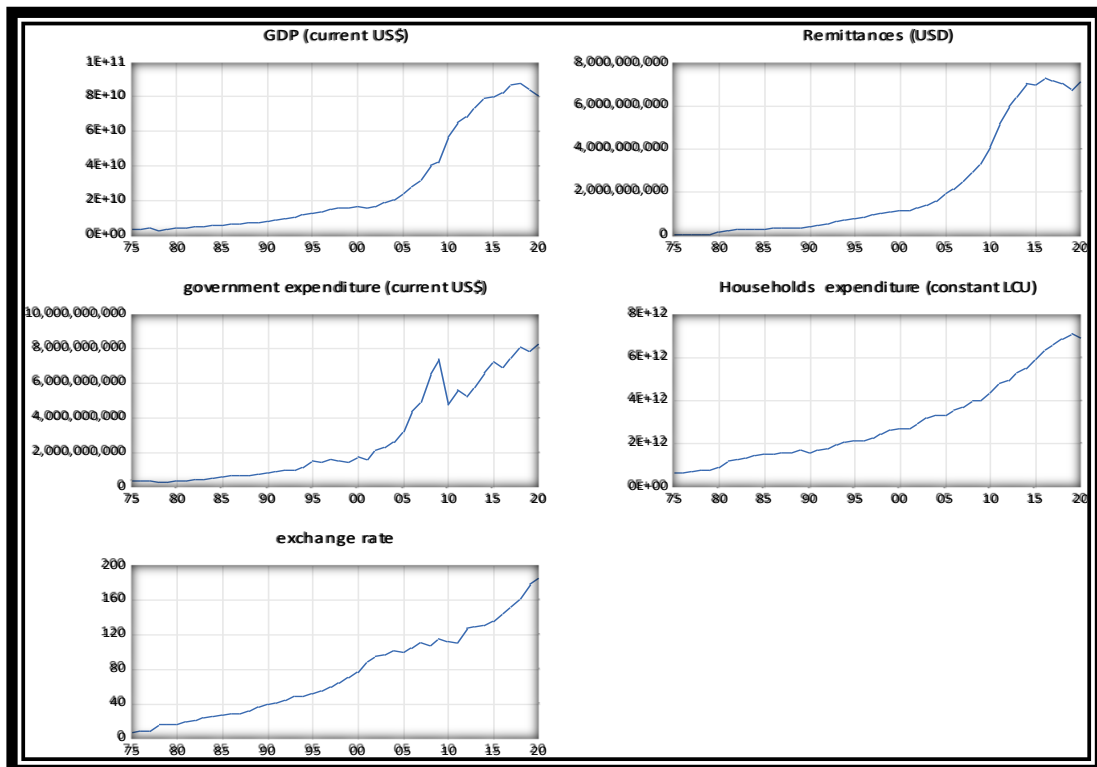Stationarity of data is shown graphically in figure 7 .

