



**NEAR EAST UNIVERSITY  
INSTITUTE OF GRADUATE STUDIES  
DEPARTMENT OF BANKING AND FINANCE**

**AN ASSESSMENT OF THE IMPACT OF EXCHANGE RATE AND  
RENEWABLE ENERGY CONSUMPTION ON NIGERIA'S ECONOMIC  
GROWTH (1990 -2019)**

**MASTER THESIS**

**JAJU ODELL BREWER-DIGGS**

**Nicosia**

**January, 2023**

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Exchange Rate and Renewable  
Energy Consumption on Nigeria's  
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**Supervisor  
Prof. Dr. Turgut Tursoy**

**Nicosia**

**January, 2023**

### Approval

We certify that we have read the thesis submitted by Jaju Odell Brewer-Diggs titled "An Assessment of The Impact of Exchange Rate and Renewable Energy Consumption on Nigeria's Economic Growth (1990 -2019)" and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science in Banking and Finance.

Examining Committee	Name-Surname	Signature
Head of the Committee:	Assoc. Prof. Dr. Turgut Tursoy	
Committee Member:	Asst. Prof. Dr. Mehdi Seraj	
Committee Member:	Asst. Prof. Dr. Ala Fathi	
Supervisor:	Assoc. Prof. Dr. Turgut Tursoy	

Approved by the Head of the Department

13 /11/2023



Head of Department

Approved by the Institute of Graduate Studies

...../...../2023

Prof. Dr. Kemal Ercan Başer

Head of the Institute



## **Declaration**

I hereby declare that all information, documents, analysis, and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of the Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

JAJU ODELL BREWER-DIGGS

/ /2023

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Additionally, I would like to dedicate this resourceful work to my parents Mr. and Mrs, Otis M. Reeves whose support from childhood until now, has brought me to this level. I also dedicate this paper to my special father His Honor Joe S. Barkon, for supporting me both financially and prayerfully. This thesis is also dedicated to my husband Mr. Julius G. Diggs Sr. who stood beside me morally and financially during this endeavor and to all of the brothers and sisters not forgetting other relatives whose names I did not mention.

To God Be the Glory.

**JAJU ODELL BREWER-DIGGS**

**Abstract****AN ASSESSMENT OF THE IMPACT OF EXCHANGE RATE AND  
RENEWABLE ENERGY CONSUMPTION ON NIGERIA'S ECONOMIC  
GROWTH (1990 -2019)****ODELL BREWER-DIGGS, JAJU****Supervisor, Prof. Dr. Turgut Tursoy****MSc, Department of Banking and Finance****December, 2023, 94 pages**

This study looks at how the Nigerian economy has changed in connection to the country's utilization of alternative energy sources and its currency exchange rate (1990–2019). Exchange rate policies in growing nations are typically delicate and contentious due to the necessary type of structural transformation, including reduced imports and increased non-oil exports, both of which entail a decrease in the nominal rate of exchange. This is due to the type of structural change that is necessary. It is generally believed that domestic adjustments are detrimental to the economy because of their short-run effect on prices and demand. Ironically, the issues that are produced by a system that artificially inflates currency rates are seldom discussed in developing nations, which depend on imports for both consumption and production. The extent of the instabilities in the exchange rate caused by internal and external shocks is the primary topic of discussion here. The increased global competitiveness of indigenous industries is evidence of this, which leads to a shift in expenditure away from imported items whose prices have grown and toward those produced domestically. The ARDL technique and the bound approach are both used in the research. The findings indicate that fluctuations in the value of Nigeria's economic growth are negatively impacted by the naira both immediately and over time. Whereas the effect of interest rates is adequate. Shortly, using renewable energy sources has been shown to have a beneficial effect on growth, but that will be in the long run, this influence has been shown to have a negative impact. When it comes to the effect that macroeconomic issues have on the exchange rate, some repercussions may go either way. The Nigerian government must take several steps to guarantee that the country is

politically stable, that sufficient infrastructure is built, and that a good macroeconomic strategy maintains stable foreign currencies and interest rates. The research's findings lead to the recommendation that methods that aim to keep the inflation rate steady are put into practice. The rise in Nigeria's Gross Domestic Product (GDP) during the last several years, could be a sign that international Investors' confidence in the country's economic growth and ability to maintain stability is improving in the face of economic upheaval on a global scale.

**Keywords:** Exchange rate, GDP growth, Macroeconomic, Real interest rate, Renewable energy

**ÖZ****AN ASSESSMENT OF THE IMPACT OF EXCHANGE RATE AND  
RENEWABLE ENERGY CONSUMPTION ON NIGERIA'S ECONOMIC  
GROWTH (1990 -2019)****ODELL BREWER-DIGGS, JAJU****Supervisor, Prof. Dr. Turgut Tursoy****MSc, Department of Banking and Finance****December, 2023, 94 pages**

Bu çalışma, Nijerya ekonomisinin ülkenin alternatif enerji kaynakları kullanımını ve döviz kuru (1990–2019) ile bağlantılı olarak nasıl değiştiğine bakıyor. Büyüyen ülkelerdeki döviz kuru politikaları, her ikisi de nominal döviz kurunda bir düşüşe yol açan, azalan ithalat ve artan petrol dışı ihracat da dahil olmak üzere gerekli yapısal dönüşüm türü nedeniyle tipik olarak hassas ve tartışmalıdır. Bu, gerekli olan yapısal değişikliğin türünden kaynaklanmaktadır. Genel olarak yurt içi ayarlamaların fiyatlar ve talep üzerindeki kısa vadeli etkileri nedeniyle ekonomiye zarar verdiği inanılmaktadır. İronik bir şekilde, döviz kurlarını yapay olarak şişiren bir sistem tarafından üretilen sorunlar, hem tüketim hem de üretim için ithalata bağımlı olan gelişmekte olan ülkelerde nadiren tartışılıyor. Döviz kurunda iç ve dış şokların neden olduğu istikrarsızlıkların boyutu burada öncelikli tartışma konusudur. Yerli sanayilerin artan küresel rekabet gücü bunun kanıtıdır ve bu da harcamalarda fiyatları artan ithal ürünlerden yurt içinde üretilenlere doğru bir kaymaya yol açar. Araştırmada hem ARDL tekniği hem de sınır yaklaşımı kullanılmıştır. Bulgular, Nijerya'nın ekonomik büyümesinin değerindeki dalgalanmaların hem hemen hem de zaman içinde nairadan olumsuz etkilendiğini gösteriyor. faiz oranlarının etkisi ise yeterlidir. Kısaca, yenilenebilir enerji kaynaklarının kullanılmasının büyüme üzerinde olumlu bir etkisi olduğu gösterilmişse de, bu uzun vadede olacak, bu etkinin olumsuz bir etkisi olduğu gösterilmiştir. Makroekonomik sorunların döviz kuru üzerindeki etkisine gelince, her iki yönde de olabilecek yansımalar var. Nijerya hükümetinin ülkenin siyasi olarak istikrarlı olmasını, yeterli altyapının inşa edilmesini ve iyi bir makroekonomik stratejinin istikrarlı döviz ve faiz oranlarını sürdürmesini garanti



edecek bir dizi adım atması çok önemlidir. Araştırmanın bulguları, enflasyon oranını sabit tutmayı amaçlayan yöntemlerin uygulamaya konmasını önermektedir. Nijerya'nın Gayri Safi Yurtiçi Hasılasındaki (GSYİH) son birkaç yıldaki artış, uluslararası yatırımcıların ülkenin ekonomik büyümesine ve istikrarı koruma yeteneğine olan güveninin, küresel ölçekteki ekonomik çalkantı karşısında geliştiğinin bir işareti olabilir.

**Anahtar kelimeler:** Döviz kuru, GSYİH büyümesi, Makroekonomik, Reel faiz oranı, Yenilenebilir enerji

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**LIST OF ABBREVIATIONS**

**ADF** Augmented Dickey-Fuller

**AFEM** Autonomy Foreign Currency Market

**APY** Annual Percentage Yield

**ARDL** Autoregressive Distributed Lag

**BLADE** Business Longitudinal Analysis Environment

**BOP** Balance of Payment

**CBN** Central Bank of Nigeria

**CD** Certificate of Deposit

**CUSUM** Cumulative Sum

**CUSUMQ** Cumulative Sum of Square

**DIR** Defensive Interval Ratio

**DSP** Digital Signal Processing

**EC** Economic Capital

**ECM** Error Correction Model

**EMU** European Monetary Union

**EXP** Exponential

**FDI** Foreign Direct Investment

**GARCH** Generalized Autoregressive Heteroscedasticity Method

**GDP** Gross Domestic Product

**GLS** Generalized Least Square

**GMM** Generalized Method of Moments

**IEA** International Energy Agency

**IFEM** Inter-Bank Foreign Exchange Market

**IMF** International Monetary Fund

**INF** Infinity

**IPI** Industrial Production Index

**NEEDS** National Economic Empowerment and Development Strategy

**NSC** Nigeria Stock Exchange

**OCA** Optimum Currency Area

**OECD** Organization for Economic Cooperation and Development

**OLS** Ordinary Least Square

**PPP** Purchasing Power Parity

**RE** Renewable Energy

**REER** Real Effective Exchange Rate

**RIR** Real Interest Rate

**SAP** Structural Adjustment Project

**SIDS** Small Islands Developing State

**TSP** Thrift Saving Plans

**VECM** Vector Error Correction Model



## **CHAPTER I**

### **Introduction**

Due to the necessary structural change, such as either less imports or more non-oil exports, each of which cause the nominal exchange rate to decrease, policy of exchange rates in developing nations are frequently complicated and divisive. Residential modifications are viewed as detrimental to the economy because of their immediate effects on pricing and request to developing countries that rely on both production and consumption that are dependent on imports, because the problems caused by an inflated exchange rate system are rarely discussed.

The study focuses primarily on the magnitude of exchange rate swings caused mostly by internal and external factors. There seems to be widespread agreement that devaluation or depreciation may improve domestic output by raising the element of net export. The increased in global competitiveness of indigenous industries is evidence of this. which leads toward a shift in expenditure from foreign commodities whose fees have risen to local ones. currency devaluation enhances the equilibrium of trade which primarily depends on correctly reorienting demand and quantity, and also the capability of the domestic economy to meet the increased request by producing added goods (Guitan, 1976; Dornbusch, 1988). Overall, exchange rate variations are expected to influence monetary performance. Consequently, it is crucial to evaluate how volatility in exchange rates influences inflation in the economy and the growth of the economy. Beginning with the time immediately following independence, when the nation kept its stable from the 1970s oil boom till the 1986 currency float following the economy's nearly catastrophic collapse, the dollar was at parity with the British pound. Nigeria's exchange rate policy underwent a dramatic transformation between 1982 and 1985. the political and economic concerns behind the exchange rate procedure have significant ramifications for the organizational development of each of these epochs' real income, inflation, the balance of payments, and economic conditions. As a result, this study's objective aims to look into the impact of fluctuations in the exchange rate on Nigeria's economic expansion. The potential linkages, both direct and indirect, were specifically studied. Previous efforts to undertake econometric research on how exchange rates are set and production fluctuations studies in Nigeria have indeed been completed, by Akinlo et al. (2003) and Egwaikhide et al.

