# THE MACROECONOMIC DETERMINANTS OF MIGRANTS' REMITTANCES IN EGYPT: AN ARDL BOUNDS TESTING APPROACH

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**Abstract** - Remittance inflows to Egypt have been increasing rapidly for the last three decades, making it one of the largest remittances- receiving country in the world and the leading one in the Middle East region. Theoretically remittances could help avoid balance of payment crisis, provide a constant source of foreign exchange and reduce the poverty severity in home developing countries, hence, representing a vital channel for sustainable economic development. Thereby it is worthy to figure out the key remittances-influencing factors to examine the elements to which remittances are sensitive to. Accordingly, this paper aims at identifying the macroeconomic determinants of migrants' remittances to Egypt during the period (1980-2018). Through applying ARDL model.Findingsreveal that variables concerning exchange rate, GDP per capita, political and economic condition in the home country are statistically significant supporting the remittances decay hypothesis and confirming that remittances hedge against macroeconomic shocks and appear to be counter-cyclical. This calls for a policy of a sustained economic growth that directed remittance savings toward productive domestic investments.

**Keywords** - Egypt, remittance inflows, Macroeconomics determinants, ARDL model.

## I. INTRODUCTION

Migrants' remittance inflows to developing countries have witnessed an increasing trend during the last two decades and become the second largest source of capital inflowsafter foreign direct investment. Remittances can be defined as personal monetary transfers from migrants and their families in the home country.This vital source of foreign exchange helps countries of origin diminishes the trade deficit gap; reduce the severity of poverty and hence promoting economic development process.Migration from Egypt has risen since the mid of the 1970s owing to several reasons, including the need of the gulf countries for labor after oil boom, the economic difficulties that Egypt passed on in the form of high rates of population, poverty severity coupled with inappropriate socioeconomic policies. The resulting remittances to the Egyptian economy have been enlarged.Also, it's become one of the main sources of external finance since the mid of 1990s, both in levels and as a percent of GDP. As reported by Migration and Remittances Fact-book, the volume of migrants' remittances in Egypt through official channels has significantly increased during the year 2017 to USD 23.6 Billion from USD 2.6 Billion reported in 1980 and accounted for more than 17% out of GDP in the year 2017. Also, remittance inflows consider the second largest source of household income after labor income.

Characterizing as being one of the top labor-exporting country, Egypt is ranked as the seventh- top receiving remittances in the world and the leading one in the Middle East region. Even with the importance of remittances to the Egyptian economy, empirical research on the determinants of remittances remains limited. Therefore, it is worthy to examine in this paper the macroeconomic determinants of migrants' remittances to Egypt to find out the most explanatory factors to which remittances are sensitive to. More specifically, we attempt to find out whether remittances could work as shock absorbers and whether the remittances decay hypothesis holds. The novelty of this paper is it tries to analyze the effect of the main characteristics of the home country, specifically the combined effect of GDP per capita, exchange rate and the inflation rate. In doing so, the Bounds Testing Approach to Co-integration within ARDL methodology is utilizedfor a time series data spanning from 1980-2017.Findings show thatremittances appear to be countercyclical and could hedge against macroeconomic shocks.The rest of the paper is structured as follows; section two demonstratesbriefly motives of Migrants' remittances. Thethird section briefly shortly displays the related literature review. The fourth section describes the methodology and sources of data collection, while the fifth section provides the main results before the last section concludes.

## II. MOTIVES BEHIND REMITTANCES

Previous international remittance literature has emphasized several motives behind remitting. At the macro level remittances are classified in the basis that remittance flows can be counter-cyclical, pro-cyclical or cyclical:

1. A counter-cyclical Remittance: in this case remittancesserve as a compensatory transferin response to periods of hardship in the home country (Gupta et al., 2009; Singh et al., 2010, Laniran, and Adeniyi, 2015:3-4).
2. A pro-cyclicalRemittances: now remittances respond positively to favorable macroeconomic

conditions in the migrant's home countryto maximize profits (Laniran, and Adeniyi, 2015:4).
3. A cyclical Remittance: here remittances are driven by implicit motives such as family assistance (Giuliano & Ruiz-Arranz, 2009).