Figure 2-Non-Stationary graph

According to figure 2, it is depicted that none of the variables are stationary at I(0).
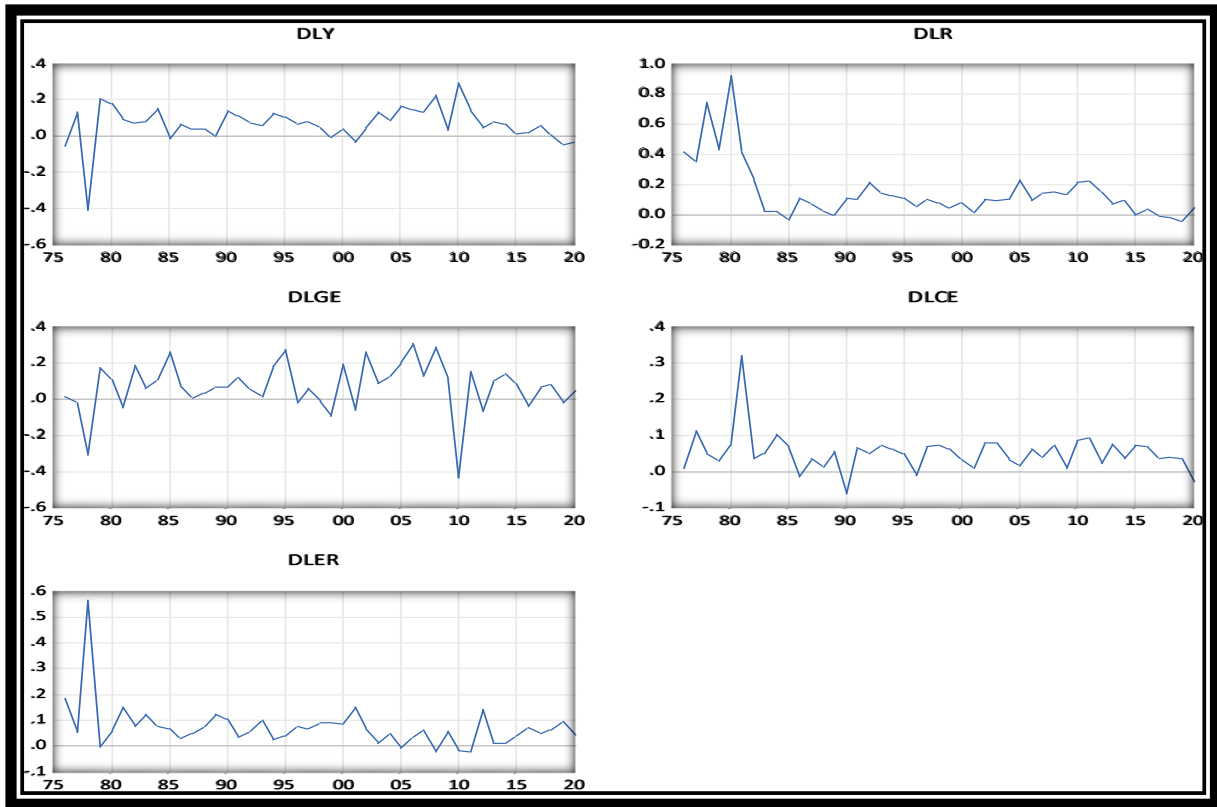
Figure 3-Stationarity of variables

According to the figure 3, it is depicted that all the considered variables are stationary at first difference. Further, The inverse root of AR graph as shown in figure 4 depicts that all polynomials are within the root circle.

Figure 4- Results of AR Roots Graph

Since the all the variables are stationary at 1st difference it can be assumed that variables has a cointegration. To verify that, Cointegration test and residual test is conducted.

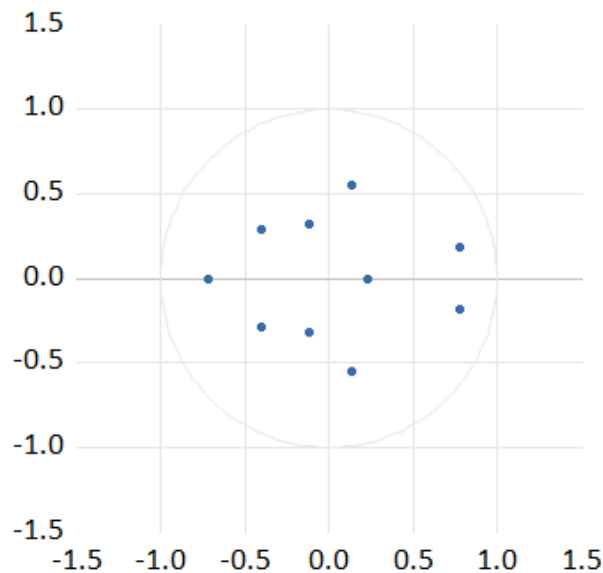The above unit root test confirms that all variables are stationary at I(1) level and therefore, it might have a long run relationship among the dependent variable of GDP and the independent variables. Since the test results confirm that variables are not stationary at the level VAR cannot be used if the variables are cointegrated. Therefore, cointegration test is carried out to confirm whether the variables are cointegrated each other.

