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MIGRANT REMITTANCES AND NAIRA PRICE OF THE DOLLAR

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ABSTRACT*:* *This study investigated the possibility that the large amount of diaspora dollar remittance to the Nigeria economy could positively impact the naira price of the dollar (exchange) rate. Our methodology employed the Johansen cointegration test (JCT).The trace statistics result shows the null hypothesis that: there is no cointegration is rejected. Thus the trace test shows, there is at least one co-integrating vector. Furthermore, the output of the Max-Eigen statistics indicates that there is a strong evidence to reject the null hypothesis of no cointegration, implying there is long run relationship among the variables. Though diaspora remittance (**logrem**) has positive and significant long run effect on the domestic price of the naira **(logexch)** to the dollar, its coefficient (3.220574) is not sufficiently large when compared with oil price (24.56832) (**logoilprice). We therefore conclude that though diaspora remittances influences the domestic naira price of the dollar, its impact on the domestic on the wider exchange rate market is insignificant.*

KEY WORDS: diaspora remittance, migration, foreign reserves, exchange rate

INTRODUCTION AND OVERVIEW

Though the literature is replete with astounding commendations by scholars and international organizations of the developmental contributions of diaspora remittances in less and least developed economies, (IMF, 2009, Khan, M.K. et al. 2019.IOM), very little is mentioned of the impact of diaspora remittances on the domestic currency price of the dollar or euro.

In 1977, migrant remittance to Nigeria totaled $20,164,380 (twenty Million, one hundred and sixty four thousand, three hundred and eighty dollar). There henceforth, it consistently remained on the rise in the decades that followed, hitting the billion dollar mark in 1990, when it reached $1,301,056,000 (One billion, three hundred and one million, and fifty six thousand dollar).In 2018 alone diaspora remittance to Nigeria peaked at &24,311,030,000 (twenty four billion, three hundred and eleven million and thirty thousand dollar), ranked the sixth highest out of 180 recipient countries of migrant remittance in that year (the Index Mundi). Given this, we fathomed this level of dollar inflow will no doubt, could impact the local currency price of the dollar, euro or even the pound sterling one of the other choice of diaspora remittance.

Background

The International Monetary Fund (IMF), the International Organization for Migration (IOM) and even economists, believe diaspora remittances play some significant roles in the domestic economies of many developing nations, in particular those of Africa, Asia and even countries of South and Latin Americas that receive remittances from migrants' workers. International Organization for Migration (IOM) asserted… "the money or goods that migrants send back to families and friends in origin countries, are often the most direct and well-known link between migration and development." Khan, M.K. et al. (2019) an economist faculty in the Northeast Normal University USA, wrote: "The inflows from developed countries to developing countries change with time. The largest sources of foreign funds are migrant remittances for developing economies." While diaspora remittances could arguably have ramifications for the development of domestic economies of recipient nations, in the absences of currency diffusion, diaspora remittances must first be transmitted to local currency unit–the exchanged rate for consumption or otherwise. It connotes therefore, diaspora remittances could have seriously consequences for the domestic currency price of either the dollar or euro, depending on the currency in which remittance are transmitted. Diaspora remittances to Nigeria now in the billions of US dollar, are in most cases received in the local currencies (naira) and only sparingly (following monetary policy) are they received in the hard currency–dollar or euro depending on country of remittance origin. Either way, we believe it is legitimate to hypothesis that: migrant remittances impact the domestic naira currency price of either the dollar or euro currency, our focus in this paper being the US dollar.

This line of thought informed the recently published Central Bank of Nigeria (CBN) diaspora remittance policy: "Naira 4 Dollar Scheme" designed to encourage more diaspora remittances inflows to the benefit of the country's exchange rate regime. The CBN stated: *In an effort to reduce the cost burden of remitting funds to Nigeria by working Nigerians in the Diaspora, the CBN has introduced a rebate of N5 for every $1 of fund remitted to Nigeria, through IMTOs licensed by the CBN*." (Nairmetrics, March 7, 2021).

Following statistics from the World Bank and based on data from IMF, Nigeria in 1980 alone, received $21,946,630 (Twenty million, nine hundred and forth six thousand, six hundred and thirty dollar) in diaspora remittance. This excluded small remittances which are: "Small amount of money sent by migrants to their families not via banks but money transfer operators, post offices, mobile phones or informal transfers." In 2020, migrant workers' remittances dipped by 12.18 percent or a $2.9 billion from $23.8 billion in 2019 to $20,997 (Twenty billion, nine hundred and ninety seven thousand United States dollar). Between 1980 and 2020, Nigeria received in migrant remittances the sum of $333.8 billion dollar (three hundred and thirty three billion, eight hundred and eighty three thousand dollar), excluding personal remittances.

This provides the point of departure for this paper - to investigate the possible link, if any, between the domestic naira price of the US dollar and diaspora remittances. In other words, do migrant remittance impact the dollar/naira price exchange rate to the benefit or otherwise of the recipient Nigeria? Thus this article argues that diaspora remittances are an important influence on price of the domestic naira price of the dollar (exchange rate) position Nigeria. Rocher and Pelletier (2008), concluded in their paper; "Remittances from migrant workers have become a major source of financing for developing countries. Latin America and Asia have benefited since the mid-1990s from a particularly sustained rise in income transferred by their emigrant workers." The rest of this paper treated literature review in section two, methodology is analyzed in section three, while section four summarized our findings. We concluded the paper in section five.

Conceptualization

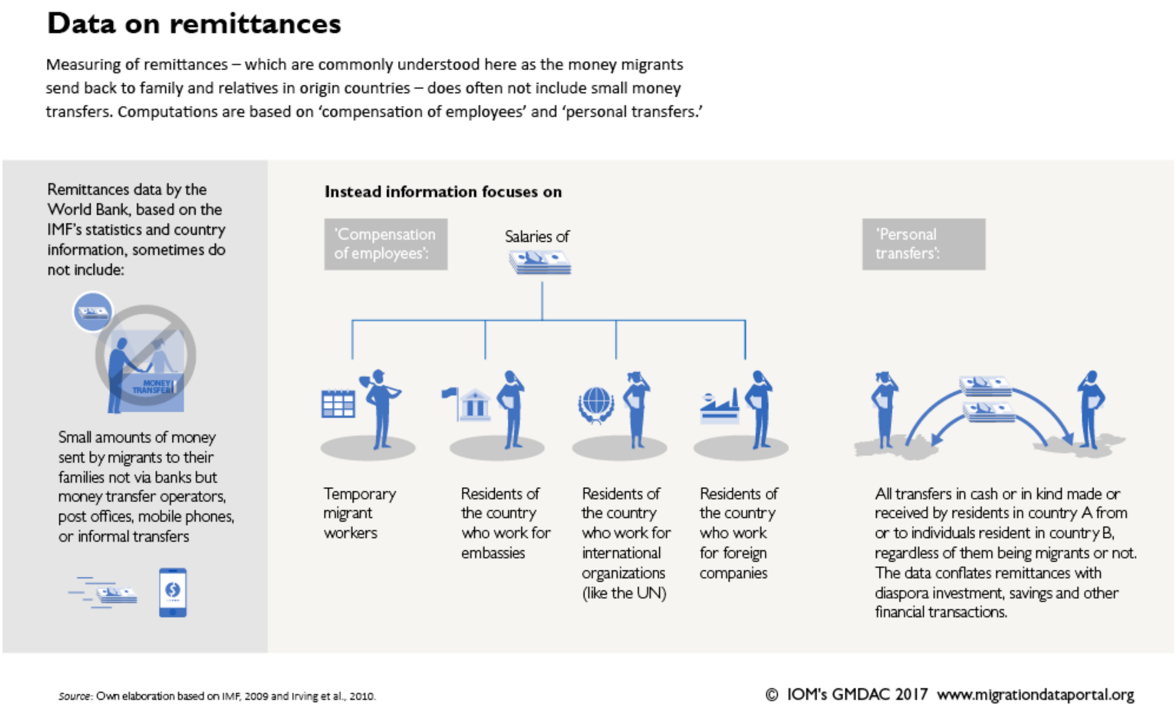
Though the concept "migrant remittances" appears unambiguous, the need still exist for further clarification. The international monetary fund (IMF 2009) conceptualized migrant remittances as:"household income from foreign economies arising mainly from the temporary or permanent movement of people to those economies. Remittances include cash and noncash items that flow through formal channels, such as via electronic wire, or through informal channels, such as money or goods carried across borders. They largely consist of funds and noncash items sent or given by individuals who have migrated to a new economy and become residents there, and the net compensation of border, seasonal, or other short-term workers who are employed in an economy in which they are not resident."