## III. THE REMITTANCE INFLOWS TO EGYPT: A BRIEF VIEW

Figure 1 shows the evolution of Egyptian migrant remittances during the period (1980-2017). Remittances have got a rising trend throughout the study period from $2.6 billion in 1980 to $23.6 billion in 2017 with about $6.9 billion annually on average. Despite of being inflows of private capital, remittances of Egyptian migrants are considerably affected by the economic and political factors. For instance, the post-Gulf War period, the periods after the devaluation of the Egyptian pound and after the 2011 revolution showed high levels of Egyptian migrant remittances.The importance of remittances to the country of origin could be evaluated according to various indicators, including the proportion of remittances to GDP, total exports, FDI and ODA. Figure 2 shows the ratio of migrant remittances to Egyptian GDP. As a % of GDP, during 1990s remittances reached a peak point during the first Gulf War, with an inflow comprising about 14% of GDP. Also, during 2000s remittances reached a higher peak point in the year 2017, with an inflow accounting for 17%. On average, during the period of 1980-2017, the ratio of remittances to GDP has been about 7.5%. From 1983 until 1994, the remittance flows had exceeded the value of Egyptian exports of goods. Starting from the year 1994 (with the exception of 2016), the proportion of remittances to Egyptian exports has continuously declined, reaching its lowest ratio in the year 2009, which corresponded to 27.9% of total exports. During the period of 1980-2017, the average proportion of remittances to total exports was at around 162%. By the same vein, during the period of 1980-2017, the average proportion of remittances to the FDI inflow was about 657%. Remittance inflows also were more than five times that of official foreign aid. During the period 1985-2006, the average percentage of remittances to the total official foreign aid was about 210%. The previous analysis reveals that migrant remittances are vital to the Egyptian economy. Therefore, policymakers must deal with remittances with extreme caution in order to ensure the stability of the foreign exchange market and the Egyptian pound.

## IV. LITERATURE REVIEW

Several empirical studies have tried to explain the macroeconomic determinantsof remittance inflowseither by usingmicro- data survey or micro-data analysis using various econometrics techniques. for instance, in their study about the main determinants of official remittances to six labor-exporting countries in North Africa and Europe: Algeria, Morocco, Portugal, Tunisia, Turkey and Yugoslavia over the 1977-1989 period, Elbadawi and Rocha (1992) found that remittances are closely correlated with income cycles in the host countries, the length of stay and with the stock of migrant workers.Nishat et al (1993)identified the determinants of remittances of the Pakistanis migrants to the Gulf countries during 1990/1991, and distinguished the motivational behavior behindremitting. Through adopting the OLS method on a random sample of 7061 out of more than 35,000 migrants, the empirical results stated that a typical migrant enjoys remitting on the basis of pure altruism (peroxided by his supporting of family, education level, income level, the level of skills) and pure self-interest (peroxided bythe accumulation of property, future planning for business) together and significantly explains remittances.El Sakka (1999) has found in examining the macroeconomic determinants of migrants' remittances to Egypt, by usingOLS, that exchange rate, black market premium, and interest rate differentials are crucial factors in encouraging migrants to remit savings through official channels over the period (1976-1991). In India, Gupta (2005)examined the macroeconomic determinants of remittance inflows during the period (1990-2005). he concludes that remittances enhanced by good economic conditions in host countries and adverse economic conditions in the home country (political uncertainty, interest rates, or exchange rate depreciation lower economic growth rates).Utilizing a panel data for 18 developing countries over the period 1983-2001, Hunte (2004) found that a one percent increase in household income results in a 0.8 percent decrease in remittances implying that migrant workers respond to negative household income.Hasan (2008) examines the macroeconomic determinants of workers' remittances in Bangladesh. He specifies five variables which are inflation, interest rate, exchange rate and GDP of the five remittance sending countries have significant impact on remittance. Through adopting the OLS method on time series datafindings reveal that the most influencing variables are domestic interest rate and the GDP of the rest of the top remittances-sending countries. Singh, et al (2010) find that the size and the location of the diaspora are important determinants of remittances in sub-Saharan Africa during the period (1990-2005. Also Remittances vary counter-cyclically with variations in GDP per capita, consistent with the hypothesis that remittances can work as shock absorbers.Alam etal (2017) examined the macroeconomic determinants of worker remittances and its impact on Pakistan economy throughoutthe period(1975-2016) by adopting ECM, findings show that interest rate, exchange rate, real GDP, gold prices, development expenditures, stock market performance and political

stability appeared to be important determinants of remittances.

## V. THE EMPIRICAL MODEL

This paperconsiders the first attempt in examining theeffect of the characteristics of the country in origin (Egypt) on the migrantremittance inflows. The first hypothesis is whether economic and price stability variables are the main determinants of remittance inflows to Egypt, followed by the second hypothesis that tests whether the remittances decay assumption holds.