5. COINTEGRATION TEST RESULTS

In order to identify cointegration among the variables, Johansen and Juselius Cointegration Test is executed. Following hypothesis considered for the test.

$H_0 = cointegration\ between\ related\ variables\ does\ not\ exists$

$H_1 = cointegration\ between\ related\ variables\ exists.$

According to both Trace test & Maximum Eigenvalue the tests, results indicate 5 cointegrating equations at 5% significance level. So, the null hypothesis can be rejected. So, the test results evidently imply the existence of long run relationship between GDP and the remittances inflow and other macroeconomic variables considered for the model.

Table 3- Johansen and Juselius Cointegration Test

Date: 11/19/22   Time: 07:21
Sample (adjusted): 1978 2020
Included observations: 43 after adjustments
Trend assumption: Linear deterministic trend
Series: LCE LER LGE LR LY
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.934660	183.4903	69.81889	0.0000
At most 1 *	0.514694	66.17982	47.85613	0.0004
At most 2 *	0.348326	35.09183	29.79707	0.0112
At most 3 *	0.267356	16.67876	15.49471	0.0330
At most 4	0.073910	3.301689	3.841465	0.0692

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.934660	117.3105	33.87687	0.0000
At most 1 *	0.514694	31.08798	27.58434	0.0170
At most 2	0.348326	18.41307	21.13162	0.1152
At most 3	0.267356	13.37708	14.26460	0.0687
At most 4	0.073910	3.301689	3.841465	0.0692

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

5.1 Residual Test

Further, Residual stationary test is performed to identify whether the residuals are stationary. This test also confirms that the variables have long run relationship if the residuals are stationary.

$H_0 = Residual\ has\ a\ unit\ root$

$H_1 = Residual\ has\ no\ unit\ root$

Table 4- Results of Residual Test.

		t-Statistic	Prob.*
Null Hypothesis: RESID01 has a unit root			
Exogenous: None			
Lag Length: 0 (Automatic - based on SIC, maxlag=9)			
Augmented Dickey-Fuller test statistic		-3.179597	0.0021
Test critical values:	1% level	-2.617364	
	5% level	-1.948313	
	10% level	-1.612229	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID01)
Method: Least Squares
Date: 11/19/22   Time: 06:52
Sample (adjusted): 1976 2020
Included observations: 45 after adjustments

Since the P value is less than 5% and significant, null hypothesis can be rejected. Thus, it is evident that residual is stationary. Further Residual plot given in figure 5 depicts that the residuals are stationary.
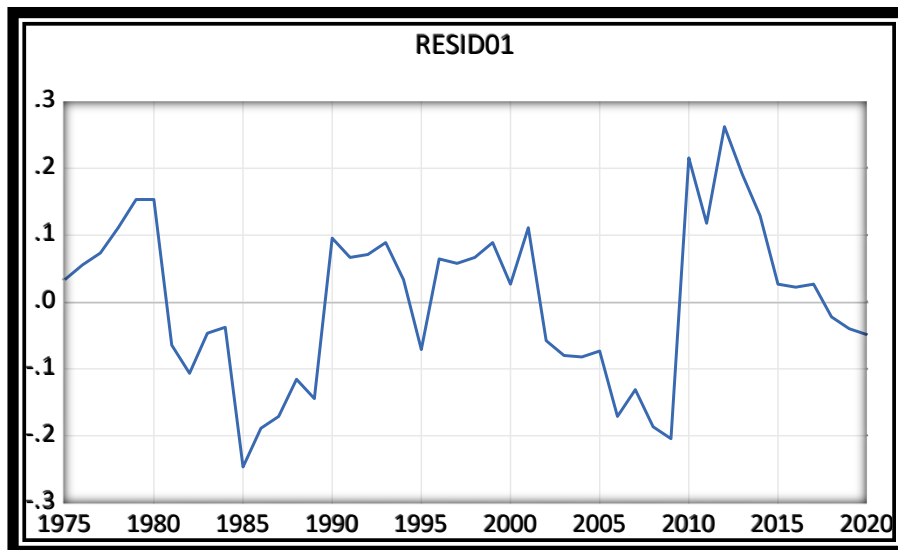
Figure 5- Residuals Stationary Graph

The economic relationship between the dependent variable and the independent variables can be written using the following equation. In equation 01, the relationship among the dependent variable and the independent variables are derived using the long run equation .