Ratha, (2005a) cited by Singer (2010) stated, "International financial transfers from migrants to family members in their home countries are known as remittances. Ratha added, "A typical remittance transaction takes place in three steps: The migrant sender pays the remittance to the sending agent using cash, check, money order, credit card, debit card, or a debit instruction sent by e-mail, phone, or through the Internet. The sending agency instructs its agent in the recipient's country to deliver the remittance. The paying agent makes the payment to the beneficiary."

Economics further broadened the conceptualization of diaspora remittances to include "social, political, technological, technical and cultural contributions such as transfers of entrepreneurial skills, experience, ideas, technology and knowledge as well as cultural and civic awareness in the diaspora networks' ancestral homeland (Connell et al., 2007; Goldring, 2003, 2004; Levitt, 1998; Saxenian and Sabel, 2008; Nyberg Sorensen, 2004) all cited by Kshetri, et al. (2015).

We noted earlier, small remittances (those not via banks, but done through money transfer operators, post offices mobile phone etc.) do not qualify for inclusion in the computation of migrant remittances. Following (IMF 2009), only remittance: "cash and noncash items that flow *through formal channels*, such as those via electronic wire, or through informal channels, as money or goods carried across borders" qualify for inclusion in the configuration of migrant remittance.

Figure 1.3: Component of Migrant Remittances S



Source: IOM GMDAC 2017

Currency price– used in this paper is conceptualized to mean: "the price of one currency expressed in terms of another currency" (https://financial-dictionary.thefreedictionary.com/Price+currency). For example, if ₦410 Nigeria naira can buy one US$1 as it currently is, then the naira price of the dollar is: ₦410 for a US$1. Commonly this is referred to as the exchange rate of the naira to the US dollar. The major hypotheses in this paper is that the large inflow of diaspora remittances to Nigeria could positively impact the naira price of the dollar. We test this hypotheses with yearly average exchange rate and yearly average diaspora remittance data. Singer (2010) noted, "the international financial consequences of immigration exert a substantial influence on the choice of exchange rate regimes in the developing world."

REVIEWING THE LITERATURE

Verma Mitali, in an undated article published in https://www.yourarticlelibrary.com/population-geography/4-general-theories-of-migration-explained/43257 asserted: "Migration is a very complex phenomenon. Apart from a set of social, economic, political and environmental factors, migration of population is determined, to a large extent, by the perception and behaviour of individuals concerned. For this reason, according to Verma, "there is hardly a comprehensive theory of migration" - how people move and why people move."

However scholars like, Everett Lee 1966, Todaro 1969, Massey 1993 (Kunaka 2020) have all attempted propounding a general theory of migration. Earliest attempt at a constructing a generalized theory of migration was by Ernst George Ravenstein (1813 – 1935). He was born in Frankfurt Germany but lived his adult life in the United Kingdom. Ravenstein in 1885, enumerated what is generally refer today as "10 Laws of Migration".
Among others, Ravenstein listed in his 10 laws:

- Most migrations are short distanced.
- There is a process of absorption, where a batch of people moving out from one area is replaced by another coming in.
- There is a process of dispersion, which is the inverse of absorption.
- Each migration flow produces a compensating counter-flow.
- Rural dwellers are more migratory than urban dwellers (kunaka 2020)

Though aspects of Ravenstein's law still has relevance in the modern world, for instance, in many instance most migrations are for economic reasons e.g. job seeking, rural dwellers still being more migratory than urban etc., it has obvious flaws and shortcomings that renders it inappropriate to explain most migrations in the modern world of today.

Firstly, the idea that migration is over short distance no longer holds in the modern world of today. African migrants travel as far as Europe, North America and even further East to China and take up permanent residence. Secondly that migration produces movement in opposite direction. Hardly has Europeans or even chines migrated to take residence in Africa besides official engagements – working for multinational or working for international organisations – United Nations (UN) World Bank etc.

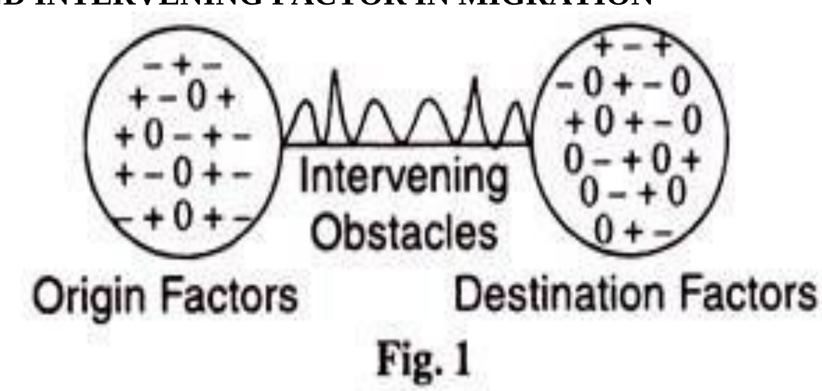
The Gravity Model of Migration –based on the assumption of the Newton law – the mass of the object and distance between them. The model used two variables: population and size to analysis and understand migration. In the gravity model of migration, the important factors are the size of each location (usually measured as population) and the distance between the two locations.https://quizlet.com/418948984/302-the-gravity-model-of-migration-flash-cards/. The model emphasis the similarity or difference between culture as an important considerations to migrants. Legal rights or restrictions affecting migrants and the possibility of finding a job are all consideration for migration.

Benefits using the Gravity models; it can easily be derived from theoretical models such as random utility maximization model (Ramos 2016).There are also multiple methods to account for analytical challenges associated with gravity models such as the use of instrumental variables or fixed effects. (ibid).

Sjaastad's (1962) human capital theory of migration is cited by Clements (2004).Sjaastad (born 1934) in North Dakota, had all four grandparents migrated from Norway in the 1818s. His main thesis is that, "migration is locating one's skill in that market that offers the highest return." Further, he analysed the decision to migrate using the concept of opportunity cost by comparing the costs of forgone earnings in the origin location with the discounted present value of higher expected earnings to be had in the destination. The migration trend in Nigeria today follows with the arguments of Sjaastad's theory. It common knowledge that Nigerian professionals – Medical Doctors, Nurses, Engineers etc. migrate to the markets (Saudi Arabia, USA, and even Europe) that offers higher expected earnings compared to what is obtained home in Nigeria. The lure of earning money in hard and more stable currency partly explain migration of Nigerian.

Everett Lee born (1917 - 2007) in Rains South Carolina – USA propounded a comprehensive theory of migration – "the push – pull theory" of migration. Lee in formulating his theory identified certain factors, which according him lead to spatial mobility of population in any area. These factors are:
(i) Factors associated with the place of origin,
(ii) Factors associated with the place of destination,
(iii)Intervening obstacles, and
(iv) Personal factors.(Lee 1966, Divisha undated)
Lee *(ibid)* noted, in every area (place of origin or destination) there are countless factors which act to hold people indicated as + sign within the area which attract people to it, and there are others which tend to repel – sign them. These factors are schematically indicated in Figure.2.1 below.