### 5.1 Methodology

The objective of this paper is to empirically examine the macroeconomic determinants of remittance inflows to Egypt during the period 1980-2017. In our analysis, we will focus on some home country characteristics (remittances pulling factors). The data are firstly tested for stationarity using the Augmented Dickey-Fuller (ADF) unit root test. And in order to establish a long run-relationship between the variables, the Bounds Testing Approach to Co-integration constructed by Pesaran et al., (2001) is employed, followed by ARDL model suggested by Pesaran and Shin (1999).Unlike bivariate and multivariate co-integration methods which are applicable mostly for large sample size and are not reliable for small sample sizes, the ARDL model applicable for small sample size.Another advantage of applying the ARDL co-integration technique is that it allows tests for the existence of relationships between variables in levels irrespective of whether the time series being considered are integrated of order one, I(1), and/or order zero, I(0) or co-integrated mutually.Also, the diagnostic tests of the ARDL model are employed.Finally, CUSUM of squares stability test is utilized.

### 5.2 Model Specification

Since the main objective of this paper is to examine the macroeconomics determinants of remittances in Egypt.The dependent variable is the remittance inflows. The independent variablesinclude GDP per capita, exchange rate, inflation rate and political instability variable.Referring to the economic literature and the previous empirical studies such as El Sakka (1999); Hunte (2004); Hasan (2008), the functional form of the proposed model can be written as follows:

$$REM_t=F\ (GDPP_t, Instability_t, RER_t, INF_t)$$

Where,$REM_t$: migrants' remittance inflows to Egypt, $GDPP_t$: Gross domestic product per capita in home country.$RER_t$: real exchange rate ,$INF_t$: inflation rate and $Instability_t$: the socioeconomic –political instability represented by a dummy variable takes the value 1 in the year that witnessed a structural break while takes zero otherwise.

This estimated Equation in logarithm form can be written as follows

$$Ln\ L\ REM_t = \alpha_1\ Ln\ GDPP_t + \alpha_2 Ln\ RER_t + \alpha_3 LnINF_t + \alpha_4\ Ln\ Instability_t + u_t$$

To test the nature of the time series of the variables, the augmented Dickey- Fuller (ADF) unit root test is conducted to decide whether the variables under study are stationary or not in order to avoid spurious regression. And to establish a long run-relationship between the variables, the Bounds Testing Approach to Co-integration constructed by Pesaran et al., (2001) is employed, followed by the Autoregressive Distributed Lag (ARDL) bounds test approach of co-integration suggested by Pesaran and Shin (1999).The general form of ARDL can be written as:

$$\Delta Yt = \alpha + \delta\ t + \rho\ Yt\text{-}1 + \gamma 1\ \Delta\ Yt\text{-}1 + \ldots + \gamma\rho\text{-}1\ \Delta\ Yt\text{-}\rho+1 + \theta\ Xt + \omega 1 \Delta\ Xt + \ldots + \omega q \Delta Xt\ –q+1 + et$$

The form of UECM-$ARDL_{(1,2,0,1,2)}$model can be expressed as:

$$\Delta\ Ln\ REM_t = \alpha_0 + \alpha_1 LnREM_{t-1} + \alpha_2\ Ln\ INF_{t-1} + \alpha_3\ Ln\ RER_{t-1} + \alpha_4 Ln\ GDPP_{t-1} + \alpha_5\ INSTABILITY_{t-1} + \beta_0 \Delta\ LnREM_{t-1} + \beta_1\ \Delta\ Ln\ INF_{t-1} + \beta_3\ \Delta\ Ln\ GDPP_{t-1} + \beta_4\ \Delta\ INSTABILITY_{t-2} + \beta_5\ Ln\ INF_{t-2} + \beta_6 \Delta INSTABILITY_{t-2} + \beta_7\ \Delta\ Ln\ INF_t + \beta_8\ \Delta\ Ln\ GDPP_t + \beta_9\ \Delta\ INSTABILTY_t + \delta T + U.$$

The ARDL procedure of co-integration involves two steps. The first one calls for testing the significance of the lagged levels of the variables by comparing the "F-statistic" of "Wald - bound test" with Pesaran critical value at $\alpha$=5% and k = the number of independent variables in the ARDL model. If the results assert the existence of a long-run relationship between the variables under investigation, we would apply the second step which involves the estimation of the long run and the short run relation between the variables. The long run coefficients of the ARDL model in the difference form for any explanatory variable are calculated by dividing the coefficient of lagged values of explanatory variable (multiplied by a negative sign) by the coefficient of lagged value of thedependent variable, while the short run coefficient is expressed with the coefficient of the first difference of the variables.