(1994). These previous efforts, however, had been using a single equation regression method. Because developing countries are undergoing a variety of structural changes exchange rate policy in their economy appears to be delicate and contentious; as a result, states make additional efforts to regulate their currency exchange practices. The currency rate regime in Nigeria has evolved significantly since the country's initial time following independence, it kept a set parity with the British pound, to the economy's almost total breakdown between 1982 and 1985, which led to the floating of the currency in (since) 1986. Akpan et al. (2011) reported that in the early 1970s and 1980s, there was a correlation between the value of the Nigerian naira with other currencies, primarily the dollar in the US. The naira was overvalued as a result of this exchange rate policy, which saw it fluctuate between 0.71 and 0.89 to the US dollar from 1970 to 1985. This boosted all kinds of imports while discouraging non-oil exports. Because of its high sensitivity to exogenous shocks, post-SAP era has seen a significant degree of fluctuations in the exchange rate of the Nigerian economy. The recent global economic crisis had a dramatic effect on Nigerian currency, as the Naira's value relative to the dollar skyrocketed between 2008 and 2009, from roughly N120 per \$1 to about N180 per \$1 (a 50% rise). This is largely attributable to the prolonged decline in the crude oil price, which fell from a record high of US\$147 a gallon in 2007, July to an all-time lowest of US\$45 per barrel in 2008, December. (CBN,2008). A key first step in comprehending exchange rates is to consider supply and demand; we need to comprehend international financial investors' views and behaviours, particularly when dealing with floating exchange rates. Foreign exchange transactions worth billions of Naira every day are allegedly linked to both positioning or changing the currency composition of foreign investors' portfolios as well as international trade in commodities and services. As a result, a country's exchange rate policy turns out to be very defenceless macroeconomic jolts. Countries favour pursuing exchange rate strategies that mitigate shocks to the domestic and international trading systems reason that the economy performs better if the economy is more stable and shocks are less disruptive under such a regime.

Nigeria has had a variety of exchange systems. Throughout the era of the fixed exchange rate, frequent volatility within the currencies led to a stable exchange rate, yet the economy was deteriorating at an alarming rate, necessitating a transformation, which

is why a flexible exchange rate was chosen. The naira is depreciating every day, thus managing the floating exchange rate has not been successful numerous macroeconomic variables are unstable. The outcomes of numerous macroeconomic shocks rely on the regulation of the country's exchange rate; it is therefore crucial that we look into how fluctuations in exchange rate affect Nigeria's economic expansion, adding to the factors which influence Nigeria's exchange rate and utilization of renewable energy.

Products and services flow between national borders suggests that foreign currency go in contrary directions. This necessitates the establishment of exchange rates between two trading partners' currencies in order to discharge debts incurred as a result of commerce between them (Nzotta, 2009). What a currency is worth managing in the market is known as the exchange rate, and it changes over the period. The variables that provide a genuine market-based naira rate of exchange in order to balance Nigeria's finances include public policy, the relationship between demand and supply, the operations of the Nigerian Stock Exchange (NSE), global commerce, the abundant supply of crude oil, and the overall economic crisis. Reduced pressure on the balance of payments will limit the rise of trade deficits, reduce imports, raise exports, and give conditions for self-sufficiency and steady development.

Unfortunately, despite the adoption of many institutional changes The Nigerian foreign currency market has not performed well compared to other markets, including the Autonomy Foreign Currency Market (AFEM) (1995), the Bureau de Change (1989), and also the Interbank Foreign Exchange Market (IFEM) (1999). Obadan (2006) asserts that the division of foreign currency profits is due to issues such as a weak capital market, inadequate risk management, and the Bureau's side de Change's inability to achieve a steady and efficient exchange rate within Nigeria's economy.

In international finance, structures of exchange rate and interest rates remain popular issues since more economies accept international banking and are accepting trade liberalization as a condition for economic development in rising nations. There are numerous empirical and theoretical studies dedicated to establishing the best optimal regime that increases economic development and has substantial effects on macroeconomic and financial variables. In Nigeria, for example, currency rates and interest rates used to be controlled by the government, but now they are set by the market.

However, the effects of such initiatives on Nigeria's economic development have remained contentious. Some scholars suggest that large credit costs are established, which stifles economic activity (Ben et al. 2010).

Due to the global economic downturn, Nigeria's economy began to encounter crises in the early 1980s, which had catastrophic implications on world commodities prices. This resulted in structural imbalances brought on by the drop in oil prices, which hurt the country's economy. As a consequence, there was a massive budget deficit. Despite declining domestic investment intake, there is a current account deficit, rising unemployment, and inflation. The present situation regarding the international financial catastrophe, that began in the US and extended to other parts of the globe, is catching up with Nigeria's economy, especially her banking sector.

The reaction of policymakers to these waves of outside shocks in Nigeria has always been precipitated by the implementation of one or more commercial reforms. In order to get the economy back on course for development, the government initiated the Structural Adjustment Project (SAP) at the beginning of 1986 together with both the IMF and the World Bank. NEEDS (the National Economic Empowerment and Development Strategy) is also another proposed legislation with a mutual purpose that was employed in the preceding decade which was accomplished in 2004. The overarching goal of this all-inclusive program is to halt the flood of youth joblessness and the economy's ever-increasing price level. The vision of 2030 is the current tagline for the economic growth plan. In spite of the macroeconomic climate seeming to be reasonably steady, economic essentials such as savings rate, investment rate, growth rate, unemployment rate, and poverty remain contentious concerns. As a result, macroeconomic policy in terms of policymakers has prioritized exchange rates, interest rates, domestic investment, and economic growth development partners' attention.

Despite the fact that the 1980s economic reforms saw a significant degree of improvement, particularly in the monetary sector, there remained quite numerous unsolved economic complications. In specific, interest rates have continued exceedingly high, having a disastrous effect on Nigeria's borrowing and investment costs, which have historically been the scourge of foreign investor discouragement. The rate of exchange, which was formerly equal to the US dollar before SAP, is currently around N160 to the

US dollar. The predicted economic expansion to absorb the jobless has proved elusive. The predicted diversification of the Nigerian economy from its monoculture status is of particular importance, given that the percentage of manufactured exports to overall exports remains low (Soyibo, 2010). The oil industry continues to retain its dominating position as the economy's primary source of foreign investment. Agriculture and industry, for example, are continually diminishing sectors of the economy (Okoroafor, 2010).

Additionally, the economy continues to be constrained by a large and ineffective public sector, low rates continuous large fiscal deficits, a lack of investment and savings, and an inconsistency in the macroeconomic environment. All of this has slowed economic development (Sanni, 2006) and Nigerians continue to have faith that adjustments in the currency rate and interest rate management will usher in brighter times and would have an impact on the nation's attempts to grow economically. However, the management of interest rates and currency rates on macroeconomic factors that could lead to economic growth is slow, let alone sustained. This is because, according to Owoeye and Onafowora (2007), Nigeria gains from both foreign commerce and domestic investment because incompatible with the reforms set in place to achieve strong results. Accessing cash for assets remains difficult, with lending rates exceeding deposit rates in the economy. As a consequence of over 40 years of policy reversals, particularly The Nigerian economy really hasn't made any progress in managing currency values and rates of interest profited much from the procedures. Little evidence has been found in prior studies of the influence exchange rate have on the stability on economic growth, suggesting that this factor may positively affect growth and development. Insufficient data was discovered by Ghosh et al. (2003) to support either a favourable or negative connection between exchange rate growth and currency stability manner for large nation samples. Schnabl (2007) extends Generalized Least Squares (GLS) and Generalized Method of Moments (GMM) panel estimates for 41 European Monetary Union (EMU). Periphery countries were used by Grauwe and Schnabl (2005). The findings which support currency rate instability has a very weak association with growth. Furthermore, the study has widely explored the current exchange rate system supports macroeconomic growth and stability. Flexible exchange rate advocates insisted that there is a need for adapting macroeconomics amid asymmetric shocks, whereas fixed exchange rate advocates

emphasized Frankel & Rose (2002)'s exploration (the microeconomic) benefits of lower transaction fees on foreign markets. Furthermore, according to the (International Energy Agency) IEA, Nigeria's overall supplies of energy was comprised of the following sources: natural gas (642,276.0 TJ), biomass and waste (4,928,822.0 TJ), hydro (24,280.0 TJ), oil (997,715.0 TJ), coal (1,409.00 TJ), solar and wind (149.0 TJ), and additional resources. These figures indicate that the proportion of renewable energy utilized in the cumulative power supply seems to be quite minimal. Energypedia (2021) cited a study from the IEA (2013) that reports that the economic sectors with the highest energy consumption are residential (90,709); 10,148 are agriculture and forestry, 8,736 are public and commercial services, 3,561 are unspecified, and 2,176 are non-energy usage. There were 116,457 Ktoe in all; the largest power user is the household sector. The findings of many studies indicate that RNEW and RGDP could have a positive, negative, or no relationship. Numerous research suggests a positive association or growth theory (Jiang et al., 2022; Bulut et al., 2022; Somoye et al. 2022; Bhattacharya et al., 2017; Chang & Fang, 2022). Studies on a negative association includes Namahoro et al. (2022), Chen et al. (2021a) and Ocal and Aslan (2013). Chen et al., (2020), Bulut and Muratoglu (2022), and Inal et al. (2021) are other researchers who support the no causal association or neutrality hypothesis.

### **Statement of Problem**

The study concluded that foreign exchange depreciation increases the price of native currency, which boosts the cost of traded and non-traded products. Due to reallocation of resources, industries that compete with imports now have more products available. Trade in goods, economic expansion, capital movements, inflation, and rate of interest can all be impacted by currency exchange rates. The control over the rate of exchange is recognized as a major objective of economic policy in Nigeria, with the aim to accomplish a number of varied goals, such as economic expansion, monetary policy control, and external competitiveness. Discussions of policy frequently highlight this aim, so as to provide strong evidence to support the idea that a system of improperly managed exchange rates might act as a significant barrier to increased economic performance. Nigeria implemented liberalization policies, including one of the key components being the reform

of currency exchange management. Ultimately, the previous "fixed rate" system was replaced with a "freely floating" one. Despite implementing a purportedly market-based Nigeria's currency rate system is still characterized by frequent interventions despite the introduction of a mechanism in 2003 (Hossain & Ahmed, 2009). The fear of inflationary pressure brought on by the exchange rate is major just because of not letting free markets operate. In fact, it appears that efforts have been taken to maintain the level of economic activity as much as reasonable to fix before outside balances become unmanageable. In the process, the policy focus on preserving the nation's competitiveness has been ignored. It is public knowledge that fears the exchange rates exist. Devaluation will result in higher import costs, which will then raise the cost of other goods and services through feedback effects. However, the effects of currency changes on development are frequently disregarded. The "orthodox" According to economic theory, when a nation's currency is devalued, it results in "expenditure switching" the mechanism that shifts domestic demand from imported products to domestically produced import-competitive items. Additionally, it enhances global competitiveness, which increases exports. When these two effects are combined, the overall economic activity is expanded. In view of this, this research will investigate whether Nigeria's economic expansion is impacted by the exchange rate and the consumption of renewable energy (1990 -2019).

### **Purpose of the study**

Consumption of goods from other nations is as common, if not more so, presently, as a result of globalization, as the consumption of goods created in one's own country. Currency values have a significant impact on the amount of money available to spend on imported items. When the worth of one's own currency declines, the cost of List items and services received skyrockets. Imported goods may cost less if the value of the local currency increases. Last but not least, the main aim of this study focuses on evaluating how the exchange rate and usage of renewable energy impact Nigeria's economic development.

### **Research Questions**

This study aims to examine the below-stated questions:

1. How do changes in foreign exchange rates influence the growth of a nation?

2. What is the connection between the economy of Nigeria and the use of renewable energy?
3. Do political decisions affect foreign exchange rates and renewable energy consumption on Nigeria's economic expansion?
- 4.

### Research Hypothesis

1. **H0:** In the Nigerian economy, economic growth and the exchange rate have no relationship.
2. **H1:** Economic growth and exchange rate have a relationship in the Nigerian economy.
3. **H0:** Economic growth and renewable energy have no relationship in the Nigerian economy.
4. **H1:** Economic growth and renewable energy have a relationship in the Nigerian economy.
5. **H0:** In the Nigerian economy, interest rates and economic growth have no relationship.
6. **H1:** In the Nigerian economy, interest rate and economic growth have a relationship.