Long run model can be defined as follows

$LY = \beta_0 + \beta_1 LR + \beta_2 LGE + \beta_3 LER + B_4 LCE + \varepsilon_t$ .... *EQ 1*

By taking the lag value of the error term the equation can be written as below.

$\varepsilon_{t-1} = LY_{t-1} - \beta_0 - \beta_1 LR - \beta_2 LGE - \beta_3 LER - B_4 LEC$ -------------------- *EQ2*

Deriving the Short run Model by incorporating error correction term to the model is as below,

Taking differences:

$\Delta LogY = \beta_{0+} \beta_1 \Delta LogR + \beta_2 \Delta LogGE + \beta_3 \Delta LogER + \beta_4 \Delta LogCE + \beta_5 \varepsilon_{t-1} + V_t$ -----------------$EQ3$

By substituting EQ2 to EQ3,

$\Delta LogY = \beta_{0+} \beta_1 \Delta LogR + \beta_2 \Delta LogGE + \beta_3 \Delta LogER + \beta_4 \Delta LogCE (LogY_{t-1} - \beta_0 - \beta_1 LogR - \beta_2 LogGE - \beta_3 LogER - B_4 LogCE) + V_t$

$\Delta LY = \beta_{0+} + \beta_1 \Delta LR + \beta_2 \Delta LGE + \beta_3 \Delta LER + \beta_4 \Delta LCE + V_t$

A short run model with error correction term and the long run model are estimated separately using the Least Square. results are shown in table 5

Model 1 for Long run

Table 5-Long Run Test Results

Dependent Variable: LY
Method: Least Squares
Date: 11/19/22   Time: 06:49
Sample: 1975 2020
Included observations: 46

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-24.42255	4.425048	-5.519160	0.0000
LR	1.023656	0.206548	4.956019	0.0356
LGE	0.590796	0.080760	7.315420	0.0000
LER	-0.648832	0.118693	-5.466449	0.0000
LCE	1.294179	0.227413	5.690869	0.0000

R-squared	0.988091	Mean dependent var	23.50170
Adjusted R-squared	0.986929	S.D. dependent var	1.098430
S.E. of regression	0.125583	Akaike info criterion	-1.209374
Sum squared resid	0.646617	Schwarz criterion	-1.010609
Log likelihood	32.81561	Hannan-Quinn criter.	-1.134915
F-statistic	850.4152	Durbin-Watson stat	1.237565
Prob(F-statistic)	0.000000		

Long equation can be derived based on the rest results as below.

DLY=-24.42 + 1.02DLR + 0.59DLGE – 0.65DLER + 1.29DLCE + V_t

The estimated results entails that the remittances have positive and significant impact on GPD in the long run. This implies that a 1% increase in remittances can cause 1.02% increase in GDP growth It indicates the importance of maintaining foreign workers remittances in positive trend to expect Economic growth in long run. Further, it is observed that the government expenditure is also positively and significantly influences GDP. This implies that 1% increase in Government expenditure can bring about 0.60% increase in GDP in long run.

Encouraging government expenditure in social wellbeing, new projects and other investments, it may create new job opportunities stimulating the aggregate demand and create more income to the workers. This will cause growth in real GDP. Increase in government expenditure may subsequently cause increase in household increase as workers getting more money to spend. Household expenditure also has positive and significant influence where 1% increase in Household expenditure can enhance GDP by 1.29% in long run. households' expenditure on goods and services to be encouraged according to the rest results as it may cause economic growth. It is also evident that appreciation in exchange rate by 1% may result reduction of GDP by 0.64% in long run. GDP fluctuates when value of local currency changes, when currency is appreciated, price of goods and services become expensive to other countries. So, the demand may reduce. it is also linked with price levels and unemployment.