## VI. DATA SOURCES AND EMPIRICAL RESULTS

In this section, after demonstrating data sources, the unit root test followed by unrestricted Error Correction - autoregressive distributed lag (UEC-ARDL) model will be applied.

### 6.1 Data Sources

DataaboutEgyptian migrants 'remittance were collected from Migration and Remittances Fact-book.The gross domestic product was gathered from World Development Indicators. Population size, inflation rate and exchange rate is getting from the Planning Ministry of Egypt. All data used are

expressed in constant prices in order to avoid the inflation effect.

### 6.2 Empirical Results

**6.2.1 Unit Root Test** : The results of the stationary test as shown in table(4) that some variables under study such as (Ln REMt, LnRERt and LnGDPPt), are integrated of order 1, d(1), while the other variables (LnINFt and INSTABILITYt) are integrated of order zero d(0) at 1%, 5% and 10% level of significance.

**6.2.2Co-integration:** ARDL Bounds Test

After the series are made stationary, the optimal lag interval is determined according to Schwarz and Akaike criteria and then the ARDL co-integration bounds test (Wald bound test) is conducted for testing the significance of the lagged values of our variables under investigation.As shown by the table (2).the results of "Wald bound test" statistics indicates the existence of a co-integrating relation of the dependent variable '$LnREM_t$ with its regressors because the computed F-statistic of a Wald bound test of value (6.26) is greater than the upper bound test critical value, the Pesaran critical value,(4.01) at α=5% and k=4. The existence of co-integration implies that the variables of the model have a tendency of moving together over the period of time. After finding that there is a co-integration in the model, the UEC-ARDL model is ready to be run.

**6.2.3 The ARDL Model Results:** The UEC-ARDL results are given in the table below in whichdependent variable is ($LnREM_t$) with 34 observations used for estimation from 1980 to 2017.Test includesintercept(C) and order of the ARDL is set according to Schwarz and Akaike criteria. The long run coefficients of the UEC-ARDL model are given below:

$$D(LnREM)_t = 6.18 - 0.65LnRER_t - 2.1LnGDPP_t + 1.64\ INSTAB_t + 0.052T$$

Findings revealed that the estimated long run coefficients of the exchange rate (LnRERt), GDP per capita of the home country (Ln $GDPP_t$), and political and economic condition in the home country ($INSTAB_t$) variables are statistically significant with different signs (according to t –statisticstest and standard error test), while the long run coefficients of the price instability (In $INF_t$) variables is insignificant statistically. The negative effect of GDP percapita and exchange rate indicates that migrant's responds to negative shocks to household incomeconsistent with the hypothesis that remittance can work as a shock absorber matching some studies such as Singh, et al (2010). Also, matching with Hunte (2004) confirming remittances decay hypothesis, in which remittances decrease as GDP per capita increases.Besides the political and economic instability conditions in the home country have a significant positive impact on the growth flows of remittances. In long run migrants' remittance inflows to Egypt appear to be strongly induced by the economic-political instability and GDP per capita in the home country. Concerning short run coefficients, the findings indicate the existence of a statistically significant positive impact of the growth of the lagged of inflation and GDP per capita growth variables on migrant remittance inflows in the same year has and at α=5%. Also, the short run coefficients of both inflation and economic and political instability variables are statistically significant with different signs at α=5% to one lag period.Also,the speed of adjustment coefficient (-0.39) indicates that about 2.5 years are needed to each equilibrium.

**6.2.4 Diagnostic Tests of the ARDL Model**

The diagnostic test results(table 4 in the appendix) indicate that the model adequately passes the econometric pathology for residual serial correlation, the normality,the functional form and heteroscedasticity. Also, the stability of the ARDL model is conducted by plotting the (CUSUM) as shown in figure (5). Since the CUSUM of squares plots cross the 5 % critical lines, therefore, the estimated parameters for the short run dynamics and long run equilibrium of the model are relatively stable.The results of the various tests suggest that the model is fairly well specified and robust for policy analysis.