### Conceptual Model

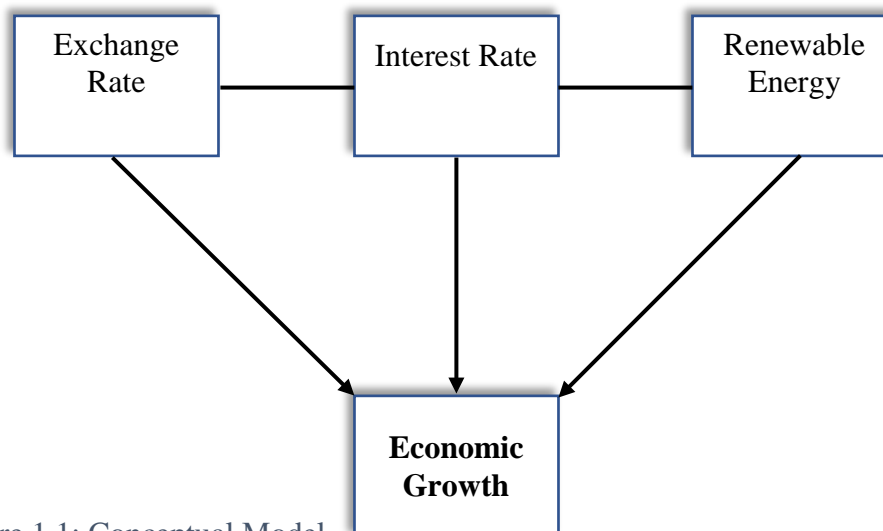


Figure 1.1: Conceptual Model



### **Significance of the Study**

This research is noteworthy because it aims to raise awareness about the effect of Nigerian exchange rates and renewable energy utilization on the nation's economic development (1990–2019). Furthermore, best practices based on accessible literature will be provided to educate researchers in the fields of energy and economic development, as well as to make the most of these practices.

Furthermore, the impetus for this study stemmed from the researcher's desire to contribute to the creation of cultural awareness regarding exchange rates and the renewable energy consumption sector that is beneficial and/or useful to: social policymakers, economic need providers, law enforcement agencies, and community-based organizations.

Thus, the purpose of this research is to persuade policymakers and service providers in the energy sector and exchange rate to recognize how the world humanitarian community used its experience in a swift reaction to economic challenges. As a result, a one-of-a-kind multispectral partnership formed by traditional public economic growth actors and humanitarian actors will facilitate mutual learning and open the door to ongoing working relationships that will hasten efficient and effective responses to future global public energy emergencies.

So, this study is important because it will try to come up with scholarly (research) material that will add to what is known about exchange rates and energy use based on statistics.

### **Limitations of the study**

There are several influencing variables for the influence of currency rates on economic growth, but in the interests of this study, only four variables will be considered: exchange rate, renewable energy consumption, rate of interest, and GDP expansion. This research covers the years 1990 to 2019 and looks at the economy as a whole during that time. This study focuses only on Nigeria's economy, despite the exchange rates fluctuations are a concern in many nations. There are other ideas on the connection between exchange rates and economic expansion, but this study is restricted to the buying power hypothesis. There are additional methods for determining the connection between

the independent and dependent variables. However, this research employed the ARDL approach to do the regression analysis.

### **Definition of Terms**

Terms vary in usage. Therefore, for our purpose, the following terms will be considered:

**Consumption** is the process of exhausting a resource: "industrialized countries should reduce their energy consumption"

**Economic Growth** is a development in the amount of goods and services output per person in a given population through time.

**Energy consumption** energy utilization is described. It involves using energy selectively for a set quantity. This has to do with how much electricity comes from energy plants or how much energy any living thing uses.

**The exchange rate** is the pace through which foreign currency is exchanged and converted to different countries or economic zones. It is crucial in assessing trade and capital transfer trends and is employed to calculate the value of exchange rates about one another.

**Renewable energy** is energy that is produced from sources that can be renewed more rapidly than they can be depleted. The wind and sun are two good examples of sources that provide a steady supply. Numerous renewable energy sources are available to us. Usage of renewable energy measures how much renewable energy is used overall.

**Interest rate:** This refers to the amount a bank or lender charges a borrower as a proportion of the principal of the loan. The average annual ratio (APR) is generally used to serve as a representation of a loan's interest rate. A bank or credit union may also apply an interest rate to the earnings from a savings account or certificate of deposit (CD). APY refers to the interest generated on these deposit accounts.

**Inflation:** Inflation is the rate of price appreciation over a specific period. Hyperinflation is usually measured by a broad indicator, like the general price increase or the growth in a nation's cost of living. For certain things, like foods, or activities, like a haircut, among many others, it may also be anticipated. Inflation measures how much a

relevant group of services and/or goods has increased in price during a specific time periodally one year, regardless of the environment.

**Balance of payments:** A summary of a country's monetary exchanges with the world at large is provided by the balance of payments. This category includes the Public. Spending as well as the export and import of goods, services, and economic ability (like foreign aid). The payment balance is an essential economic statistic for "open" countries that participate in international commerce, such as Nigeria since it summarizes the movement of resources between Nigeria and its trading partners.

## CHAPTER II

### Review of Related Literature

#### Introduction

This chapter will cover the essential literature of the research. It will draw conclusions on other sources that support this research in attempting to address one of the gaps regarding the assessment of the impact on exchange rates and the influence of renewable energy consumption on Nigeria's economic growth from 1990 to 2019. In the following discussion, the researcher will focus on finding answers to the questions that were raised in the introduction to this paper.

#### Theoretical Framework

It is possible to differentiate between a relative analysis of indicators at two distinct points in time and a correlation of the exchange rates versus PPP using time series. The older Time point carries the conventional understanding of the foundation. era according to the comparative-static framework. If the exchange rates are floating, at the time point, the "current period" could be anything. In that situation, the method is a specific example analytical time series. The subsequent era, however, should have the same features as the sequence if in some way the exchange rate determined during the same time; alternatively, at the very least, it should be a "normal" the optimal time frame for long-run exchange rate equilibrium. The two time periods' symmetry provides a balanced foundation for evaluating the PPP theory. A more challenging exam would arise from selecting the latter period at random. This analysis has a few merits because, if somehow the PPP truly represents the protracted nominal exchange rate, gold or market manipulation points should enclose the PPP in order to prevent long-term profits or losses in a nation's foreign exchange reserves.

The PPP theory has been tested in a comparative-static study by Cassel (1916) manner, similar to the time-series technique. He always starts with the pre-war era. His first experiment compared for each of the three nations with fluctuations in their exchange rates, including the PPP and real effective exchange rates using Sweden, France, Germany, and Russia as the reference countries. "The divergences between the theoretical and real rates are relatively modest, and all lie within the bounds of the mistakes inherent

in such a computation and the sporadic swings of exchange rates" (1916, p. 64). In the fall of 1918, PPP conducted a similar test on the freely floating Swedish krona. According to Cassel (1918), the Swedish krona is overvalued about the pound. He says this because Sweden has much stricter limits on what it can import than what it can send out.

The magnitude of the German mark's decline towards the end of 1919 is also examined by Cassel (1919, p. 493). "Thus, with full regard for the uncertainty of our calculation of the purchasing power parity, a tremendous undervaluation of the mark as compared with the Swedish crown must be considered as established," he writes of his conclusions. Cassel (1919) provides two explanations aimed at this outcome. Primary, since worldwide credit was unable to be reached, the German government could only get foreign currency from foreign speculators at actual unfavorable exchange rates. The subsequent event was a capital flying from Germany.

The PPP hypothesis has not been subjected to any comparative-static testing for a very long time. The comparative-static test is then used in two experiments to fix rather than float currencies. When calculating PPPs as of July 1957 for 35 nations, Yeager (1958) uses the United States as the benchmark nation and a year before World War II as the base period. He talks about how he chose the pricing measurements that were used to calculate PPP. Except in cases when there is only one index available, the CPI and WPI average is utilized. The WPI for a country that is most heavily weighted in nontraded items is chosen from among the available WPIs.

For three-fourths of the nations taken into consideration, the actual exchange rate relative to PPP ratio falls between the ranges of 75 to 125%. Yeager (1958) says in his conclusion that "these results and those from the [other studies] already mentioned hardly leave room to doubt a broad correspondence between actual and purchasing power parity exchange rates, especially when compared to the huge differences that would be expected if Cassel's doctrine were completely wrong".

The connection does not need to be synchronous if PPP influences exchange rates considering a delay (lag) effect is consistent with the theory, and it may even help the theory explain things better, especially if the lag effects happen at different times.

The study by Bunting (1939) of the exchange rates between the years 1919 and 1936 compared the French franc with the US dollar. It is the first research of this kind.

Bunting selected 1926 as the starting point rather than 1913 because the latter, in his opinion, was too far away. The exchange rate and WPI equalities were plotted by him for the following periods: unled, led for a month, led for two months, and controlled for three months. Bunting earlier PPP research is for only taking into account an unlagged connection. "To assume that changes in local price levels will be instantly acted upon by international purchasers is to allow a lag" (Bunting, 1939, p. 293). Bunting found significant exchange rate departures from the PPP for both the franc and the pound, even when utilizing delays. "This is damning statistical evidence against the purchasing power parity idea," he wrote in his conclusion. A statistical investigation intended to present Professor Cassel's idea in the best possible light finds only a little support for it (Bunting, 1939, p. 293).

The OCA (Optimum Currency Area) theory that was created by Mundell (1961) and McKinnon (1973) is the most common and important theory that guides the selection of exchange rates models. Based on ideas such as shock equilibrium, openness level, and labor market flexibility, the aim of the research is on the sustainability of the economic cycle and trade. The hypothesis states that by decreasing the instability of exchange rates at the expense of trading a fixed system of exchange rate may promote commerce and output growth, as well as stimulate investment by reducing the difference between currencies and rates of interest. Alternatively, it might obstruct trade and economic expansion by preventing, postponing, or inhibiting the required process of comparable dynamic pricing. Later concepts emphasized the sustainability of risky economic behavior about developing economies in particular. Theoretically, trade and economic growth can be accelerated by a fixed regime giving the money supply the credibility it frequently lacks, trying to prevent competitive devaluation, and encouraging financial markets' development (Barro & Gordon, 1983; Calvo, 2003; Edwards & Savastano, 2000; Eichengreen et al., 1999; Frankel, 2003).

Contrarily, according to the idea, a fixed regime may potentially postpone the required relative price fluctuations frequently resulting in speculation assaults. Because of this, numerous growing and developing nations' economies have a "fear of floating" (Calvo & Reinhart, 2002). However, when there is a "sudden cessation" of international investment, the set administrations frequently ended in collapses (Calvo, 2003). Along

with capital flight, as was obvious during the crisis in different sub-African nations, Latin America, and even East Asia. Even in the development economics literature, there is no theoretic agreement on the choosing of a government and the ensuing expansion of the economy. Although the function of a nominal anchor is frequently highlighted (Montiel & Ostry, 1991; Montiel & Ostry, 2003; Frankel et al. 2002), factors like Market size (or lack thereof), political economy, institutions, etc., frequently result in all-inclusive recommendations regarding the ideal exchange rate policy for such a developing nation literature on economic growth recognize the significance for such consequences of both the extent of advancement on connections between exchange rates regime and growth (Berg et al., 2020; Borensztein & Lee, 2002; Lin, 2001; McKinnon & Schnabel, 2003; Mussa et al. 2000).