FIG. 2.1 ORIGIN AND DESTINATION FACTORS AND INTERVENING FACTOR IN MIGRATION



Source: Divisha, S.: Top 3 theories of Migration.

There are others, shown as O's, to which people are indifferent. Lee suggested some of these factors affect almost all people, while others affected people differently. These are the push factors according to Everett Lee.

Factors associated with the Area of Destination:
There are very attractive forces at the area of destination to which the proportion of "selectivity" migrants is high. Going by Lee argument, these forces are found in metropolitan areas of a country. Pull factors are present in such areas. Another important difference in the factors associated with area of origin and area of destination is related to stages of the life cycle.

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Intervening variables – Lee stated, "Between every two points there stands a set of intervening obstacles which may be slight in some instances and insurmountable in others." In Lee's view, is distance is one such obstacles though "omnipresent, is by no means the most important."(ibid). Lee also referred to physical obstacles such as actual physical barriers like the Berlin Wall may be interposed, or immigration laws may restrict the movement. People are, differently, affected by the same set of obstacles.

Personal Factors - Lastly, are the personal factors upon which the decision to migrate from place of origin to the place of destination depends. It is an individual's perception of the 'pull and push forces' that determine actual migration. Lee *(ibid)* categorises these forces into "pluses" and "minuses" respectively. Pluses are pull factors and minuses are push factors and in between them are "zeros" which balance the competing forces. He asserted that personal factors such as age, sex, race and education which along with the pull-push factors and intervening obstacles that determine migration.

Recent literature include Singer (2010). Citing the World Bank (2006) Frankel (2009) sources, Singer stated, "Remittances are transfers between families that tend to flow countercyclically relative to the recipient country's economy. "Migrants send money home when their families experienced hardship." Continuing, Singer (*ibid*) drew attention to the "multiplier" effect of diaspora remittances on the domestic economy. "Inflows of remittances generally contribute more than their initial value to the receiving economy." In an empirical study of the Mexican economy, Durand, Parrado and Massey (1996) cited by Singer, found that "each diaspora remitted dollar generated $4 in demand for goods and services." At an current exchange rate of approximately ₦410 to the dollar in Nigeria, each dollar of diaspora remittance, will indeed have much more multiplier here than in Mexico.

Lopez et al. (2007), notes, "findings from a number of existing empirical studies indicate that diaspora remittances have a positive impact on a good number of development indicators of recipient countries. Yet, when flows are too large relative to the size of the recipient economies, as those observed in a number of Latin American countries, they may also bring a number of undesired problems. Among those probably, the most feared in this context is the possibility of a real exchange rate appreciation…." This findings further heightened the real need to undertake this study. Our point of departure is to establish the possibility of a confounding relationship between the value of the naira currency relative to the dollar, as to whether this is influenced by the large volume of continuous diaspora remittance inflow into the country.

In an empirical work, Acosta et al.(2009), found "a 1 percentage point increase in remittances causes the average currency to appreciate by 0.29 percentage points, but quickly countered, "this result is attenuated in countries with higher credit." Other empirical works tends to support the view that diaspora remittances can cause exchange real rate appreciation. For instance Rajan and Subramanian (2005), Winters and Martins (2005), and Lopez, Molina, and Bussolo (2007), all cited by Acosta et al. find that remittances can, in fact, cause real exchange rate appreciation.
All the studies cited here are by foreign scholars and not related to Nigeria. However Osigwe & Madichie (2015) did a paper that examined: "Remittances, Exchange Rate and Monetary Policy

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in Nigeria". Their finding though did not establish any clear relationship between the naira price of the dollar and diaspora remittance which is the focus of the current effort. They did find; "that causality runs from exchange rate (LEXR) to money supply (LM2)… and not in the reverse order." In other words, the study could not establish any clear relation between the naira price of the dollar and diaspora remittance.

Hypothesis

Following the arguments and issues raised in this paper, we hypothesis that:

(i) ***The large volume of diaspora remittance to Nigeria will positively impact the nominal naira price of dollar that is, less naira unit to buy one unit of the dollar.***

Lopez et al. (2007) noted, "the most feared in this context is the possibility of a real exchange rate appreciation." In another empirical work, Hassan and Holmes (2013), showed that "workers remittances contributes to the real exchange rate appreciation in the long-run. And also concluded from the same study that "there is causality running from remittances to real exchange rate in the short run, and this short run effect is stronger than that of the long run." Against this backdrop, we believe the improved supply of dollar to the Nigeria economy due migrant workers' remittances will positively impact the real exchange rate of the naira to the dollar.

METHODOLOGY

Our hypotheses will be tested first using simple descriptive statistics and test of normality - checking the behaviour of the variables in confirming to assumptions of the classical regression model (CLM) model. Further, we used simple multiple regression econometrics model to test the parallel relationship between diaspora remittances and the naira price of the dollar. To capture the impact of diaspora remittance on nominal exchange rate, we introduced two other variables: – Nigeria foreign reserve ***(rem)*** and the dollar price of crude oil ***(opr)*** were introduced as control variables. Previous studies have proven that commodity economies such as Nigeria, Kenya, and Saudi Arabia etc. suffer exchange rate volatility as commodity price impact the nominal exchange rate behaviour of the host economy. The coefficients of these variables - foreign reserve, diaspora remittances and crude oil price will point which of the variables has greater impact on nominal exchange rate.

Model specifications - REM_t

Nigerians in the diaspora regularly remit large sums of money home each year. *PriceaterhouseCooper (PwC*) projected an average remittances of US$25.5bn, US$29.8bn and US$34.8bn in 2019, 2021 and 2023 respectively. The Mundi Index recorded US$24.3 in 2018 as diaspora remittance to Nigeria. We believe, given these huge remittances, the naira price of the dollar, that is, the naira per unit of US$ will be impacted. If this economic reasoning is true, we could then model a functional relationship as per equation (1) below.

The a-priori expectation: diaspora remittance to Nigeria should positively impact the foreign exchange relationship - the naira should appreciate against the dollar). Following this, we stated the functional equation in (1):

$$Exchg_t. = f(REMt_t)\text{……………………………………}\mathbf{(1)}$$

Where:

$\$xchg_t$ = the dollar exchange rate of the naira (₦)t

$\$Rt_t$ = the total dollar of diaspora remittance at time t

Modelling Foreign Reserve - RES_t

It is common knowledge amongst economists that the level of foreign reserve in the balance of payment account of any given nation state impacts the nominal exchange rate relation of the local currency, either negatively or positively. Economic theory says when the level of foreign reserve a nation is low, it requires larger units of a domestic currency to purchase one unit of a given foreign currency - the dollar. The reverse is the case when the foreign reserve is higher. Countries with strong foreign reserve base (example the UK, China, Austria, North America, Denmark etc. and even South Africa) enjoy strong exchange rate relation with other foreign currencies.

Given this to be true, we expressed this functionally as:

$$Exch_t = f(REM_t)\text{……………………………………}(2)$$

Where:

$Exch_t$ = the dollar exchange rate of the naira $(₦)_t$

REM_t = the total dollar $(\$)_t$ value of foreign reserve in the balance of payment.