6.Concluding Remarks

Egyptian migrants remittances have been rising rapidly for the last three decades, making the leading one in the Middle East region. Thereby it is worthy to figure out the key remittances-influencing determinants to examine the factors to which remittances are sensitive to. On this ground, this paper aims at identifying the macroeconomic determinants of migrants' remittances to Egypt during the period from 1980 to 2017.Our focus was on the characteristics of the country of origin, such as political and economic conditions(price stability and GDP per capita). Through applying UEC-ARDL, results find that exchange rate and GDP per capita of home country have a statistically significant negative impact on the growth flow of remittances. The model findings support the remittances decay hypothesis and the hypothesis that remittances hedge against macroeconomic shocks and remittance inflows appear to be counter-cyclical, that is, higher during periods of low economic growth. This calls for a policy of sustained economic growth that directed remittance savings toward productive domestic investments.

In fact the liberalization of exchange rate helps attract remittance earnings only if it is accompanied by a realistic interest rate policy. But in fact, favorable exchange rates and domestic rates of return will not succeed if remittances do fuel inflation through enhancing imports.

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## Appendix

| variables | ADF (t- statistic) | Critical value (1%) | 5% level | 10% level | Probability* | Degree of cointegration (at level) |
|---|---|---|---|---|---|---|
| LnREM | -4.46 | -2.64 | -1.9 | -1.6 | 0.000 | d(1) |
| LnINF | -4.08 | -3.6 | -2.9 | -2.6 | 0.0029 | d(0) |
| Ln RER | -8.4 | -2.64 | -1.9 | -1.6 | 0.000 | d(1) |
| LnGDPP | 2.60 | -2.64 | -1.9 | -1.6 | 0.0109 | d(1) |
| INSTABILITY | -4.7 | -2.6 | -1.9 | -1.6 | 0.000 | d(0) |

**Table 1: The augmented Dickey- Fuller (ADF) unit root test results**
***MacKinnon (1996) one-sided p-values**

| Test Statistic | Value | df | Probability |
|---|---|---|---|
| F-statistic | 6.268382 | (5, 19) | 0.0014 |
| Chi-square | 31.34191 | 5 | 0.0000 |

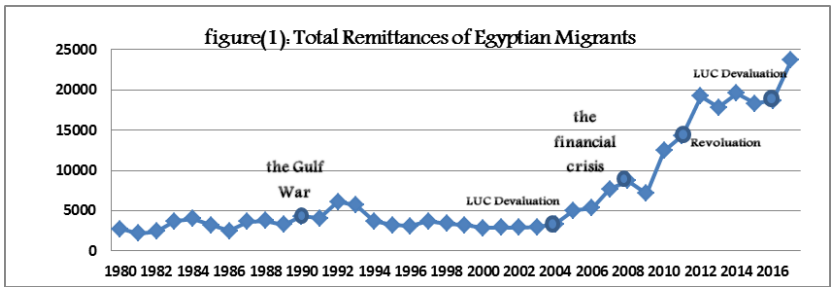
**Table (2): The ARDL co-integration bounds test:**
**Source: computed using E-views packages, k=4 the n≠ of independent variables in the ARDL model.*The critical values are extracted from Pesaran et al., 1999: table(3): Case V with unrestricted Intercept and Unrestricted Trend.**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 2.474078 | 0.663704 | 3.727683 | 0.0014 |
| LNREM(-1) | -0.399263 | 0.198560 | -2.010799 | 0.0588 |
| LNINF(-1) | -0.133332 | 0.114075 | -1.168817 | 0.2569 |
| LNRER(-1) | -0.260615 | 0.051508 | -5.059683 | 0.0001 |
| LNGDPP(-1) | -0.837208 | 0.368128 | -2.274231 | 0.0347 |
| INSTABILITY(-1) | 0.657920 | 0.230476 | 2.854614 | 0.0101 |
| D(LNINF) | 0.115933 | 0.067151 | 1.726465 | 0.1005 |
| D(INSTABILITY) | 0.060588 | 0.109321 | 0.554215 | 0.5859 |
| D(LNGDPP) | 0.845566 | 0.302262 | 2.797459 | 0.0115 |
| D(LNINF(-1)) | 0.251610 | 0.093428 | 2.693091 | 0.0144 |
| D(LNREM(-1)) | 0.278147 | 0.176549 | 1.575469 | 0.1317 |
| D(LNINF(-2)) | 0.077668 | 0.059619 | 1.302739 | 0.2082 |
| D(INSTABILITY(-1)) | -0.318001 | 0.153295 | -2.074440 | 0.0519 |
| D(INSTABILITY(-2)) | -0.185214 | 0.133103 | -1.391510 | 0.1801 |
| @TREND | 0.052740 | 0.010561 | 4.993835 | 0.0001 |
| R-squared | 0.814727 | Mean dependent var | | 0.060482 |
| Adjusted R-squared | 0.678210 | S.D. dependent var | | 0.314282 |
| S.E. of regression | 0.178281 | Akaike info criterion | | -0.310481 |
| Sum squared resid | 0.603898 | Schwarz criterion | | 0.362914 |
| Log likelihood | 20.27817 | Hannan-Quinn criter. | | -0.080834 |
| F-statistic | 5.967964 | Durbin-Watson stat | | 2.098312 |
| Prob(F-statistic) | 0.000236 | | | |