### **Determination of Exchange Rates**

Exchange rate is the cost associated with exchanging one type of currency for another. It represents the unit value of currency expressed in relation to the other. In a marketplace having a free exchange, the demand and the exchange rate is driven by the flow of currency. Another study conducted by Choudhry (2005) noted that the economy's openness, money supply both domestically and abroad, the system of exchange rates, interest rates, and central bank independence are among the determinants, of imports, exports, revenue, inflation, public debt, and, random circumstances. He observes that the level or extent to which these elements have had an effect is based on the country's conditions among others; economists have identified inflation to be the most influential factor determining the exchange rate, while others identified central banks' money supply as the most determinant factor influencing the rate of exchange. The nominal exchange rate refers to the amount of a single foreign currency relative to the domestic one. On the foreign exchange market, it compares the currency values of numerous nations at a given time. Exchange rates can also be viewed here as the price through which nations trade their respective goods (Reinert 2012; Krugman & Obstfeld, 2007). As with any cost, an exchange rate diverges from underlying value base due to the effects of monetary demand and supply on the buying power of currencies. This correlation between supply and demand depends on a variety of factors. You can see how there is a relationship between

exchange rates and other economic factors (cost, price, money, interest rate, and the balance of payments) (Boykorayev, 2008, p. 9). The literature is divided into two variables affecting the volatility of currency rates. They are typically categorized as either economic or noneconomic concerns. The researcher may distinguish between long-term and short-term influences in the initial grouping. In analyzing this, it is important to consider the comparable costs (comparing the situation abroad, especially in the "countries" of the principal in trading) and the impact of various factors on the currency rate. Despite efforts by many researchers, the concern with currency rate fluctuations remains the concern of many economists. In Liberia, the situation regarding exchange rate fluctuation has drowned public attention and continues to be a major topic for discussion by economic agents. The continuous depreciation of the L\$ against the US\$ remains a major debate today in Liberia and requires attention (The Central Bank of Liberia Annual Report, 2011).

## **Empirical Analysis**

### **The Exchange Rate-Growth Relationship**

Aliyu (2009) studied the actual exchange rate instability and the implications of the shock of oil price on Nigeria's actual economic development from 1986 Q1 to 2007 Q4 utilizing quarterly time series data. A series of data analyses of information is the initial stage in an empirical study. After that, the type of connections between the variables is looked at. In addition, the co-integration is based on Johansen VAR, which is a methodology used to examine long-term real economic growth's susceptibility to fluctuating actual trade rates and shifts in the price of oil, whilst the short-term dynamics are analyzed utilizing a model for vector error correction. The results of the PP and unit root of this data is present, according to ADF testing, yet the Pairwise Causality test via Granger demonstrated oil prices' one-way causation of the two different causation of exchange rate to GDP and GDP to exchange rate. Further research shows that currency rate increases and shocks of oil price have a positive influence on Nigeria's actual economic development. Akpokodje (2009) examined the effects of exchange rate fluctuation on exports and imports from African nations outside the CFA (Community of Financial African Nations) from 1986 to 2006. The nations selected were Nigeria,



Uganda, Lesotho, Ghana, Zambia, Malawi, and Sierra Leone. The actual exchange rate volatility dataset for each nation was generated annually using the GARCH method. The research demonstrates that fluctuation in currency rates has a detrimental impact on imports and exports within the selected African countries. According to the study, currency rate volatility has a detrimental impact on exports mostly in identified nations, underscoring the importance of taking regulatory actions to limit and, if necessary, eliminate exchange rate fluctuations. Omojimitte and Akpokodje (2010) looked at the influence of fluctuations in exchange rate on trade balance in Nigeria from 1986 to 2007. A slight beneficial impact of alterations in exchange rates for trades of non-crude oil was discovered as a result of the decline of Nigeria's local currency. Even after adjustments were made in their exchange rate, the imports' structure, which comprises of consumer-oriented commodities, continued constantly. It was revealed that modifications on the country's exchange rate did not restrict imports as expected. Instead, they encourage imports, although somewhat.

Essien et al. (2011) investigated how changes in price and exchange rates impacted cocoa exports from Nigeria. Utilizing Ordinary Least Squares Regression, a cocoa export supply function was developed and calculated. Results indicated that exchange rate changes and agricultural loans had a beneficial impact on cocoa exports in Nigeria. The results also demonstrated that there is connection between the relative pricing of cocoa and export quantity is not scientifically important; nonetheless, it does not have a good sign, which supports the earlier hypothesis. Therefore, this study indicates a largely beneficial influence on the volatility of currency fluctuations on Nigerian cocoa exports. The research concludes that because the exchange rate declined, and had a favorable influence on cocoa exports in Nigeria, the exchange rate for cocoa exports in Nigeria should be determined based on free market.

Oladipupo and Onotaniyohuwo (2011) studied the influence of the exchange rate for Nigeria's external sector (balance of payments situation) for data covering 1970 to 2008 utilizing the OLS estimation approach. The research indicated that the exchange rate has a significant influence on the condition of the balance of payment. If financial restraint is ensured, the decline in exchange rate may result in a better state of balance of payments. The ongoing deficit in balance of payments in Nigeria has been linked to a lack of

domestic credit, its misuse, fiscal irresponsibility, and the fact that the government has too much power and does not have the right tools to control spending.

Polodoo et al, (2011) examined how tiny island developing countries' macroeconomic achievement was impacted by exchange rate volatility (SIDS). Using 15 SIDS as a sample, the current research econometrically examines the influence of fluctuation of exchange rates on the SIDS's important macroeconomic indicators, including external commerce, foreign direct investment, and economic growth. Both a stable framework with estimates and a dynamic, longitudinal data structure using the generalized technique for analysis was conducted on the influence of exchange rate fluctuations on the macroeconomics of an economy. Strong standard errors from the OLS Findings demonstrate that exchange rate fluctuation has a detrimental impact on the current account balance, but had a favorable effect on the examined countries' growth rates. However, volatility in exchange rates increases in a changing situation and has little effect on macroeconomic indicators.

Musa (2014) investigated the connection between economic expansion, trade activity, and exchange rate volatility development in a minor market economy in sub-Saharan African countries, with Nigeria as the focal point. The time series information from the empirical analysis was from 1970 to 2009. The findings reveal that ERV had a considerable influence on the flows Nigeria's trade and economic development. The results show that a free - floating exchange rate system is better than a fixed one because it leads to increased trade with Nigeria.

To pinpoint the precise currency rate pass-through route in Nigeria, Adedayo (2012) conducted organizational and analytical research that examined the connections between inflation as well as the interest rate before using a spread-out latency model that includes a first-order exchange rate lag and the present production level. This procedure yielded two forms. Using the ordinary least squares technique, an estimation was made of the modified model. The empirical data revealed that only the earlier exchange rate of the Nigerian Naira to one US dollar between 1970 and 2010 influenced the interest rate in Nigeria, although neither the present nor the previous exchange rates did so between 1970 and 2010. Adejare and Usman (2012) conducted an empirical analysis of the effects of fluctuations in exchange rates on industry growth using secondary data from the Nigerian Central Bank Annual Report for the years 1985 to 2005. Multiple regressions were used

to assess data on parameters including the World Price Index, Per Capita Income, Gross Domestic Product, and Net Export. With a corrected R<sup>2</sup> of 69%, the exchange rate had a huge influence on economic development. Using the study's results as evidence, it can be said that the utilization of net export, each income, the global price index, and foreign exchange, the incentive for improved presentation in the pursuit of steady economic development may result in stable pricing for manufactured products.

Akpan et al. (2011) looked at how exchange rate volatility affected the performance of Nigeria's macroeconomy from 1986 to 2010. The GDP was considered the dependent variable while the exchange rate (EXR), balance of payments (BOP), and the oil revenue (OREV) were considered independent variables in the model. Accordingly, the Ordinary Least Square (OLS) and Johansen cointegration estimate models were used to examine the short and long-run consequences. The ADF test indicated that all variables are stationary. OLS statistics indicated that EXR and OREV are favorably associated, but BOP is adversely connected to GDP, according to OLS data. Further research shows that oil revenues and the BOP hurt GDP, although fluctuating exchange rates ultimately boost GDP.

Akpan et al. (2011) evaluated changes in the currency rate's effects on Nigeria's real production growth. The research analyzed the likely direction of utilizing quarterly. The study investigated the relationship between both exchange rates and GDP growth from 1986 to 2010 using time series data. The relationship was developed in two different ways to fit a simultaneous equations model in a fully defined small monetary model. The Generalized Method of Moments (GMM) technique was examined. The projection findings indicate that there is little proof that changes in exchange rates are directly related to rising production. Instead, money factors have directly influenced the expansion of Nigeria's economy's genuine exchange rate structure that has been preserved by these factors which have been detrimental to economic progress. To revitalize the Nigerian economy, changes to the control of exchange rates are significant yet inadequate. Supporting the established exchange rate system requires a comprehensive strategy for economic restructuring.

Using annual data from 1970 to 2009, Oyovwi (2012) assessed how exchange rate fluctuations affected Nigeria's economic development. A literature review indicates that

exchange rate volatility may have both positive and negative effects on economic growth. In the empirical inquiry, the Augmented Dickey-Fuller (ADF) test was employed to determine the stationarity of the variables. The co-integration of the model was then put to the test. Other factors' results, excluding exchange rate volatility, which were integrated at order zero,  $I(0)$ , were effectively integrated at level one,  $I(1)$  (O), according to the unit root test. Additionally, the co-integration study demonstrated the co-integration of the factors. The Generalized Autoregressive Heteroscedasticity (GARCH) method was employed to assess the link between economic development and exchange rate fluctuations, which caused exchange rate volatility. While volatility in exchange rates and economic development have a positive short-term correlation, their long-term link is negative. Additionally, the long-term outcome suggests that higher oil prices reduce Nigeria's economic growth. As a result, the impact on production is evident in the closure of enterprises and their move to neighboring countries, although the impact of higher oil prices on revenue is not experienced.

Obi et al (2016) explored the connection between macroeconomic and exchange rate developments in order to evaluate the impact of various systems on the growth of the Nigerian economy. Between 1970 and 2014, the information was examined using the Generalized Moments Method (GMM). During the entire testing period, the findings indicated that the effect of the exchange rate on the economy's expansion was minimal. The analysis indicated that the exchange rate had a considerable negative impact on economic development. However, the analysis revealed that the exchange rate had no meaningful effect on economic development, for a floating exchange rate policy. Mordi, (2006) investigated the difficulties of the control of the Nigerian monetary strategy of exchange rate fluctuations. The generalized autoregressive conditional heteroskedasticity (GARCH) model is used in this research to examine Nigeria's currency rate fluctuation from 1970 to 2005. The outcome revealed causal linkages between inflation, fiscal deficits, and economic expansion; fluctuation in exchange rates. The study found that between 1992 and 2005 there was significant exchange rate fluctuation. Even though the data was not broken down by exchange rate system, it showed that the fixed system tended to be more stable and the floating system tended to be more volatile.

In studies on Nigeria's output growth and foreign direct investment (FDI), Olokoyo (2012) investigated the degree to which the rate of exchange fluctuates accounted for differences in GDP growth from 1970 thru 2007 with the help of the ordinary least squares (OLS) method. The research discovered that exchange rates and economic growth have no causal connection. Moreover, applying customary and generalized least squares (OLS and GLS) estimate approaches, Okoye et al (2017) studied the effects of foreign debt, exchange rates, and inflation on the economic development of Nigeria from 1981 to 2015. Both the OLS and GLS yielded statistically substantial evidence for the growth-enhancing effects of foreign debt, the currency rate, and the inflation rate. However, this research is unrelated to a specific regime. Recent research on the exchange rate-growth nexus has focused mostly on the floating regime. This might be a result of the growing worldwide trend toward economic liberalization. For example, Anyanwu et al (2017) looked into the connection between Nigeria's Economic growth as well as the exchange rate. The research concentrated on the floating or reformed exchange rate system (1986–2015). There was a unidirectional relationship between the exchange rate, GDP, and exchange rate industrial capacity utilization. Using a (ECM) correction model, Okorontah and Odoemena (2016) examined how exchange rate fluctuations influenced Nigeria's economic growth between 1986 and 2012. The analysis showed that the exchange rate had no effect on economic development. However, in a similar analysis, Maduabuchi and Ajudua (2014) demonstrated a considerable negative exchange rate effect on Nigeria's manufacturing GDP. Branson and Love (1998) evaluated the connection to exchange rate fluctuation and U.S. manufacturing employment. The research indicated that changes in currency rates had a detrimental outcome on manufacturing employment. The results of this study are the same as those of Frenkel (2004), who also found that exchange rate fluctuations harm manufacturing jobs in Argentina, Brazil, Chile, and Mexico. However, Ngandu (2008) and Adedokun (2012) found a favorable exchange rate changes' effects on manufacturing employment in South Africa and Nigeria respectively. Berman et al. (2012) show that enterprises increase in response to exchange rate decline output prices and scaling down operations, resulting in job losses using data from 1995 to 2005. Low employment in the industrial sector correlates to poorer capacity utilization and production growth.