Modelling Crude Oil Price - *$\$Opr_t$*

Nigeria is a commodity (crude oil) based economy. This implies that Nigeria's foreign exchange rate relation with other international currencies could be impacted by the international market price of crude oil in dollar $(\$)_t$. Given that this conjecture about exchange rate behaviour in a commodity based economy is true, we modelled this relationship functionally thus:

$$exch_t = f(Opr_t)\text{ ……………………………………}\mathbf{(3)}$$

Where:

$exch_t$ = the dollar exchange rate of the naira (₦)at time t

Opr_{tt} = the international dollar price of crude at time at t

Combing these models in a single functional equation we have:

$$\mathbf{Exchg_t = REMt_t + RES_t + Opr_t}\text{ ……………………………………}(4)$$

From the single functional equation (4) above, we derived the econometric equation (5) as:

$$\mathbf{Exch_t} = \alpha_t + \mathbf{REM_t + RES_t + Opr_t + \mu_t}\text{……………………}\mathbf{(5)}$$

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Equation **(5)** reads thus– is valued by a constant term (α_{t}), the exchange rate (amount) of the naira to a unit of the dollar is a partial function of diaspora
remittance (**REM_{t}**), plus foreign reserve **(RES_{t})**, the international market price of crude oil in dollar **(Orp_{t})** and some confounding errors **(μ_t).** However our hypothesis is that diaspora remittances could have major influence on the exchange rate of the naira to a unit of the dollar. The foreign reserved and the international market price of crude oil are introduced only as "control variables." **A-priori we expect the coefficient of $REMt_{t}$, RES_{t} , Opr_{t} > 0 and $REMt_{t}$ > RES_{t} & Opr_{t} where μ_t** is the error term or the unexplained confounding variables. Though all variables are denominated in United State dollar US$), we still natural log transformed the Nigeria foreign reserve (RES_t) and diaspora remittance, these figures being in billions and in huge disparity with exchange rate and crude oil price. Equation (5) is further expressed econometrically in natural logarithms format as:

$$\mathbf{logExchg_t} = \alpha_t + \mathbf{Log\beta rem + log\beta res_{t2} + log\beta opr_{t3}} + \varepsilon_t \text{ ....(6)}$$

Where the **β**s are the coefficient of the explanatory variables and the size of the coefficients determined its relevance as an explanation for. It is convenient to bring all variables to a common base, hence the log transformation.

Data construction

Our data are diaspora remittances sourced from the mundi index, exchange rate sourced from the central bank of Nigeria (CBN) and Nigeria foreign reserved also from the CBN. All are time series secondary sourced data. These are as presented in the excel table 3.1 below

Table 3.1: logrem logres logoilprice logexch

logrem	logres	logoilprice	logexch
7.3010300	9.637088	1.147367	2.436163
6.4771213	9.307241	1.175512	2.447158
6.9030900	9.770826	1.173478	2.453318
7.3424227	10.02693	1.176670	2.466908
7.2041200	9.619975	1.177825	2.512724
7.2552725	9.284754	1.194514	2.523711
7.1461280	9.097600	1.187239	2.596969
7.0791812	9.223785	1.206826	2.737515
7.0000000	9.276891	1.224792	2.690136
6.6020600	9.130303	1.229170	2.427558
6.4771213	9.175463	1.267875	1.930778
6.3010300	8.969877	1.173478	1.932898
7.0000000	9.309860	1.260787	1.882522
7.0000000	9.615823	1.375846	1.849999
7.8195439	9.670062	1.301898	1.778214
7.7481880	9.07775	1.286007	1.697031
8.8992732	9.214961	1.230704	1.736704
8.7403627	9.217266	1.200303	2.003727
8.9052560	9.232771	1.230960	2.204754
8.9763500	9.636427	1.314710	2.317585
9.2833012	9.891049	1.281261	2.373056
9.1886473	9.863236	1.105851	2.435401
9.1142773	9.752027	1.252853	1.846291
9.1435850	10.00430	1.457276	1.844571
9.0669274	10.02721	1.388456	1.891447
9.0824114	9.878913	1.397766	1.892810
9.0264600	9.870116	1.460146	1.864792
9.3565487	10.23695	1.582745	1.874807
10.165544	10.45685	1.736954	1.932199
10.228712	10.63079	1.813981	1.961432
10.255621	10.71523	1.859978	1.952535
10.283376	10.72916	1.986503	1.996183
10.264065	10.65811	1.790567	1.964428
10.295450	10.55491	1.900968	2.000000
10.314223	10.55947	2.046339	2.001337
10.312663	10.67714	2.047781	2.046843
10.318003	10.66516	2.035670	2.074864
10.318672	10.574	1.995504	2.104129
10.323452	10.46257	1.718668	2.100606

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10.277747	10.44747	1.639885	2.063195
10.265017	10.60745	1.733438	2.047315
10.242339	10.63184	1.853333	2.024462
10.218411	10.71549	1.808211	2.107289

Data Analysis
The data used to test our stated hypothesis is presented in Table 3.1 above. As explained earlier, they were transformed from their natural form into natural logarithms to have a common unit for analysis.

Table 4.1: Descriptive Statistics

	LOGEXCH	LOGRES	LOGREM	LOGOILPRICE
Mean	2.116388	9.929056	8.766275	1.478476
Median	2.035652	9.874514	9.074669	1.345278
Maximum	2.737515	10.77340	10.32345	2.047781
Minimum	1.697031	8.969877	6.301030	1.105851
Std. Dev.	0.273324	0.599939	1.429374	0.308375
Skewness	0.666211	-0.006040	-0.334258	0.575034
Kurtosis	2.307426	1.517663	1.560624	1.813787
Jarque-Bera	4.134177	4.028690	4.617649	5.004558
Probability	0.126554	0.133408	0.099378	0.081898
Observations	44	44	44	44

Source: Eview 10 Output

Table 4.1 expresses the different characteristics of the variables employed in this paper. It is observed that the mean value of all the four variables are positive. This implies that the time series of the variables have the possibility to increase thereafter.

The standard deviation values of exchange rate, reserve, remittance and oil price are approximately 0.27, 0.60, 1.43 and 0.31 respectively. Reserve is the most volatile of the variable since it has the highest standard deviation value. Exchange rate and oil price have positive skewness values, and are skewed to the right. This suggests that the tail of the distribution points to the right. However, reserve and remittance are negatively skewed. By implication, the tails of their distribution are skewed to the left.All the variables have positive kurtosis value that is below 3. This means that the distribution has sharper peak and heavier tails. The probability values reveal that the series of all the variables are normal distribution since their probability values are greater than 5 percent alpha value.

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Unit Root Test for Stationarity

In this session we present the summarized result of the unit root statistics. The test was conducted to ascertain the stationary property of the variables used for this study. The result is reported in Table 4.2 below.

Table 4. 2: Unit Root Test

Variables	ADF test statistic	Critical Value (5%)	P-Value	I(1)
Logexch	-4.927042	-2.933158	0.0002	stationary
Logres	-6.036577	-2.933158	0.0000	stationary
Logrem	-3.488687	-2.935001	0.0133	stationary
Logoilprice	-5.649848	-2.935001	0.0000	stationary

Source: Eview 10 Output

Table 4.2 Table above shows the unit root test statistics result for the variables. The test result reports the Augmented Dickey Fuller (ADF) statistics alongside with the critical values at 5% significant level. The result shows that all the variables are stationary and integrated at order one I(1). This implies that there is the possibility all the variables will co-integrate in the long run. To conform this assumption, we perform the Johansen co-integration test, the output of which is reported on Table 4.3 below.

Table 4.3: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.490919	48.14059	40.17493	0.0065
At most 1	0.309292	21.13468	24.27596	0.1183
At most 2	0.116142	6.333146	12.32090	0.3966
At most 3	0.034268	1.394770	4.129906	0.2781

Trace test indicates 1 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 *	0.490919	27.00591	24.15921	0.0201
At most 1	0.309292	14.80153	17.79730	0.1335
At most 2	0.116142	4.938376	11.22480	0.4860
At most 3	0.034268	1.394770	4.129906	0.2781

Max-eigenvalue test indicates 1 cointegrating eqn.(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Eview 10 Output

In Table 4.3 above, the trace statistics result shows the null hypothesis that: *there is no cointegration* is rejected. Thus the trace test shows, there is at least one co-integrating vector. Furthermore, the output of the Max-Eigen statistics indicates that there is a strong evidence to reject the null hypothesis of no cointegration, implying there is long run relationship among the variables.