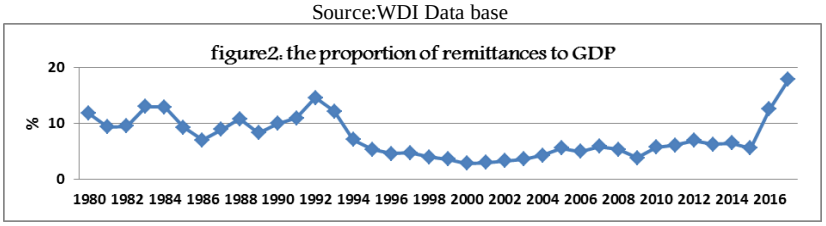
**Table 3: Autoregressive Distributed Lag Estimates (UEC- $ARDL_{(1,2,0,1,2)}$)**
**Model: Ln $REM_t$=f ($LnINF_t$, $LnRER_t$ , Ln $GDPP_t$, $INSTAB_t$,C)**
**Source: computed using E-views packages**

| | |
|---|---|
| Breush-Godfrey serial correlation Lagrange Multiplier test | f-statistics (1.22) prob (0.65)<br>Chi-square prob (0.44) |
| Heteroscedasticity test : Breush- pagan-Godfrey | Chi-square prob (0.58)<br>f-stat. prob (0.69) |
| Ramsey (RESET) test | f-statistics prob (0.37) |
| Histogram: normality test Jarque-Bera | Prob (0.85) |

**Table 4: Diagnostic Test of the ARDL Model 2$_{(1,2,0,1,2)}$**
**Source: computed using E-views packages**




Source:WDI Data base

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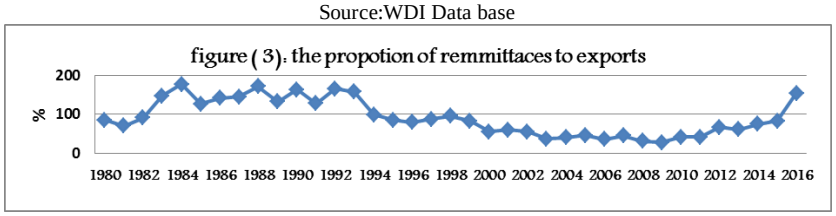


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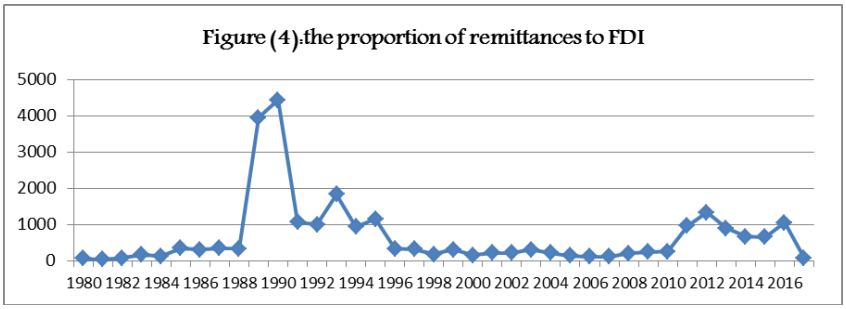


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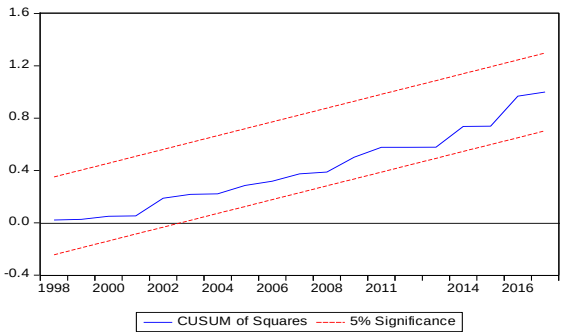


**Figure 5: plot of the Cumulative Sum of Recursive Residual of squares (CUSUM)**

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