### **Renewable Energy–Economic Growth Relationship**

The utilization of renewable and nonrenewable energy and economic development are related on a specific basis (Bowden & Payne, 2010). Between 1949 and 2006, certain industries within the United States utilized the Toda-Yamamoto causality process as part of a multivariate model that included gross fixed capital production and manpower. The results show that there is no relationship between utilizing renewable energy and health. The growth hypothesis is upheld despite the existence of a positive unidirectional cause-and-effect relationship connecting household renewable energy use and GDP growth in the industrial and commercial sectors which indicates the presence of neutrality theory. Contrarily, the results of the causality tests revealed negative unidirectional causation, and the feedback hypothesis was supported by the fact that non-renewable energy use is positively connected with real GDP in both the business and household sectors. The comparison of the use of Non-renewable energy used in industry and real GDP shows that the growth premise is correct.

Tiwari (2011b) examined the effects of energy use and economic growth in European and Eurasian countries from 1965 to 2009: “The impact of both renewable and non-renewable resources” using the PVAR technique. He discovered that the rate of expansion in the use of non-renewable energy had a detrimental effect on the GDP's rate of growth, while the rate of growth in it is advantageous to use renewable energy. 80 countries' economic growth between 1990 and 2007 was evaluated by Apergis, N., and Payne (2011b) in connection to their use of various energy sources, both natural and artificial using labor as well as a multivariate panel architecture for gross fixed capital formation. Despite the projection of long-term elasticity for non-renewable energy consumption being considerably greater, they concluded that both types of energy consumption influence economic expansion. This means that the feedback theory has been verified. By the results which revealed a co-integrating connection between the variables of interest and causality test that demonstrated a bidirectional causal relationship between the consumption for both the short and long-term effects of both renewable and nonrenewable energy and economic growth. There is a multitude of research examining the relationship between renewable energy use and American economic expansion. Using variance decomposition analysis, Ewing et al. (2007) discovered a relationship between

utilizing renewable energy and economic growth through industrial production index (IPI) as a measure of development in the United States from January 2001 to June 2005. Sari et al. (2008) establishes a significant causal connection between the use of renewable energy and economic expansion (as determined by the IPI) in the United States between January 2001 and June 2005 using the same data and the ARDL limitations test.

However, Yildirim et al. (2012) utilize the Toda-Yamamoto causality test to determine that between 1949 and 2010, The United States' adoption of renewable energy was causally related to economic expansion. This association, however, is rather slight. Payne (2009) employed the Toda-Yamamoto causality test as well and concluded that there is no substantial causation between the increase in the use of both renewable and non-renewable energy sources in the US from 1949 to 2006. Using Hatemi-asymmetric J's Granger causality, Tiwari (2014) discovers that renewable energy has a two-way cause-and-effect relationship with economic growth in the US from January 1973 to October 2011.

There is further research that investigates the link between economical and renewable energy development in various nations. For instance, employing OLS, or ordinary least squares) estimates, Fang (2011) concludes that there is a significant causal relationship between renewable energy and China's economic growth from 1978 to 2008. The empirical model presented by Fang (2011) incorporates R&D spending to capture technical advancement and discovers a substantial causal link between economic growth and renewable energy. Sari et al (2004) show substantial economic growth and renewable energy are related development in Turkey from 1969 to 1999. Ocal and Aslan (2013) use the ARDL limits along with the Toda-Yamamoto causality test approach to determine a substantial causal relationship between Turkey's GDP and renewable energy use from 1990 to 2010. Pao and Fu (2013) use the vector error correction model (VECM) to look at the causal relationships between linked variables in Brazil from 1980 to 2010. Azlina, et al. (2014) used the significant causal VECM and Granger causality tests to determine the relationship between two variables: economic development and renewable energy in Malaysia from 1975 to 2011.

## **Interest Rate and Economic Growth Relationships**

There is a general notion that the Breton Woods Institution marketed the original thesis of financial deregulation to several developing nations. In particular, the preconditions for their theory's application and implications were not considered by these nations as part of the bargain for their efficacy. Since the early 1970s, a lot of theoretical and empirical debate has focused on the relationship between growth in the economy and the evolution of interest rate liberalization. Low interest rates, according to Keynesian and Neoclassical ideas, will encourage investment, spending, and economic growth in both developed and developing countries (Odhiambo, 2008).

McKinnon and Shaw (1973) provide the theoretical foundation and analytical underpinnings for the claim that interest rate liberalization promotes financial and economic growth prosperity. Their thesis of financial liberalization, which centers on liberalizing interest rates and the financial industry enables savers to move away from ineffective real assets to financial assets, thereby enhancing the economy's credit supply. This is how financial liberalization helps the economy grow: it affects savings, financial growth, and investment.

Given the foregoing, it is important to note that there are differences between the Keynesians and the McKinnon-Shaw school. Prior investment is supported by the Keynesian school, whilst prior savings are backed by McKinnon Shaw School. For instance, In McKinnon (1973)'s opinion, the quantity of loanable funds, rather than their demand, restrains investment in emerging nations. He said that this is because banking sectors in emerging nations are severely suppressed thereby exceeding the supply of loanable money availability. This is how a rise in interest rates will lead to a rise in deposits of money that can be loaned out. This will result in more consolidation of finances, capital, and economic expansion.

Ironically, from 1970 to 1985, the Nigerian government kept a policy of putting limits on interest rates. This made it easier for the government to borrow money, but it hurt private sector investment.

The goal of the interest rate policy from 1986 to 2010 was to encourage private sector initiative as a catalyst for economic development and job creation via deregulation and managed deregulation. Similarly, numerous empirical research has demonstrated the



connection between the growth of the economy and interest rates. The link between interest rates and economic growth in Nigeria, by Obamuyi (2009) for instance, was analyzed using time series data from 1970 to 2006. A co-integration and error correction model is used to calculate how the model's variables change over time and how they change quickly. The outcome suggested that actual lending rates significantly influenced the expansion of the economy. Odhiambo (2010) also applied co-integration and error correction models to examine the interest rate reforms, banking industry expansion, and South Africa's economic growth. According to the report, interest rate modifications are beneficial for the growth of the financial industry.

Additionally, the study found that increases in interest rates do not lead to increased investment or economic development, according to Granger. Chete et al. (2006) examined the link between economic indicators and the real interest rate development in Nigeria. This study demonstrated a unique relationship between rates of interest and economic expansion over the long term. He concluded that the interest rate is a significant predictor of Nigeria's economic growth. He said that the goal of lowering interest rates in Nigeria might not be reached as well as it could be if these other problems that hurt investments are not solved.

Lyndon and Peter (2016) examined the connection between the interest rate in Nigeria and the country's economic progress throughout the period from 1986 to 2014. The Statistical Bulletin of the Central Bank of Nigeria and the National Bureau of Statistics, issues were mined for information. The research determined that interest rates and economic growth have a negative relationship using the Johansen integration test and the enhanced the Augmented Dicker-Fuller (ADF) unit root tests, and an error correlation model (ECM) method was used to analyze the results, but the connection was not statistically significant. They suggested that Nigeria's monetary authorities make decisions that would promote and accelerate economic growth.

The study's goal was to calculate the impact of the nation's factors that affect gross domestic product is the rates of currency exchange, inflation, and deposit interest. The Nigerian Central Bank's statistical bulletin provided the study's data from 1980 to 2016. The investigation used an ex-post facto research methodology. It was determined that INF and EXR had a bad and insignificant impact on GDP and DIR has a substantial and

advantageous relationship with GDP. According to most studies, interest rates have a weak correlation with GD inconsequential.

Barry (2022) looked into the factors that affect interest rates over the long run, specifically to know how changes in interest rates affect economic growth, whether there is a connection, as suggested by traditional growth theory, or whether economic development eclipsed by a greater number of local and international influences. Several significant economies' data were used to illustrate international interest rates' effects on the globalization of the financial market and the development of a system to modify the short- and long-term interest rates for predicted inflation. According to Acha, and Acha (2011), the financial markets around the world are interconnected, therefore, modeling, analyzing, or forecasting Nigeria's savings and investment behavior about interest rates using a closed-economy paradigm is not very useful. This information was gathered from the Nigerian Central Bank (CBN). Pearson's correlation coefficient and regression were utilized for data analysis. The study demonstrates that interest rates are a poor indicator of savings and investment, which implies that bank loans are rarely used for advantageous purposes. If interest is to serve as the economy of Nigeria's catalyst, then bank loans should be directed toward productive ventures. Richard (2018) examined how the interest rate structure affected Nigeria's economic expansion (1986–2016). The sample was Nigeria, and the effects of the independent variable independent variables (interest rates and monetary policy rates) on the dependent variable, economic development, were examined using the Granger-causality, OLS, Co-integration, and Error Data correction model analytical approaches (proxied by the Human Development Index), with a 5% level of significance. The study concluded, among other things, that discount rates should be predictable by prevailing economic requirements, ecologically friendly and business-friendly, and that, to the greatest extent practicable, government discretion should be minimized when determining monetary rates.

Obamuyi (2009) used secondary time series data to investigate the 1970–2006 Nigerian period of interest rate development and economic growth. With cointegration methodology and error correction model, he was able to record both the short and long-term data analysis, and conclude that the research variables have linear dynamic linkages.

The study's findings showed that actual loan interest rates have a specific relationship with economic growth and that they have a major impact on it over the long term.

Udoka and Roland (2012) evaluated how changes in interest rates affected Nigeria's economic development from 1970 to 2009 utilizing the common multiple regression methods of least squares. They included the time before and after interest rates were deregulated in their evaluation. They employ secondary time series panel data from the Central Bank of Nigeria (CBN)'s statistical bulletin for their ex-post post analysis. The study methodology makes use of dynamic panels from the second time series. The information showed a conflict between interest rates and Nigeria's economic growth.

## CHAPTER III

### Methodology

#### Introduction

In this part of the research, a more extensive discussion is conducted on the several approaches, techniques, and procedures that were utilized to gather the data that was necessary for the study. These strategies, methods, and procedures were employed to collect the information that was required. This part also analyses and explains the many statistical methods that were used to evaluate the data that was obtained throughout the investigation. These processes were used to determine whether the data was relevant to the inquiry. During the course of the research, these methods were used to analyze the information that was acquired.

#### Data Sources and Kinds

The great majority of research projects depend on two distinct kinds of data to arrive at their findings: theoretical knowledge and data analysis, which is often used to arrive at those conclusions. Both of these types of data are used to get to those conclusions. The researcher who worked on this study used an approach to the tasks that was identical to the one taken by the researcher who worked on the study that came before it. It is vital to contact the World Bank Data Center as a resource to get quantitative data for a wide range of different components and parts. The project will begin collecting data on an annual basis in the year 1990 and continue doing so until the year 2019; this will indicate a total of 30 years of data collection starting in 1980 and coming to a close in 2019. It is essential to examine economic parameters such as real effective exchange rates, GDP growth, and renewable energy over a significant time to achieve greater dependability and accuracy in one's conclusions. This can be accomplished by conducting research over an extended period

#### Variables

**Renewable energy:** We say that a resource is renewable if it can be naturally replenished over a significant amount of time and this potential exists within the resource itself. Even though it is consumed by humans, it may still be considered sustainable for

this reason. This is because when it comes to the production of energy, renewable resources are seen as being of the highest value due to their capacity to serve as a replacement for non-renewable resources, which are also referred to as limited resources. This is because, when it comes to the production of energy, renewable resources are seen as being of the highest value due to their capacity to serve as a replacement for non-renewable resources. Also, non-renewable resources like coal and fossil fuels might make energy that is bad for the environment, while renewable resources like the sun and the wind might make energy that is less bad for the environment.