Table 4.4: Long Run Results Vector Error Correction Estimates (VECE)

Variables	Coefficient	Std. error	t-value
LOGOILPRICE(-1)	24.56832	5.98538	4.10473
LOGREM(-1)	3.220574	1.27928	2.51749
LOGRES(-1)	-21.52249	4.17864	-5.15060

Source: Eview 10 Output

Table 4.4 above reports the results of the long run relationship between the variables. The coefficients of logoilprice and logrem have positive and significant long run effect on logexch. However, logres has an inverse but significant influence on logexch. This implies that on the long run, exchange rate will increase with increase in oil price and remittance. Nevertheless, it will decrease with increase in reserve; this is counter a-priori expectation.

Table 4.5: Short Run Dynamic

	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.006762	0.006507	-1.039140	0.3011
DLOGEXCH(-1)	0.053266	0.178608	0.298231	0.7661
DLOGEXCH(-2)	-0.014125	0.174341	-0.081019	0.9356
DLOGEXCH(-3)	-0.027356	0.161397	-0.169492	0.8657
DLOGOILPRICE(-1)	0.469799	0.249028	1.886532	0.0620
DLOGOILPRICE(-2)	0.232399	0.256748	0.905163	0.3675
DLOGOILPRICE(-3)	0.112297	0.264459	0.424631	0.6720
DLOGREM(-1)	0.175834	0.090917	1.934006	0.0558
DLOGREM(-2)	0.102118	0.089656	1.138990	0.2573
DLOGREM(-3)	0.159052	0.094090	1.690420	0.0939
DLOGRES(-1)	-0.253405	0.167764	-1.510481	0.1340
DLOGRES(-2)	-0.259281	0.155176	-1.670884	0.0978
DLOGRES(-3)	-0.390912	0.154763	-2.525871	0.0130
CONSTANT	-0.034216	0.024405	-1.402018	0.1639

Source: Eview 10 Output

The ECM parameter is not significant though, but has the a-priori sign, implying that disequilibrium can be adjusted within a period of one year. The results show that in the short run DLOGEXCH(-2), DLOGEXCH(-3), DLOGRES (-1), DLOGRES (-2), DLOGRES (-3), have negative dynamic influence on LOGEXCH. This indicates that in the short run dynamic condition, LOGEXCH decreases with a unit increase in these variables. Nonetheless, only DLOGRES(-3)has significant influence on LOGEXCH at 5 percent level of significance. DLOGEXCH(-1), DLOGOILPRICE(-1), DLOGOILPRICE(-2), DLOGOILPRICE(-3), DLOGREM(-1), DLOGREM(-2) and DLOGREM(-3) have positive short run dynamic influence on LOGEXCH, implying that LOGEXCH is positively driven by these variables in the short run.

SUMMARY AND CONCLUSION

The summary we could draw from this study so far is that there exist, both on the short and long run, a relationship exist between Nigerian diaspora remittances and the price (exchange rate) of the dollar to naira. This is evident from the coefficient of ***logoilprice*** and ***logrem*** with positive and significant long run effect on logexch. However, ***logres*** has an inverse but significant influence on logexch, implying that in the long run exchange rate will increase with increase in oil price and remittance. Nevertheless, it will decrease with increase in foreign reserve; which is not only against a-priori expectation but also stymied economic rationale.

Though diaspora remittance ***(logrem)*** has positive and significant long run effect on the domestic price of the naira ***(logexch)*** to the dollar, its coefficient (3.220574) is not sufficiently large when compared with oil price (24.56832) (***logoilprice).*** We therefore conclude that though diaspora remittances influences the naira price of the dollar, its impact on the wider exchange rate market is insignificant.

A possible explanation could be that, though yearly average of diaspora remittance is large and growing by the year, actual individual remittances trickles and do not all come in one lump in following the year average figures posted. The negative sign on foreign reserve appears to us paradox, because it defies economic reasoning and would require further research for confirmation.

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Appendix 1: Data

Year	Logrem	Logres	logoilprice	logexch
1977	7.30103	9.637088	1.147367	2.436163
1978	6.477121	9.307241	1.175512	2.447158
1979	6.90309	9.770826	1.173478	2.453318
1980	7.342423	10.02693	1.17667	2.466908
1981	7.20412	9.619975	1.177825	2.512724
1982	7.255273	9.284754	1.194514	2.523711
1983	7.146128	9.0976	1.187239	2.596969
1984	7.079181	9.223785	1.206826	2.737515
1985	7	9.276891	1.224792	2.690136
1986	6.60206	9.130303	1.22917	2.427558
1987	6.477121	9.175463	1.267875	1.930778
1988	6.30103	8.969877	1.173478	1.932898
1989	7	9.30986	1.260787	1.882522
1990	7	9.615823	1.375846	1.849999
1991	7.819544	9.670062	1.301898	1.778214
1992	7.748188	9.07775	1.286007	1.697031
1993	8.899273	9.214961	1.230704	1.736704
1994	8.740363	9.217266	1.200303	2.003727
1995	8.905256	9.232771	1.23096	2.204754
1996	8.97635	9.636427	1.31471	2.317585
1997	9.283301	9.891049	1.281261	2.373056
1998	9.188647	9.863236	1.105851	2.435401
1999	9.114277	9.752027	1.252853	1.846291
2000	9.143585	10.0043	1.457276	1.844571
2001	9.066927	10.02721	1.388456	1.891447
2002	9.082411	9.878913	1.397766	1.89281
2003	9.02646	9.870116	1.460146	1.864792
2004	9.356549	10.23695	1.582745	1.874807
2005	10.16554	10.45685	1.736954	1.932199

2006	10.22871	10.63079	1.813981	1.961432
2007	10.25562	10.71523	1.859978	1.952535
2008	10.28338	10.72916	1.986503	1.996183
2009	10.26406	10.65811	1.790567	1.964428
2010	10.29545	10.55491	1.900968	2
2011	10.31422	10.55947	2.046339	2.001337
2012	10.31266	10.67714	2.047781	2.046843
2013	10.318	10.66516	2.03567	2.074864
2014	10.31867	10.574	1.995504	2.104129
2015	10.32345	10.46257	1.718668	2.100606
2016	10.27775	10.44747	1.639885	2.063195
2017	10.26502	10.60745	1.733438	2.047315
2018	10.24234	10.63184	1.853333	2.024462
2019	10.21841	10.71549	1.808211	2.107289
2020	10.19309	10.7734	1.622835	2.094689

Appendix 2: Results of Data analysis

Date: 04/09/21
Time: 11:43
Sample: 1977 2020

	LOGEXCH	LOGRES	LOGREM	LOGOILPRICE
Mean	2.116388	9.929056	8.766275	1.478476
Median	2.035652	9.874514	9.074669	1.345278
Maximum	2.737515	10.77340	10.32345	2.047781
Minimum	1.697031	8.969877	6.301030	1.105851
Std. Dev.	0.273324	0.599939	1.429374	0.308375
Skewness	0.666211	-0.006040	-0.334258	0.575034
Kurtosis	2.307426	1.517663	1.560624	1.813787
Jarque-Bera	4.134177	4.028690	4.617649	5.004558
Probability	0.126554	0.133408	0.099378	0.081898
Sum	93.12105	436.8785	385.7161	65.05293
Sum Sq. Dev.	3.212360	15.47687	87.85378	4.089082
Observations	44	44	44	44