<u>Estimating the short run model with error correction term</u>

In order to examine the short regression is used to estimate the relationship between the dependent variable of GDP and the independent variables. The error Correction Term is added to the short run model. For the purpose of this analysis, VECM is an appropriate model. According to research done on the topic 'Macroeconomic Determinants of Workers' Remittances' (Carlos Vargas-Silva, 2005), use of VECM is emphasized as it is vigorous enough to test with endogeneity shocks in macroeconomy perspectives in short term. Test results are shown in Table 6.

Table 6-Short Run Test results

Dependent Variable :DLY
Method: Least Squares
Date: 11/19/22   Time: 07:02
Sample (adjusted): 1976 2020
Included observations: 45 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.105988	0.015246	6.951937	0.0000
DLR	0.173857	0.043598	3.987694	0.0003
DLGE	-0.029587	0.060524	-0.488839	0.0277
DLER	-1.116563	0.100425	-11.11839	0.0000
DLCE	0.376497	0.149388	2.520270	0.0159
RESID01(-1)	-0.188882	0.067052	-2.816934	0.0076

R-squared	0.812267	Mean dependent var		0.068030
Adjusted R-squared	0.788198	S.D. dependent var		0.103589
S.E. of regression	0.047674	Akaike info criterion		-3.125314
Sum squared resid	0.088638	Schwarz criterion		-2.884425
Log likelihood	76.31955	Hannan-Quinn criter.		-3.035513
F-statistic	33.74830	Durbin-Watson stat		1.511087
Prob(F-statistic)	0.000000			

The coefficient value of the error term should be $-1 < \mathcal{E}_{t-1} < 0$. The estimated results show that the coefficient value of the error term is negative and within the required range. Coefficient of the error correction term ($\mathcal{E}_{t-1}$) = -0.188882. E_{t-1} explains that the speed of adjustments from short run period towards long run equilibrium. In this scenario value of $\mathcal{E}_{t-1} = -0.188882$ denotes that the GDP is corrected from short run towards long run by equilibrium by 19% annually. Apparently, it may take more than 5 months (1/0.188882= 5.2943) to reach equilibrium and 19% of discrepancy between long run and the short run is corrected within one year. P value of $\mathcal{E}_{t-1}$ is below 0.05 (P=0.0076 >α=0.05). Thus, the Coefficient of the error correction is statistically significant. Durbin Watson value (1.511087) is higher than R -squared value (0.812267). Hence this implies that there is no spurious regression. It is also confirmed that the coefficient values of the estimated results are statistically significant.

Accordingly, it can be implied that the selected model is appropriate

Short run equation can be derived based on the estimated coefficient values as below.

DLY=0.1060 + 0.1739DLR – 0.030DLGE – 1.1166DLER + 0.3765DLCE – 0.188882 $\mathcal{E}_{t-1}$ + V_t

Elucidating the equation , 1% increase in DLR may cause 0.17% increase in GDP . 1% increase in DLGE may cause 0.03% decrease in GDP. 1% appreciation of exchange rate may cause Decline of GDP by 1.11% whereas 1% increase in Household consumption can cause 0.38% of GDP.

This indicates worker remittances and exchange rate significantly influence GDP eve n in short run.

In contrast to the long run equation, influence of worker remittances are less in percentage. Rendering the results, Remittances, Government Expenditure, and Household Consumption has comparatively more influence in GDP growth and subsequently economic growth in long run than in short run. Nevertheless, Exchange rate has high negative impact to GDP in short run compared to long run.

Table summarizing the long run and short run test results are shown in table 7.