**Real Effective Exchange Rate (REER):** The worth of one currency concerning another is shown by the exchange rate. Depending on the specifics of the situation, they may be offered as a rate that was effective at the end of a certain period they may be presented as a rate that was effective on an average basis during the relevant time period of international Monetary Fund claims (IMF), exchange rates can be broken down into three primary categories: (1) market rates, which are decided by the market; (2) official rates, which are decided by the government; and (3) currency rates. These three categories are as follows: (1) market rates; (2) official rates; and (3) currency rates. A conversion rate displays the value of a certain currency based on the rate at which the value of one currency is exchanged for another value of the United States dollar. We felt it would be interesting to look at Nigeria's currency exchange system since it is one of the countries with the highest population density in the world. As a result of this, we came to the conclusion that the real exchange rate would be the most suitable one to employ. This rate offers an indicator of how much domestic products and services are worth when converted to another currency.

**GDP Growth:** In order to arrive at an accurate estimation of the rate at which a nation is expanding, it is essential to evaluate the degree to which a nation's economic production has shifted over the course of the years. This can be done by analyzing the degree to which a nation's GDP has changed over the years. Because of this, those in charge of matters pertaining to the economy often make reference to this number, which is generally presented in the form of a total percentage. According to the Federal Reserve, a rise in the rate of GDP growth might be considered by the central bank as a signal that the economy is "overheating," and the bank could therefore consider increasing interest

rates. This is because the economy is "overheating" when the rate of GDP growth increases. However, central banks regard a slower (or negative) rate of GDP growth to be a signal that interest rates should be cut and that more stimulus measures may be necessary. This is because a recession is a period of decreased economic activity. This is due to the fact that a recession is a sign that the economy is beginning a time of contractionary activity.

**Interest rate:** The interest rate is calculated by contrasting the cost of taking out a loan with the cost of saving the same amount of money over a certain period of time. If you are a consumer, the interest rate is the cost you incur to borrow money. lender in return for taking out loans. It is shown as a percentage of the overall amount that you borrow from them. When you borrow a certain amount of money and are given a percentage of it, the total amount of money that you are responsible for repaying is increased. If you put money away, the savings rate will inform you, as a percentage of the total amount you have put away, how much cash will be deposited into your bank account each month as a result of your savings. If the savings rate is greater than the existing rate, more money will be deposited into your bank account for the same amount of money that you deposit. We decided to go with the real interest rate rather than the nominal one since it takes inflation into account. When determining the real interest rate on a bond or loan, it is necessary to take inflation into account. To put it another way, this rate informs investors of the amount of money they may anticipate earning after considering the effects of inflation. This kind of rate is referred to as predictive when the actual rate of inflation is either unknown or projected to be in the future.

Even seemingly small changes in interest rates have the potential to significantly impact the economy. It is of utmost importance to monitor their size and determine if they are growing, shrinking, or remaining the same.

Table 3.1 Variable Discription

#	Variables	Abbreviation	Measurement	source
1	GDP per capital	GDP	(Current US\$)	World Bank
2	Renewable energy	RE	(% of total final energy consumption)	World Bank
3	Real effective exchange rate	REER	(2010 = 100)	World Bank
4	Real interest rate	RIR	(%)	World Bank

### Model Specification

The autoregressive distributed lag (ARDL) paradigm, developed by Pesaran et al. (2001) investigation, we used this tactic. In conditions which the variables issues ARDL model seems to be either stationary at I or integrated to order I. (0). It is regarded to be the preferable option when contrasted with other econometric models available to choose from as a possible solution to the problem at hand. In circumstances in which the ARDL model is seen as the most advantageous option, this is the circumstance that applies (1). This model is superior to others in that it is able to capture both the effects of independent influences on rice across time, both short-term and long-term output. This was one of the goals of the research, and it is one of the reasons why this model is superior.

The ARDL approach, which is acceptable for the creation of a limited sample size with simultaneous Ordinary least squares (OLS) is a methodology for cointegration across variables that are used to determine short-run and long-run elasticities. This method was created to examine the connection between multiple variables. Despite the fact that the ARDL approach is based on the OLS methodology, this is still the case. (Duasa 2007).

Because the sequence in which te variables are integrated may be changed at any time throughout the process of modelling, an ARDL model offers an increased degree of flexibility. The application of ARDL is effective where the model's independent variable is the integration I(0), I(1), or mutually cointegrated-integrated. (Frimpong & Oteng, 2006), while the model's dependent on variable application, ARDL is unsuccessful when any of the variables contain I (0). (2). The following model, which was designed in such

a manner that it could detect the link between variables that are dependent on one another and those that are independent of one another, is as follows:

$$GDP = \beta_0 + \beta_1 RE + \beta_2 REER + \beta_3 RIR + \varepsilon_t$$

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^p \gamma_1 \Delta GDP_{t-i} + \sum_{i=0}^{q1} \beta_1 \Delta RE_{t-i} + \sum_{i=0}^{q2} \beta_2 \Delta REER_{t-i} + \sum_{i=0}^{q3} \beta_3 \Delta RIR_{t-i} + \varepsilon_t$$

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^p \gamma_1 \Delta GDP_{t-i} + \sum_{i=0}^{q1} \beta_1 \Delta RE_{t-i} + \sum_{i=0}^{q2} \beta_2 \Delta REER_{t-i} + \sum_{i=0}^{q3} \beta_3 \Delta RIR_{t-i} + \delta ECT_{t-1} + \varepsilon_t$$

Where:

- RE represents renewable energy
- GDP stands for gross domestic product
- REER is the abbreviation of real effective exchange rate
- RIR stands for real interest rate and  $\varepsilon_t$  is the error term
- ECM is a measure of how quickly long-run equilibrium adjusts after a short-term shock.

### The Significance of the ARDL Model

The study employed the Autoregressive Distributed Lag (ARDL) technique is developed by Pesaran et al (2001). When the variables are stationary at I (0) or integrated of order I, the ARDL model is regarded as the best econometric approach. when compared to other models, it is more effective at capturing the immediate and long-term impacts of independent factors on rice production according to the research objectives.

The ARDL approach, which employs variable cointegration and the ordinary least squares (OLS) method, is ideal for generating short-run and long-run elasticities concurrently for a small sample size (Duasa 2007). The order in which the variables are integrated is configurable when using ARDL. ARDL works well when the model's independent variables are I(0), I(1), or mutually cointegrated, but it fails when I(2) it is present in any variable. (Frimpong & Oteng 2006). The following model was developed to ascertain how dependent and independent variables are related:

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^p \gamma_1 \Delta GDP_{t-i} + \sum_{i=0}^{q1} \beta_1 \Delta RE_{t-i} + \sum_{i=0}^{q2} \beta_2 \Delta REER_{t-i} + \sum_{i=0}^{q3} \beta_3 \Delta RIR_{t-i} + \varepsilon_t + \beta_1 GDP_{t-1} + \beta_2 RE_{t-1} + \beta_3 REER_{t-1} + \beta_4 RIR_{t-1} + \varepsilon_t$$

$$\Delta RE_t = \beta_0 + \sum_{i=0}^p \gamma_1 RE_{t-1} + \sum_{i=0}^q \beta_2 REER_{t-1} + \sum_{i=0}^q \beta_3 RIR_{t-1} + \sum_{i=0}^q \beta_4 GDP_{t-1} + \beta_1 RE_{t-1} + \beta_2 REER_{t-1} + \beta_3 RIR_{t-1} + \beta_4 GDP_{t-1} + \varepsilon_t$$



$$\Delta REER_t = \beta_0 + \sum_{i=0}^p \beta_1 REER_{t-1} + \sum_{i=0}^q \beta_2 RE_{t-i} + \sum_{i=0}^q \beta_3 GDP_{t-i} + \sum_{i=0}^q \beta_4 RIR_{t-i} + \beta_1 REER_{t-1} + \beta_2 RE_{t-1} + \beta_3 GDP_{t-1} + \beta_4 RIR_{t-1} + \varepsilon_t$$

$$\Delta RIR_t = \beta_0 + \sum_{i=0}^p \beta_1 RIR_{t-1} + \sum_{i=0}^q \beta_2 GDP_{t-i} + \sum_{i=0}^q \beta_3 REER_{t-i} + \sum_{i=0}^q \beta_4 RE_{t-i} + \beta_1 RIR_{t-1} + \beta_2 GDP_{t-1} + \beta_3 REER_{t-1} + \beta_4 RE_{t-1} + \varepsilon_t$$

## Descriptive Statistics

The basic characteristics of the data utilized in an investigation are described by statistics, which are referred to as "descriptive statistics." They give a succinct description of the sample and the measurements through which they were made. They serve as the cornerstone for essentially every quantitative study of data, as well as a simple analysis of visuals. Inferential statistics are often differentiated from descriptive statistics using this common distinction. Simply explain that when using descriptive statistics, you examine what is real or what the data shows. The goal of utilizing inferential statistics is to draw conclusions that go beyond those that can be drawn solely from the data at hand. For instance, based on the sample data, we utilize inferential statistics to infer what the general public would believe. Alternatively, we may use inferential statistics to assess whether there's a difference between groups and observed whether a finding in this study can be trusted or whether it result of chance is unknown. Descriptive statistics are thus used to simply describe what is happening in our data, but inferential statistics are used to conclude situations based on our data. Using our data as a foundation, inferential statistics are used to make predictions regarding more general situations.

## Unit Root Test

A stochastic process that has a time series, and has unit roots or structural breakdowns is said to be non-stationary. As opposed to that key contributor, the Unit roots are nonstationary. When there is a unit root in a time series analysis, the time series may not be stationary. On the other hand, if there is no unit root, the time series may be stationary. This demonstrates that one of the contributors to the non-stationarity is the unit root. A non-stationary stochastic process such as the deterministic trend stationary process (TSP) or difference stationary process (DSP) may exist (DSP). If a time series' tendency is entirely foreseeable and does not vary, we refer to that time series as having either a different stationary process, an integrated stochastic trend, or both. On the other hand, if the trend does not vary and is completely predictable, we refer to that time series as having

a stationary trend. When there is a deterministic trend, any deviation from the original value, which reflects a non-stationary mean, is entirely random, and any such deviations are short-lived and disappear. They do not make any contribution to or have any effect on the evolution of the time series over the long term. On the other hand, when a stochastic trend is integrated, the series' long-term growth is influenced by the random component, also known as divergence. Any effective empirical study that makes use of time series with these characteristics requires that the series be cleansed of the trend before it can be used. The term for this phenomenon is the "detrending of the series." A stationary process and a deterministic stationary process differ depending on whether or not the given series is stationary, this might be accomplished in one of two different methods. When a series is said to be DSP, it indicates that the series is in question and it has a unit root. The difference between series like this is stagnant. Consequently, nonstationary series may be solved by differencing a series. The same applies if a series is TSP, this indicates that it follows a predictable pattern, but an  $I(0)$  value may be obtained from a stagnant trending variable with a non-constant mean when a deterministic trend is subtracted from it. In other words, when such series are regressed on time ( $t$ ), the residuals that are produced by this regression will stable ( $Y_t = t + U_t$ )