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.927042	0.0002
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGEXCH,2)
Method: Least Squares
Date: 04/09/21 Time: 11:50
Sample (adjusted): 1979 2020
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGEXCH(-1))	-0.755163	0.153269	-4.927042	0.0000
C	-0.006475	0.021999	-0.294324	0.7700

R-squared	0.377681	Mean dependent var	-0.000562
Adjusted R-squared	0.362123	S.D. dependent var	0.178247
S.E. of regression	0.142361	Akaike info criterion	-1.014460
Sum squared resid	0.810661	Schwarz criterion	-0.931714
Log likelihood	23.30367	Hannan-Quinn criter.	-0.984131
F-statistic	24.27575	Durbin-Watson stat	1.961373
Prob(F-statistic)	0.000015		

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.036577	0.0000
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGRES,2)
Method: Least Squares
Date: 04/09/21 Time: 11:52
Sample (adjusted): 1979 2020
Included observations: 42 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGRES(-1))	-0.919547	0.152329	-6.036577	0.0000
C	0.032843	0.033244	0.987926	0.3291

R-squared	0.476716	Mean dependent var	0.009232
Adjusted R-squared	0.463633	S.D. dependent var	0.292135
S.E. of regression	0.213951	Akaike info criterion	-0.199692
Sum squared resid	1.831001	Schwarz criterion	-0.116946
Log likelihood	6.193529	Hannan-Quinn criter.	-0.169362
F-statistic	36.44026	Durbin-Watson stat	1.646808
Prob(F-statistic)	0.000000		

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.488687	0.0133
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGREM,2)
Method: Least Squares
Date: 04/09/21 Time: 11:55
Sample (adjusted): 1980 2020
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

D(LOGREM(-1))	-0.776210	0.222493	-3.488687	0.0012
D(LOGREM(-1),2)	-0.249719	0.140290	-1.780024	0.0831
C	0.064695	0.049748	1.300465	0.2013

R-squared	0.574118	Mean dependent var	-0.011007
Adjusted R-squared	0.551704	S.D. dependent var	0.441954
S.E. of regression	0.295910	Akaike info criterion	0.472832
Sum squared resid	3.327380	Schwarz criterion	0.598215
Log likelihood	-6.693047	Hannan-Quinn criter.	0.518489
F-statistic	25.61334	Durbin-Watson stat	1.938818
Prob(F-statistic)	0.000000		

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.649848	0.0000
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGOILPRICE,2)
Method: Least Squares
Date: 04/09/21 Time: 11:57
Sample (adjusted): 1980 2020
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGOILPRICE(-1))	-1.232721	0.218187	-5.649848	0.0000
D(LOGOILPRICE(-1),2)	0.359319	0.160359	2.240709	0.0310
C	0.015193	0.015906	0.955204	0.3455

R-squared	0.492410	Mean dependent var	-0.004472
Adjusted R-squared	0.465694	S.D. dependent var	0.135780
S.E. of regression	0.099250	Akaike info criterion	-1.711994

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Sum squared resid	0.374321	Schwarz criterion	-1.586611
Log likelihood	38.09588	Hannan-Quinn criter.	-1.666336
F-statistic	18.43175	Durbin-Watson stat	1.897377
Prob(F-statistic)	0.000003		

Date: 04/09/21 Time: 11:59
Sample (adjusted): 1981 2020
Included observations: 40 after adjustments
Trend assumption: No deterministic trend
Series: LOGEXCH LOGRES LOGREM LOGOILPRICE
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.490919	48.14059	40.17493	0.0065
At most 1	0.309292	21.13468	24.27596	0.1183
At most 2	0.116142	6.333146	12.32090	0.3966
At most 3	0.034268	1.394770	4.129906	0.2781

Trace test indicates 1 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 *	0.490919	27.00591	24.15921	0.0201
At most 1	0.309292	14.80153	17.79730	0.1335
At most 2	0.116142	4.938376	11.22480	0.4860
At most 3	0.034268	1.394770	4.129906	0.2781

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

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Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LOGEXCH	LOGRES	LOGREM	LOGOILPRICE
8.170063	-3.897121	1.822495	3.249570
-1.219087	-0.462561	1.366768	-3.427426
1.180988	-0.789416	-0.422006	5.454333
-0.113814	0.391547	0.141678	-3.784107

Unrestricted Adjustment Coefficients (alpha):

D(LOGEXCH)	-0.026806	0.044997	0.022696	0.000365
D(LOGRES)	-0.017756	0.044225	-0.036800	-0.017563
D(LOGREM)	-0.152863	0.002256	-0.027699	-0.018532
D(LOGOILPRICE)	-0.007677	0.009866	-0.024614	0.009726

1 Cointegrating Equation(s): Log likelihood 108.3460

Normalized cointegrating coefficients (standard error in parentheses)

LOGEXCH	LOGRES	LOGREM	LOGOILPRICE
1.000000	-0.477000	0.223070	0.397741
	(0.02673)	(0.04202)	(0.16283)

Adjustment coefficients (standard error in parentheses)

D(LOGEXCH)	-0.219005
	(0.17029)
D(LOGRES)	-0.145067
	(0.25985)
D(LOGREM)	-1.248896
	(0.31789)
D(LOGOILPRICE)	-0.062723
	(0.14370)

2 Cointegrating Equation(s): Log likelihood 115.7468

Normalized cointegrating coefficients (standard error in parentheses)

LOGEXCH	LOGRES	LOGREM	LOGOILPRICE

1.000000	0.000000	-0.525604	1.742095
		(0.15320)	(0.89246)
0.000000	1.000000	-1.569546	2.818352
		(0.32178)	(1.87451)

Adjustment coefficients (standard error in parentheses)

D(LOGEXCH)	-0.273860	0.083651
	(0.15662)	(0.07441)
D(LOGRES)	-0.198980	0.048740
	(0.25314)	(0.12027)
D(LOGREM)	-1.251647	0.594680
	(0.32139)	(0.15269)
D(LOGOILPRICE)	-0.074751	0.025355
	(0.14444)	(0.06862)

3 Cointegrating Equation(s): Log likelihood 118.2160

Normalized cointegrating coefficients (standard error in parentheses)

LOGEXCH	LOGRES	LOGREM	LOGOILPRICE
1.000000	0.000000	0.000000	-1.098275
			(0.21869)
0.000000	1.000000	0.000000	-5.663499
			(0.62475)
0.000000	0.000000	1.000000	-5.404015
			(0.39152)

Adjustment coefficients (standard error in parentheses)

D(LOGEXCH)	-0.247057	0.065735	0.003070
	(0.15395)	(0.07386)	(0.04274)
D(LOGRES)	-0.242441	0.077791	0.043614
	(0.24879)	(0.11935)	(0.06908)
D(LOGREM)	-1.284359	0.616546	-0.263818
	(0.32159)	(0.15428)	(0.08929)
D(LOGOILPRICE)	-0.103819	0.044785	0.009881
	(0.14045)	(0.06738)	(0.03900)