Table 7-Summary table of long run and short run

Variable	Long run		Short run	
	Coefficient	Probability	Coefficient	Probability
Constant	-24.42255	0.0000	0.105988	0.0000
Remittances	1.023656	0.0356	0.173857	0.0003
Government Expenditure	0.590796	0.0000	-0.029587	0.6277
Exchange Rate	-0.648832	0.0000	-1.116563	0.0000
Household Expenditure	1.294179	0.0000	0.376497	0.0076

When comparing to log run and short run results, 1% increase in remittances' s positive influence on GDP, is higher in long run-in contrast with short run. It can be a long-term result of social wellbeing projects which are promoted with remittances inflow over the time. 1% increase in government expenditure which is estimated to have adverse effect on GDP in short run can whilst increase in the same variable may cause a positive influence in long run. Government expenditure could be in the form of public investment like education, health care and defense. A 1% increase in government expenditure may negatively affect investments and consumption incurs a cost, where the positive benefits can be expected in the long run with 1%. Increase in terms of long run. Appreciation of the exchange rate depreciates the local currency. In both the long run and short run, it may affect GDP negatively and it is expected that the run affect is lesser than the short run. With the local currency depreciation available current account balances are also valued at a low price. And a weak local currency may make exports less expensive to other countries. So, the exports are more demanded whereas the country may be in a beneficial state in the long run. Household expenditure has positive effect in both short run and long run where long run effect is higher. Increase of 1% in household consumption of goods and services may result in higher sales returns in firms where the production may be encouraged and directly calculated under GDP. In the long run, higher production may motivate lowering the unemployment rate since it creates more job opportunities and higher sales return may cause wages increase which will cause increase in personal consumption.

5.2 Model Diagnostic Test

After estimating the regression, model diagnosis tests are carried out to confirm the validity of the selected model. The following tests are confirmed whether the selected model is appropriate for this analysis.

1) Residual Normality Test

This is a graphical method for evaluating residual normality. P Value is higher than $\alpha = 0.05$ implying that the distribution of error is normally distributed.

Following Hypothesis is used for the test.

H_0 : Residuals are normally distributed
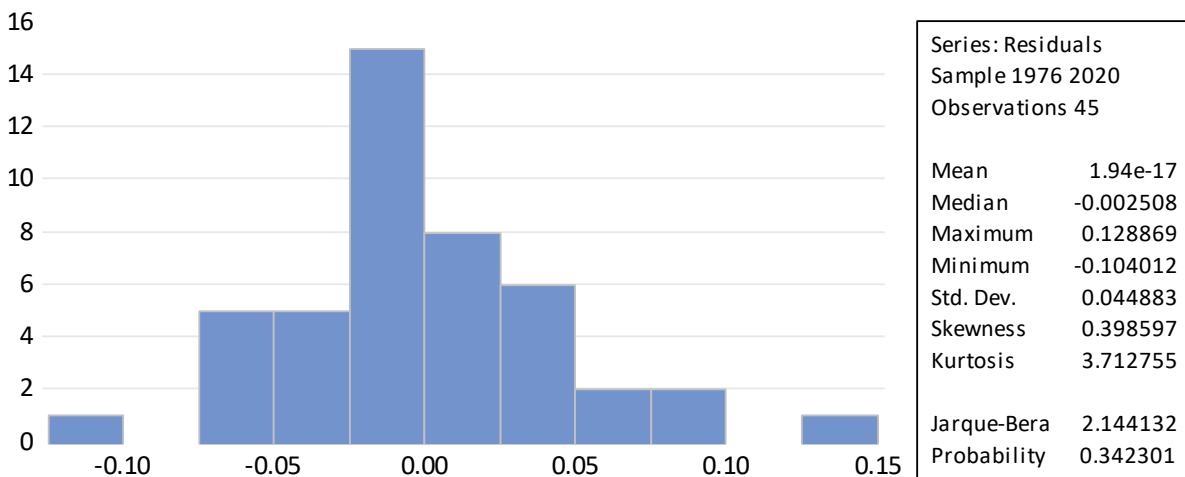
H_1: Residuals are not normally distributed.

Figure 6- Normality Test Resuts

P value > α=0.05, hence H_0 cannot be rejected. Thus, Residuals are normally distributed, and normality assumption is validated.

2) Serial Correlation

In time series data , to identify the relationship of a variable in different lags is called serial correlation. If no serial correlation identified it can be assumed that the variable is independent over the time where as if a serial correlation is detected, it can be assumed that future values may be influenced by past values, and it has a pattern and not random.

For this model, Breusch-Godfrey Serial Correlation LM test is used with following Hypothesis.