As a result, cointegration should not be seen as a route to any desired destination but rather as constrained. It is important to make it clear that the phenomenon known as "over-differencing" describes what happens when a time series that should be TSP is instead handled as a DSP. On the other hand, the phenomenon known as under-differencing occurs when a time series that should be DSP is instead regarded as TSP. In light of the way the linked error terms' serial correlation properties are treated, these specification types of errors may have major repercussions, which are directly proportional to the severity of the errors. On the other hand, it has been shown that the majority of DSP is used to depict time series instead of TSP. As a result, when using such non-stationary Time series (DSP) to estimate an econometric model, the standard diagnostic statistic of the ordinary least square (OLS) is employed to assess the accuracy of the model estimations. Become in terms of forecast and policy, quite deceptive are unreliable. These statistics include the coefficient of determination ( $R^2$ ), Fisher's Ratio, Durbin-Watson, and t-statistic, amongst others. The mean, standard deviation, covariance,

and autocorrelation functions of such series are subject to change with time, which in turn affects the series' long-term evolution. The existence of a unit root in these series causes a breach of the OLS assumption that the means and variances would remain constant throughout the analysis. But this analysis focuses more on the stationary process that is different from one that is on the trend because the different stationary process describes most time series. As was just seen, the only way to determine the stationary state of a time series variable is to differentiate it. Therefore, using different variables in regressions will result in the loss of information on significant long-term features or the equilibrium relationship between the variables that are being considered. This indicates that we need to come up with a strategy for storing the relevant information on the variables over an extended period. As a result, cointegration makes it feasible to regain important information regarding. Throughout a lengthy period, the correlations between the factors had been lost as a result of differencing. This information had previously been unavailable. In other words, it combines the dynamism of the long-run equilibrium with that of the short-run. This is the foundation upon which one may derive accurate model estimations from the basis of relevant analysis. Prediction and the execution of policy. To represent empirically significant connections between DSP variables, cointegration is the recommended step. Cointegration refers to the process of examining the long-term connections between the variables that are already integrated, as well as the process of parametrizing the connection between the variables that are being analyzed into an error-correcting algorithm (ECM). In circumstances According to the well-established Granger (1981) and Engle and Granger (1987) methodologies, cointegration analysis is irrelevant when variables are integrated into distinct orders (i.e., series-A is  $I(1)$  and series-B is  $I(0)$ ), but it is appropriate based on Cointegration techniques used by ARDL. Johansen and Juselius (1990). Pesaran et al. (2001) claimed that the ARDL cointegration approach is used in the process of finding the long-term relationship between series with various integration orders. The outcome of parametrizing the model provides the long-term and short-term dynamics of the interaction between the variables that were taken into consideration. Even though the ARDL cointegration method doesn't require unit root pre-testing, we think that a unit root test needs to be done to find out how many of the series

include unit roots being looked at. This is to keep the ARDL model from crashing when an integrated stochastic trend of I exists (2).

### **ADF Unit Root Test**

A wide range of analytical techniques, such as co-integration tests for variance ratios and unit roots on actual exchange rates of price series, have all been used. A unit root-based representation of a real exchange rate is a prerequisite for an absolute PPP violation, but it is not sufficient by itself. Testing for unit roots has been done in a variety of different ways throughout the years. According to Nelson and Plosser (1982), the majority of macroeconomic time series, including real exchange rates, have a unit root when evaluated using augmented Dickey-Fuller (ADF) type regressions. However, standard unit root tests, according to Perron (1989), include a bias that causes them to be less likely to when a trend is broken, reject the unit root that was previously considered stationary. According to Serletis and Zimonopoulos (1997) who adopted Perron and Vogelsang's (1992) approach, both quarterly dollar-based and real exchange rates based on the Deutschmark (from 1957 to 1995 for 17 OECD countries) show that the unit root theory cannot be refuted, even in the presence of large fluctuations in the data after accounting for the potential of a single shift in the series' mean at an unspecified moment in time. These considerations motivated Serletis and Zimonopoulos (1997) to conduct their research.

There have been several efforts made to construct unit root tests for time series that have structural discontinuities. Because it enables the trend to be a deterministic function of time that is essentially random, the Bierens (1997a, 1997b) nonlinear augmented DickeyFuller (NLADF) test is the one that is used in this situation. The hypothesis is tested using an auxiliary regression model of the ADF type, in which A linear function of Chebyshev polynomials symbolizes the deterministic trend. In contrast to other tests, these make use of Chebyshev time polynomials as opposed to normal time polynomials, a parametric dynamics specification as opposed to a long-run variance estimator of the Newey-West (1987) type, and the unit root with continuous drift hypothesis as the unit root theory and the null hypothesis being nonlinear trended drift. According to Bierens (1997a), the fact that Chebyshev polynomials are orthogonal and limited is one of the

primary reasons why they are seen as having significant benefits over normal-time polynomials.

### **ARDL Bound Test for Co-integration**

The ARDL limits testing method created by Pesaran et al. (2001) is used in this study to examine the cointegration among the estimated variables to study how exchange rates, renewable energy, interest rates, and economic growth are related. This is done in order to examine the connection between these four factors. In order to study the estimated variables' long-term connection with one another, a number of many cointegration techniques, including those created by Johansen and Juselius (1990), and Engle and Granger (1987), among others, have been used. Comparing it to the more traditional cointegration testing technique, ARDL bounds testing is a more adaptable approach, despite the fact that these methods may be used to analyze series with a specific integration order.

This approach may be used with any series that integrates into a non-standard sequence since it is universally applicable. However, A prerequisite is to make sure that none of the variables are I (2). The one that will be reliant on the other variables must be I(1).

### **ARDL Short Run and Long Run**

#### **The Significance of ARDL Model**

The research used Pesaran et al (2001)'s ARDL (autoregressive distributed lag) method. When the variables are integrated in order or fixed at I (0), the ARDL model is considered to be the best econometric approach when compared to others. According to the research aims, it is a better model than others at capturing the short and long-term effects of independent factors on rice yield. For a small sample size, the ARDL approach works perfectly for simultaneously generating short-run and long-run elasticities and it uses variable cointegration using the help of the ordinary least squares (OLS) technique. The variables' integration order which was determined by ARDL is flexible. According to Frimpong and Oteng (2006), ARDL works well for model independent variables that are present in any variable, when I(2) is I(0), I(1), or mutually cointegrated analyses are

unsuccessful. The following model was created to ascertain the link between dependent and independent variables:

$$GDP = f(\beta_0 + \beta_1(RE) + \beta_2(REER) + \beta_3(RIR) + \varepsilon_t)$$

Autoregressive distributed lag (ARDL) models are often employed in a single-equation framework to analyze dynamic interactions using data in time series. The amount of the dependent variable present value permitted must rely on its own past realizations (the autoregressive aspect), as well as the current and past values of other explanatory variables (the distributed lag part). It is possible for variables to be both stationary and nonstationary or to combine the two. The ARDL model can be used to determine whether there is cointegration or, more generally, whether the variables of interest have a long-term relationship and to differentiate between long and short-run effects in its equilibrium correction (EC) form. We propose the ARDL Stata command, which can be used to calculate an ARDL or EC model with the ideal number of lags based on the Akaike or Schwarz/Bayesian information criteria in this session. Guide to the Pesaran et al. (2001) limits test to see whether a long run connection will be supplied, as will answers to frequently posed problems. This examination serves as the `estat ectest` command for post-estimation, which includes freshly calculated crucial values for the finite-sample and estimated p-values. These essential values apply to a broad variety of model setups and replace prior the literature's tabulations. They take into consideration sample size, lag order, explained variable count, and whether the deterministic model components are unfettered or limited. To estimate the model, the ARDL command utilizes the `regress` tool in Stata. So, with the standard postestimation commands which can be used to do specification tests using the `forecast` command suite, one can deliver dynamic predictions for linear (time series) regressions.

### **Residual Diagnostic**

This thesis makes use of the Jarque-Bera normality test, the Breusch-Godfrey serial correlation test, and the Breusch-Pagan-Godfrey heteroskedasticity test in order to evaluate the model's efficacy as well as its robustness and reliability. In order to successfully finish the modelling process, you will need to conduct a broad variety test for stability and diagnosis. In addition, the outcomes of the many tests that are described in

this body of work have the potential to have a major influence on the validity of the model. These findings are presented in this body of work. Putting a numerical value on the degree to which the data are related to one another is a critical first step that must be taken. This can be accomplished by comparing the values of the residuals to the values that were predicted, as well as by demonstrating the value of the residual values in relation to the values that were projected. One more workable strategy for accomplishing this objective would be to make use of a specific illustration. The comparison of the computed F-statistics' probability value leads to the disproving of the null hypothesis and the model's conclusion either demonstrates heteroscedasticity or else homoskedasticity is determined as a consequence of this comparison. As soon as the probability value is put up against the calculated the null hypothesis according to F-statistics is disproved. When the probability value and the calculated F-statistics are compared, it shows that the null hypothesis must be disregarded since it is false.

### **Granger Causality Test**

A statistics hypothesis test called the Granger Causality Test was first introduced in 1969. Its goal is to discover whether one-time series may be used to predict another. Clive Granger claimed that one may test for causation in economics by assessing one's ability to predict potential values of a time series using past values of another time series, however, "mere" regressions automatically capture "mere" correlations. In response to the finding that regressions frequently yield negative results, Granger devised this strategy. The Granger test only uncovers "predictive causality," according to econometricians, because the issue of "real causality" is highly philosophical and because of the post hoc ergo propter hoc fallacy, this is the idea that the fact that one event happens before another can serve as evidence of causality. This misconception holds that the occurrence of one item before another can be used to demonstrate causation. Because the easiest way to express Granger-causality is "precedence" to use the term "causality" by itself, it is a misnomer as Granger himself went on to claim in 1977. The Granger causality test examines whether X can predict Y with accuracy rather than whether X is to blame for Y. If it can be demonstrated, t-tests and F-tests are frequently used to determine whether X values that have lag (together with lagged values of Y) offer statistically significant data on future values of

Y. one can say, time series X is a causal factor of another time series Y. This is referred to as the Granger-cause relationship.

The conventional Granger test of causation entails the testing of the null hypotheses that the exchange rate does not create GDP and vice versa, that renewable energy does not affect GDP, and that the interest rate does not induce foreign direct investment. It is possible to do this by only running the two regression models shown below:

$$\Delta \ln EG_t = \lambda_0 + \sum_{i=1}^m \lambda_{1i} \Delta \ln EG_{t-i} + \sum_{i=1}^n \lambda_{2i} \Delta REER_{t-i} + \sum_{i=1}^p \lambda_{3i} \Delta RE_{t-i} + \sum_{i=1}^q \lambda_{4i} \Delta \ln RIR_{t-i} + \mu_t \dots \dots \dots 5$$

$$\Delta \ln REER_t = \lambda_0 + \sum_{i=1}^m \lambda_{1i} \Delta \ln REER_{t-i} + \sum_{i=1}^n \lambda_{2i} \Delta EG_{t-i} + \sum_{i=1}^p \lambda_{3i} \Delta RE_{t-i} + \sum_{i=1}^q \lambda_{4i} \Delta \ln RIR_{t-i} + \varepsilon_t \dots \dots \dots 6$$

### Model Stability

The CUSUM tests are used to determine whether or not the coefficients in a model of multiple linear regression are likely to remain stable. The inference is produced iteratively from nested data subsamples by making use of a series of recursive residual balances or sums of squares (standardized one-step-ahead prediction errors). The coefficient's null hypothesis stability asserts that the structure of the model has changed over time if the values in a series travel outside of a specified range values and exceed the range.



## CHAPTER IV

### Results and Discussion

#### Introduction

Each of the tests that were covered in the conclusions of the preceding chapter is explained in this chapter. The tests in question are the descriptive statistics test, the stationarity test, ARDL bound testing, the ARDL short run test, the ARDL long run test, the residual diagnostic tests, and the stability test. With the assistance of EViews software, each and every one of them was successful.