Vector Autoregression Estimates
Date: 04/09/21 Time: 12:16
Sample (adjusted): 1979 2020
Included observations: 42 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LOGEXCH	LOGRES	LOGREM	LOGIOLPRICE
LOGEXCH(-1)	1.196305	0.026445	0.038896	-0.112893
	(0.16014)	(0.22640)	(0.29911)	(0.12261)
	[7.47052]	[0.11681]	[0.13004]	[-0.92079]
LOGEXCH(-2)	-0.315134	-0.166907	-0.884715	0.061336
	(0.17154)	(0.24251)	(0.32040)	(0.13133)
	[-1.83712]	[-0.68824]	[-2.76128]	[0.46702]
LOGRES(-1)	-0.171287	1.020511	0.159076	0.019653
	(0.13603)	(0.19232)	(0.25408)	(0.10415)
	[-1.25917]	[5.30645]	[0.62608]	[0.18870]
LOGRES(-2)	0.093225	-0.346418	0.008395	0.041704
	(0.13404)	(0.18950)	(0.25037)	(0.10263)
	[0.69549]	[-1.82803]	[0.03353]	[0.40637]
LOGREM(-1)	0.123469	-0.227581	0.528621	0.006802
	(0.08741)	(0.12358)	(0.16327)	(0.06693)
	[1.41249]	[-1.84157]	[3.23771]	[0.10164]
LOGREM(-2)	-0.109516	0.308998	0.323847	0.017942
	(0.08313)	(0.11753)	(0.15528)	(0.06365)
	[-1.31733]	[2.62905]	[2.08556]	[0.28188]
LOGOILPRICE(-1)	0.455038	0.602885	0.077905	0.914457
	(0.26121)	(0.36929)	(0.48789)	(0.19999)
	[1.74203]	[1.63255]	[0.15968]	[4.57250]
LOGOILPRICE(-2)	-0.364455	-0.483989	-0.259653	-0.199043
	(0.24986)	(0.35324)	(0.46669)	(0.19130)
	[-1.45864]	[-1.37014]	[-0.55637]	[-1.04048]
C	0.751174	2.678986	1.800438	-0.285215
	(0.72065)	(1.01883)	(1.34605)	(0.55175)
	[1.04235]	[2.62947]	[1.33757]	[-0.51692]

R-squared	0.796240	0.918722	0.973469	0.907892
Adj. R-squared	0.746844	0.899019	0.967038	0.885562
Sum sq. resids	0.609368	1.217954	2.125932	0.357204
S.E. equation	0.135889	0.192114	0.253815	0.104040
F-statistic	16.11941	46.62692	151.3552	40.65921
Log likelihood	29.29763	14.75503	3.057225	40.51403
Akaike AIC	-0.966554	-0.274049	0.282989	-1.500668
Schwarz SC	-0.594196	0.098309	0.655347	-1.128310
Mean dependent	2.100898	9.950813	8.855665	1.493573
S.D. dependent	0.270078	0.604558	1.398004	0.307551

Determinant resid covariance (dof adj.)	2.91E-07
Determinant resid covariance	1.11E-07
Log likelihood	97.95713
Akaike information criterion	-2.950340
Schwarz criterion	-1.460908
Number of coefficients	36

Vector Error Correction Estimates
Date: 04/10/21 Time: 14:01
Sample (adjusted): 1981 2020
Included observations: 40 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LOGEXCH(-1)	1.000000
LOGOILPRICE(-1)	24.56832 (5.98538) [4.10473]
LOGREM(-1)	3.220574 (1.27928) [2.51749]
LOGRES(-1)	-21.52249 (4.17864) [-5.15060]
C	146.3467

Error Correction:	D(LOGEXCH)	D(LOGOILPRICE)	D(LOGREM)	D(LOGRES)
CointEq1	-0.006762	-0.007733	0.023929	0.022857
	(0.00651)	(0.00542)	(0.01480)	(0.00903)
	[-1.03914]	[-1.42664]	[1.61704]	[2.53037]
D(LOGEXCH(-1))	0.053266	-0.090088	0.085335	0.224862
	(0.17861)	(0.14878)	(0.40619)	(0.24795)
	[0.29823]	[-0.60551]	[0.21009]	[0.90689]
D(LOGEXCH(-2))	-0.014125	0.026495	-0.442955	0.066583
	(0.17434)	(0.14523)	(0.39649)	(0.24202)
	[-0.08102]	[0.18244]	[-1.11720]	[0.27511]
D(LOGEXCH(-3))	-0.027356	-0.172803	-0.229883	-0.253824
	(0.16140)	(0.13444)	(0.36705)	(0.22406)
	[-0.16949]	[-1.28532]	[-0.62630]	[-1.13286]
D(LOGOILPRICE(-1))	0.469799	0.174858	0.200207	0.351907
	(0.24903)	(0.20744)	(0.56634)	(0.34571)
	[1.88653]	[0.84294]	[0.35351]	[1.01793]
D(LOGOILPRICE(-2))	0.232399	-0.392433	-0.261372	-0.536072
	(0.25675)	(0.21387)	(0.58390)	(0.35642)
	[0.90516]	[-1.83491]	[-0.44763]	[-1.50403]
D(LOGOILPRICE(-3))	0.112297	0.075073	-0.120003	-0.233953
	(0.26446)	(0.22029)	(0.60143)	(0.36713)
	[0.42463]	[0.34079]	[-0.19953]	[-0.63725]
D(LOGREM(-1))	0.175834	-0.043895	-0.054597	-0.233524
	(0.09092)	(0.07573)	(0.20676)	(0.12621)
	[1.93401]	[-0.57960]	[-0.26405]	[-1.85023]
D(LOGREM(-2))	0.102118	0.034609	0.383632	0.002944
	(0.08966)	(0.07468)	(0.20390)	(0.12446)
	[1.13899]	[0.46341]	[1.88150]	[0.02365]
D(LOGREM(-3))	0.159052	0.118318	-0.168121	-0.096799
	(0.09409)	(0.07838)	(0.21398)	(0.13062)

	[1.69042]	[1.50960]	[-0.78568]	[-0.74108]
D(LOGRES(-1))	-0.253405	0.016036	0.104657	0.508908
	(0.16776)	(0.13975)	(0.38153)	(0.23289)
	[-1.51048]	[0.11475]	[0.27431]	[2.18514]
D(LOGRES(-2))	-0.259281	-0.051472	0.202369	-0.080632
	(0.15518)	(0.12926)	(0.35290)	(0.21542)
	[-1.67088]	[-0.39820]	[0.57344]	[-0.37430]
D(LOGRES(-3))	-0.390912	-0.107825	0.318685	0.293372
	(0.15476)	(0.12892)	(0.35196)	(0.21485)
	[-2.52587]	[-0.83639]	[0.90545]	[1.36550]
C	-0.034216	0.007305	0.032067	0.035556
	(0.02441)	(0.02033)	(0.05550)	(0.03388)
	[-1.40202]	[0.35933]	[0.57776]	[1.04948]
R-squared	0.481119	0.274694	0.336958	0.461662
Adj. R-squared	0.221679	-0.087958	0.005437	0.192492
Sum sq. resids	0.447093	0.310231	2.312358	0.861621
S.E. equation	0.131133	0.109234	0.298223	0.182042
F-statistic	1.854449	0.757458	1.016399	1.715135
Log likelihood	33.11982	40.42880	0.254696	19.99884
Akaike AIC	-0.955991	-1.321440	0.687265	-0.299942
Schwarz SC	-0.364883	-0.730332	1.278373	0.291166
Mean dependent	-0.009305	0.011154	0.071267	0.018662
S.D. dependent	0.148639	0.104725	0.299037	0.202581

Determinant resid covariance (dof adj.)	2.56E-07
Determinant resid covariance	4.57E-08
Log likelihood	110.9945
Akaike information criterion	-2.549726
Schwarz criterion	-0.016407
Number of coefficients	60

System: UNTITLED
Estimation Method: Least Squares
Date: 04/10/21 Time: 14:05
Sample: 1981 2020
Included observations: 40
Total system (balanced) observations 160