H_0: serial correlation does not exist.

H_1: serial correlation exists.

Table 8-Serial Correlation Test Results

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.000333	Prob. F(2,37)	0.3775
Obs*R-squared	2.308422	Prob. Chi-Square(2)	0.3153

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 11/19/22   Time: 07:07
Sample: 1976 2020
Included observations: 45
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003567	0.015481	0.230406	0.8190
DLR	0.003125	0.043655	0.071594	0.9433
DLGE	-0.035105	0.065519	-0.535798	0.5953
DLER	-0.014902	0.101543	-0.146757	0.8841
DLCE	-0.021911	0.150677	-0.145415	0.8852
RESID01(-1)	-0.030716	0.070511	-0.435614	0.6656
RESID(-1)	0.283066	0.202507	1.397808	0.1705
RESID(-2)	0.011394	0.178671	0.063770	0.9495

P value > α=0.05, hence H_0 cannot be rejected. Thus, serial correlation does not exists and efficiency of least square regression is evident.

3) Heteroscedasticity

To check weather variance of residuals is unequally scattered, Heteroscedasticity test is conducted. In linear least square regression, it is assumed that all residuals derived from a data set that has a constant variance. are If heteroskedasticity exists, the data used in the regression are unequally variated and the analysis results can be invalid.

For this model Breusch Pagan Godfrey test is used and   hypothesis are derived as follows,

H_0: Heteroscedasticity exists

H_1: Heteroscedasticity does not exist

Table 9- Heteroscedasticity Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	2.016824	Prob. F(5,39)	0.0976
Obs*R-squared	9.245054	Prob. Chi-Square(5)	0.0997
Scaled explained SS	9.418769	Prob. Chi-Square(5)	0.0935

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/19/22   Time: 07:09
Sample: 1976 2020
Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003220	0.000993	3.241566	0.0024
DLR	-0.001698	0.002841	-0.597853	0.5534
DLGE	-0.002413	0.003944	-0.611943	0.5441
DLER	0.001663	0.006544	0.254211	0.8007
DLCE	-0.018063	0.009734	-1.855688	0.0711
RESID01(-1)	-0.005133	0.004369	-1.174960	0.2471

R-squared	0.205446	Mean dependent var	0.001970
Adjusted R-squared	0.103580	S.D. dependent var	0.003281
S.E. of regression	0.003106	Akaike info criterion	-8.587180
Sum squared resid	0.000376	Schwarz criterion	-8.346292
Log likelihood	199.2116	Hannan-Quinn criter.	-8.497379
F-statistic	2.016824	Durbin-Watson stat	1.738555
Prob(F-statistic)	0.097595		

According to the test results, P value > $\alpha=0.05$, hence H_0 can not be rejected. Thus, heteroscedasticity does not exists

According to all three-test conducted as diagnostic test for model specification, it is evident that derived model is accurate and valid. Hence it can be determined that the derived model and the estimated results are robust.

6.   CONCLUSION

When considering economic growth, factors which promotes cash inflows is a major concern. According to economists, GDP can be used as a measuring variable of economic growth whist worker remittances are one of key pillars in developing countries' economy.

With the pandemic situation and financial crunch on economy which currently Sri Lanka is facing, immediate measures to be taken to identify the bottlenecks which may limit the economic growth .Consequently factors that stimulate economic growth should also be identified and encouraged for a sustainable economic growth

With the outcome of the regression model,

In Short run exchange rate is affecting more in GDP. The higher the exchange rate , local currency is depreciating, making account balances also depreciated. remittances have positive but less effect in short run towards economic growth

Nevertheless, in long run household consumptions affects GDP In higher proportion while remittances also have positive and significance effect towards economic growth. Yet exchange rate appreciation negatively affects economic growth but lesser affect than is short run.

Therefore, according to the test results, it is evident that remittances has significantly positive effect towards economic growth. So, it should be promoted to elevate the Sri Lankan economy while controlling exchange rate is also a major concern.