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.006762	0.006507	-1.039140	0.3011
C(2)	0.053266	0.178608	0.298231	0.7661
C(3)	-0.014125	0.174341	-0.081019	0.9356
C(4)	-0.027356	0.161397	-0.169492	0.8657
C(5)	0.469799	0.249028	1.886532	0.0620
C(6)	0.232399	0.256748	0.905163	0.3675
C(7)	0.112297	0.264459	0.424631	0.6720
C(8)	0.175834	0.090917	1.934006	0.0558
C(9)	0.102118	0.089656	1.138990	0.2573
C(10)	0.159052	0.094090	1.690420	0.0939
C(11)	-0.253405	0.167764	-1.510481	0.1340
C(12)	-0.259281	0.155176	-1.670884	0.0978
C(13)	-0.390912	0.154763	-2.525871	0.0130
C(14)	-0.034216	0.024405	-1.402018	0.1639
C(15)	-0.007733	0.005420	-1.426638	0.1567
C(16)	-0.090088	0.148780	-0.605509	0.5462
C(17)	0.026495	0.145226	0.182439	0.8556
C(18)	-0.172803	0.134444	-1.285322	0.2015
C(19)	0.174858	0.207440	0.842936	0.4012
C(20)	-0.392433	0.213871	-1.834906	0.0694
C(21)	0.075073	0.220294	0.340785	0.7340
C(22)	-0.043895	0.075734	-0.579603	0.5634
C(23)	0.034609	0.074684	0.463408	0.6440
C(24)	0.118318	0.078377	1.509598	0.1342
C(25)	0.016036	0.139747	0.114752	0.9089
C(26)	-0.051472	0.129261	-0.398202	0.6913
C(27)	-0.107825	0.128917	-0.836391	0.4049
C(28)	0.007305	0.020329	0.359327	0.7201
C(29)	0.023929	0.014798	1.617038	0.1089
C(30)	0.085335	0.406190	0.210087	0.8340
C(31)	-0.442955	0.396486	-1.117201	0.2665
C(32)	-0.229883	0.367050	-0.626299	0.5325
C(33)	0.200207	0.566340	0.353511	0.7244
C(34)	-0.261372	0.583897	-0.447634	0.6553
C(35)	-0.120003	0.601432	-0.199529	0.8422
C(36)	-0.054597	0.206764	-0.264054	0.7923
C(37)	0.383632	0.203897	1.881499	0.0627
C(38)	-0.168121	0.213980	-0.785683	0.4338
C(39)	0.104657	0.381530	0.274308	0.7844
C(40)	0.202369	0.352902	0.573444	0.5676
C(41)	0.318685	0.351962	0.905453	0.3673
C(42)	0.032067	0.055502	0.577762	0.5647

C(43)	0.022857	0.009033	2.530372	0.0129
C(44)	0.224862	0.247947	0.906892	0.3666
C(45)	0.066583	0.242024	0.275110	0.7838
C(46)	-0.253824	0.224055	-1.132861	0.2599
C(47)	0.351907	0.345707	1.017934	0.3111
C(48)	-0.536072	0.356424	-1.504031	0.1356
C(49)	-0.233953	0.367128	-0.637252	0.5254
C(50)	-0.233524	0.126213	-1.850231	0.0671
C(51)	0.002944	0.124463	0.023651	0.9812
C(52)	-0.096799	0.130618	-0.741085	0.4603
C(53)	0.508908	0.232894	2.185144	0.0311
C(54)	-0.080632	0.215419	-0.374301	0.7089
C(55)	0.293372	0.214846	1.365501	0.1750
C(56)	0.035556	0.033880	1.049484	0.2964

Determinant residual covariance 4.57E-08

Equation: D(LOGEXCH) = C(1)*(LOGEXCH(-1) + 24.5683232755
*LOGOILPRICE(-1) + 3.22057359525*LOGREM(-1) - 21.5224947446
*LOGRES(-1) + 146.346684491) + C(2)*D(LOGEXCH(-1)) + C(3)
*D(LOGEXCH(-2)) + C(4)*D(LOGEXCH(-3)) + C(5)*D(LOGOILPRICE(
-1)) + C(6)*D(LOGOILPRICE(-2)) + C(7)*D(LOGOILPRICE(-3)) + C(8)
*D(LOGREM(-1)) + C(9)*D(LOGREM(-2)) + C(10)*D(LOGREM(-3)) +
C(11)*D(LOGRES(-1)) + C(12)*D(LOGRES(-2)) + C(13)*D(LOGRES(
-3)) + C(14)

Observations: 40

R-squared	0.481119	Mean dependent var	-0.009305
Adjusted R-squared	0.221679	S.D. dependent var	0.148639
S.E. of regression	0.131133	Sum squared resid	0.447093
Durbin-Watson stat	1.735999		

Equation: D(LOGOILPRICE) = C(15)*(LOGEXCH(-1) + 24.5683232755
*LOGOILPRICE(-1) + 3.22057359525*LOGREM(-1) - 21.5224947446
*LOGRES(-1) + 146.346684491) + C(16)*D(LOGEXCH(-1)) + C(17)
*D(LOGEXCH(-2)) + C(18)*D(LOGEXCH(-3)) + C(19)
*D(LOGOILPRICE(-1)) + C(20)*D(LOGOILPRICE(-2)) + C(21)
*D(LOGOILPRICE(-3)) + C(22)*D(LOGREM(-1)) + C(23)*D(LOGREM(
-2)) + C(24)*D(LOGREM(-3)) + C(25)*D(LOGRES(-1)) + C(26)
*D(LOGRES(-2)) + C(27)*D(LOGRES(-3)) + C(28)

Observations: 40

R-squared	0.274694	Mean dependent var	0.011154
Adjusted R-squared	-0.087958	S.D. dependent var	0.104725
S.E. of regression	0.109234	Sum squared resid	0.310231

Durbin-Watson stat 1.904427

Equation: D(LOGREM) = C(29)*(LOGEXCH(-1) + 24.5683232755
*LOGOILPRICE(-1) + 3.22057359525*LOGREM(-1) - 21.5224947446
*LOGRES(-1) + 146.346684491) + C(30)*D(LOGEXCH(-1)) + C(31)
*D(LOGEXCH(-2)) + C(32)*D(LOGEXCH(-3)) + C(33)
*D(LOGOILPRICE(-1)) + C(34)*D(LOGOILPRICE(-2)) + C(35)
*D(LOGOILPRICE(-3)) + C(36)*D(LOGREM(-1)) + C(37)*D(LOGREM(
-2)) + C(38)*D(LOGREM(-3)) + C(39)*D(LOGRES(-1)) + C(40)
*D(LOGRES(-2)) + C(41)*D(LOGRES(-3)) + C(42)
Observations: 40

R-squared	0.336958	Mean dependent var	0.071267
Adjusted R-squared	0.005437	S.D. dependent var	0.299037
S.E. of regression	0.298223	Sum squared resid	2.312358
Durbin-Watson stat	2.030977		

Equation: D(LOGRES) = C(43)*(LOGEXCH(-1) + 24.5683232755
*LOGOILPRICE(-1) + 3.22057359525*LOGREM(-1) - 21.5224947446
*LOGRES(-1) + 146.346684491) + C(44)*D(LOGEXCH(-1)) + C(45)
*D(LOGEXCH(-2)) + C(46)*D(LOGEXCH(-3)) + C(47)
*D(LOGOILPRICE(-1)) + C(48)*D(LOGOILPRICE(-2)) + C(49)
*D(LOGOILPRICE(-3)) + C(50)*D(LOGREM(-1)) + C(51)*D(LOGREM(
-2)) + C(52)*D(LOGREM(-3)) + C(53)*D(LOGRES(-1)) + C(54)
*D(LOGRES(-2)) + C(55)*D(LOGRES(-3)) + C(56)
Observations: 40

R-squared	0.461662	Mean dependent var	0.018662
Adjusted R-squared	0.192492	S.D. dependent var	0.202581
S.E. of regression	0.182042	Sum squared resid	0.861621
Durbin-Watson stat	2.062642		