It is observed to many reasons foreign workers tend to remit money via un-official channels so that they are not contributing to Sri Lanka' economy.so the promoting remittances via official channels with suitable incentives, cost of remittances and tax reductions, would be beneficial for the country as well as the worker. Encouraging licensed commercial banks to open branches in countries with high dense of Sri Lakan workers with added incentives and benefits should also suggested.

Not only unskilled house maids to gulf countries, but also different skilled workers in many other fields in many other countries with great economies can also be targeted to provide more opportunity and return for the workers.

Enhancing the skill level of the worker by training and targeting differentiated job market are also factors to be considered to expect more return from a worker. Improved labour productivity and professional skills which can be gained form necessary training to match global labour requirements will give Sri Lankan foreign labour migrants a competitive advantage. So, the wages levels and job opportunities may increase.

Governments can consider having collaboration programs with the countries which have skill shortages may provide more overseas job opportunities.

Policy makers should consider diverting remittances through unofficial channels to official channels while increasing Sri Lankan workers' skill level and productivity to attract more global demand and the job opportunities. That can make workers demand higher wages where they can remit more for their families. Apparently, more remittance can aid poverty reduction in the country and to uplift the living standards of their families,

Moreover , policies should be regulated to bear the shock of external factors like oil prices which will directly affect the exchange rate. Because the exchange rate also plays a major role in this model. With a good rate of remittances household expenditure should be encouraged to keep the economy growing while encouraging the government expenditure for investments and social wellbeing.

For instance—as proposed in the 2006 budget—the government has introduced "Nation Building Bonds" to attract more financial inflows from migrant Sri Lankans. In 2007, the Central Bank of Sri Lanka launched a programme to encourage licensed commercial banks to open branches in host countries with dense populations of Sri Lankan migrants. Through the Sri Lanka Bureau of Foreign Employment, the government has been promoting migration by seeking more opportunities in the overseas labour market, regulating employment agencies, registering emigrants and providing welfare services to migrants and their families.

Sri Lanka must, therefore, be prepared to identify the comparative advantages of its labour export. It is necessary to explore more opportunities in the integrated global labour market as well as improvements in overall labour productivity and professional skills of the local labour force. Additionally, the economic potential of labour export in shaping linkages between trade, development and poverty reduction is undeniable in small open economies high in labour resources but deficient in capital.

Remittances, in fact, have great potential to generate a positive impact on development and poverty reduction in Sri Lanka. It is important to note that remittances can reduce the probability of food-based and capability-based poverty among underprivileged entities at the receiving end. This applies to both rural and conflict affected areas of the country.

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APPENDIX - UNIT ROOT TEST RESULTS

1. Variable GDP (Y)

Null Hypothesis: Y has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.517018	0.1187
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

Figure 01- not stationary at I(0)

Null Hypothesis: DLY has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.634900	0.0089
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Figure 02- stationary at I(1)

2. Variable Remittances (R)

Null Hypothesis: R has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.443050	1.0000
Test critical values:	1% level	-3.621023	
	5% level	-2.943427	
	10% level	-2.610263	

*MacKinnon (1996) one-sided p-values.

Figure 03- not stationary at I(0)

Null Hypothesis: DLR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.044222	0.0385
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

*MacKinnon (1996) one-sided p-values.

Figure 04- stationary at I(1)

3. Variable Government Expenditure (GE)

Null Hypothesis: GE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.512233	0.9854
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Figure 05- not stationary at I(0)

Null Hypothesis: DLGE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.913735	0.0000
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

*MacKinnon (1996) one-sided p-values.

Figure 06- stationary at I(1)

4. Variable Remittances Household Consumption Expenditure (CE)

Null Hypothesis: CE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.030679	1.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.030679	1.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Figure 07- not stationary at I(0)

Null Hypothesis: DLCE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.561898	0.0000
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

*MacKinnon (1996) one-sided p-values.

Figure 08- stationary at I(1)

5. **Variable Exchange Rate (ER)**

Null Hypothesis: ER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.940511	1.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

Figure 09- not stationary at I(0)

Null Hypothesis: DLER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.206939	0.0000
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

*MacKinnon (1996) one-sided p-values.

Figure 09- stationary at I(1)