**Table 4.1 Descriptive Statistics**

	<i>GDP</i>	<i>RE</i>	<i>REER</i>	<i>RIR</i>
<i>Mean</i>	4.546357	85.06475	107.7774	3.127071
<i>Median</i>	4.823564	85.11064	99.78190	5.918908
<i>Maximum</i>	15.32916	88.68000	272.9995	18.18000
<i>Minimum</i>	-2.035119	80.64000	49.74471	-31.45257
<i>Std. Dev</i>	3.986615	2.278999	50.99604	10.63006
<i>Skewness</i>	0.430109	-0.239734	1.850754	-1.329318
<i>Kurtosis</i>	3.313360	1.959840	6.104215	5.110485
<i>Jarque-Bera</i>	1.047712	1.639779	29.17163	14.40311
<i>Probability</i>	0.592233	0.440480	0.000000	0.000745
<i>Sum</i>	136.3907	2552.943	3233.322	93.81213
<i>Sum. Sq. Dev.</i>	460.8998	150.6213	75417.29	3276.946
<i>Observation</i>	30	30	30	30

*Source: This study*

Economic growth has a mean of 4.546357, which is the third highest in the category; the real exchange rate is 107.7774, which is the highest in the category; and the real interest rate is 3.127071, which is the lowest in the category. The maximum for the exchange rate is 272.9995, while GDP growth is 15.32916. In terms of skewness, GDP growth, renewable energy, and real interest have relatively low skewness, but the exchange rate has a large skewness. The kurtosis number for renewable energy shows a normal distribution; however, the other variables are the reverse.

## Unit Root Test

A variety of analytical co-integration tests for testing the unit root and variance ratio of actual exchange rate series for prices and exchange rates are some of the methods that have been used. Absolute PPP must be broken if a true exchange rate exists with a unit root, but that is not enough on its own. Various methods of testing for unit roots have been used throughout the year's Nelson and Plosser (1982) assert that When augmented Dickey-Fuller (ADF) type regressions are applied, the majority of real exchange rates and other macroeconomic time series have a unit root. However, Perron (1989) demonstrated that standard unit root testing includes a bias that makes them less likely to reject when a break occurs in a unit root previously assumed stationary trend. Serletis and Zimonopoulos (1997) show that the unit root hypothesis is not falsifiable even when Perron and Vogelsang's (1992) method is used, along with quarterly dollar- and Deutschmark-based real exchange rates (for 17 OECD countries from 1957 to 1995). nations) were used to examine the likelihood of an unexpected one-time change in the series' mean). Serletis and Zimonopoulos were inspired to undertake their investigation by these concerns.

**Table 4.2 ADF Unit Root Test**

<i>ADF UNIT ROOT TEST</i>				<i>PP unit root test</i>		
<i>Variables</i>	<i>Level</i>	<i>1<sup>st</sup> difference</i>	<i>Order</i>	<i>Level</i>	<i>1<sup>st</sup> difference</i>	<i>order</i>
<i>GDP</i>	0.8830**	0.0034	<i>I(1)</i>	0.0628	0.0000	<i>I(1)</i>
<i>REER</i>	0.1343	0.0003***	<i>I(1)</i>	0.1343	0.0000	<i>I(1)</i>
<i>RE</i>	0.4841	0.0002***	<i>I(1)</i>	0.4841	0.0002	<i>I(1)</i>
<i>RIR</i>	0.2495	0.0041***	<i>I(1)</i>	0.0226	-0-	<i>I(0)</i>

*Source: This study*

*Note: Schwarz info criterion significant level 1\*\*\*5\*\*10\**

Non-stationary time series are unpredictable processes with unit roots or structure breakdowns. Contrarily, unit roots play a vital role in non-stationarity. According to the table 4.2 above, one of our variables, GDP, is stationary at 1st difference with a p value of 0.0034, whereas the other variables, REER, RE, and RIR, are stationary at first difference with concomitant p values of 0.0003, 0.0002, and 0.0041. The result for the PP

unit root shows that the variables are stationary at level and first difference. There are three variables that are stationary at level; they are GDP, Renewable energy and exchange rate while only interest rate is stationary at level.

**Table 4.3 ARDL Bound Test**

<i>Model</i>	<i>Lag.</i>	<i>F-Statistic</i>	<i>Decision</i>
<i>GDP, RE, REER, RIR,</i>	<i>(2, 1, 4, 4,)</i>	<i>5.217547***</i>	<i>Co-Integration Exist</i>
<i>Bound</i>	<i>Critical</i>		
<i>Value</i>		<i>I (0)</i>	<i>I (1)</i>
<i>Sign.</i>	<i>10%</i>	<i>2.01</i>	<i>3.01</i>
	<i>5%</i>	<i>2.45</i>	<i>3.63</i>
	<i>2.5%</i>	<i>2.87</i>	<i>4.16</i>
	<i>1%</i>	<i>3.42</i>	<i>4.84</i>

*Source: This study*

*Note: Akaike info criterion (AIC) Pesaran et al. suggest the critical value bounds (2001) \*\*\*at 1percent level of significance \*\*at 5percent level of significance \*at 10percent level of significance*

The ARDL approach was used to develop the Bound Test, which was used to determine whether or not the data set under consideration exhibited co-integration. To reject the null hypothesis, F-statistics must be smaller than the lower limit (critical values for I) (0). The null hypothesis of no co-integration is disproved if the statistic exceeds upper limit I. (1). When the statistic falls within acceptable bounds, the findings are inconclusive. We may infer that both the dependent and independent variables have a long-term statistically significant correlation that is statistically significant utilizing the tests for 1%, 5%, and 10% levels of F statistic (5.217547). Because of this, we disprove the null hypothesis that there isn't a co-integration and find that GDP and GDP and renewable energy are linked.

**Table 4.4 ARDL Short Run and Long Run**

## ARDL LONG RUN

ARDL LONG RUN				
Variables	Coef.	Std. Error	t-statiistic	Prob.
GDP (-1)	0.220	0.390	0.565	0.6017
RE	-0.070	0.023	-2.954	0.0418
RIR	-0.016	0.006	-2.790	0.0493
REER	0.002	0.007	-1.678	0.1685

## ARDL SHORT RUN

Variables	Coef.	Std. error	t-statistic	P value
GDP(-1)	0.220	0.154	1.427	0.2265
D(RE(-2))	0.036	0.009	3.697	0.0209
D(RE(-3))	0.061	0.013	4.525	0.0401
D(RIR)	-0.024	0.003	-1.798	0.0002
D(RIR(-2))	-0.006	0.002	-2.995	0.0401
D(RIR(-3))	-0.060	0.012	-4.207	0.0136
D(REER)	-0.002	0.000	-4.255	0.0131
ECM	-0.0607	0.012	-5.051	0.0072

*Source: This study*

*Note: Akaike info criterion (AIC) \*\*\* at a 5% level of significance, \*\* at 10% level of significance, and \* at 1% level of significance*

According to Table 4.4, there is a persistent or negative correlation between the exchange rate and economic expansion, with a substantial level of 1% and a negative coefficient of -0.002. As a result, as economic growth becomes scarcer the rate of exchange rises by 0.002 percent over time in the long term. This illustrates how the currency exchange rate complements economic activity rather than a replacement for economic progress.

Renewable energy, nonetheless, has a statistically significant difference. likelihood of 0.0360 at a 5% level, despite the coefficient being 0.140. Because of this, Long-term economic expansion and renewable energy are positively correlated Interest rates are also substantial and have a beneficial influence on Nigerian economic development; This outcome is consistent with that of Ajibola et al. (2020), who calculated the foreign currency rates' effects on Nigeria's economic expansion. Time series data from 1981 to 2017 are used in the study, along with the autoregressive distributed lag model (ARDL). Real effective exchange rates, interest rates on loans, money supply, real GDP, foreign direct investment, oil revenues, and trade openness (percentage of GDP) data sets were examined to see if they were stable using the ADF and PP tests. Stationarity was established I (one each for the five various variables) and I (0 for two variables). According to the results of the correlation test, there is a strong association between money in circulation and oil revenue. However, the worst indicators are the inflation rate and foreign direct investment. The co-integration test for ARDL showed that the variables were connected over the long term. The findings of the ARDL test show that the actual effective exchange rate is negative and significantly affects Nigeria's long-term economic growth. The effective real exchange rate's lag value plays a small role in explaining variations in the near-term speed of economic growth. In explaining GDP, the money supply lag value is negative and important. at the same time. However, it is advantageous in the long run and essential in understanding Nigeria's economic success. Over the short and long terms, the rate of inflation has a negative and considerable impact on GDP. The error correction period of 20.7% shows how quickly things are changing to reach long-run equilibrium. According to the study's conclusions, Nigeria's interest rates are inflationary. In other words, a rise in interest rates will increase inflation. As a result, the study's findings suggest that foreign exchange rates in Nigeria's economic development will be significantly harmed by these factors, and the nation's monetary authorities must implement a flexible exchange rate.

Table 4.4 shows how the exchange rate affects economic expansion The information demonstrates the exchange rate's -0.059 probability of impacting economic growth, this has a 5% statistical significance leveling economic growth, which is statistically significant at a 5% level. When economic growth slows, the exchange rate

coefficient rises by -0.059 percent. As a consequence, we find that the variables have a meaningful short-run relationship and reject the null hypothesis.

Renewable energy has a probability of 0.169 and a statistical significance of 1%. We reject the null hypothesis because our data show that factors have a positive and negative short-term effect on each other, or that variables have a negative and positive short-term association. In the short run, we find that utilizing renewable energy significantly boosts national economic growth, suggesting that more renewable energy use leads to significant gains in the exchange rate. The result of switching from the immediate to the long-term is a 43% decrease in speed.

This conclusion is consistent with Okoye and colleagues' (2021) estimations of the Energy use's impact on Nigeria's economic development between 1981 and 2017, which includes financial development, the production of gross fixed capital, and inflation for more stability. According to the findings, gross fixed capital creation, a proxy for infrastructure, and energy usage have a big influence on the Development of the Nigerian economy. The research also provides empirical evidence for the subsequent reaction of an endogenous variable to shocks due to explanatory factors. As a result, it states that energy consumption is a primary predictor of Nigeria's economic development, which is consistent with the hypothesis that is driven by energy. The endogenous growth theory is supported by the positive benefits of electricity and capital utilization. Increasing public and private sector spending on infrastructure and energy development are highly encouraged.

**Table 4.5 Residual Diagnostic Tests**

<i>Test</i>	<i>Statistic</i>	<i>Pro.</i>	<i>Decision</i>
<i>Serial correlation test</i>	<i>1.023155</i>	<i>0,1099</i>	<i>No level of serial correlation up to 2lag</i>
<i>Normality test</i>	<i>2.139124</i>	<i>3.343330</i>	<i>Normal distribution</i>
<i>Heteroskedasticity</i>	<i>0.026527</i>	<i>0.9003</i>	<i>Homoscedastic</i>

*Source: This study*

The findings of this study's residuals show that there is no sequential association, conditional heteroskedasticity, and normal distribution. These results are consistent with what was seen in the residuals, which show a normal distribution.

According to the alternate hypothesis, the model has serial correlation. in contrast to the null hypothesis findings, which imply that serial correlation does not exist. The probability value, 0.1099, is more than the threshold, of which 0.05% is the default. Therefore, we select the null hypothesis and conclude that the model doesn't have any serial correlation.

To be more exact with the heteroskedasticity test, the null hypothesis is supported which claims that the model does not show heteroskedasticity at 5% but becomes stationary at 10%. The likelihood value of 0.9003 exceeds the 0.05 percent requirement, according to the residual diagnostic test, suggesting that the issue is more serious. Accordingly, utilizing the 5% threshold for significance needed to reject the null hypothesis we can't say that the model doesn't behave in a heteroskedastic way.

Finally, at the 5% significance level, the evidence offered in favor of the null residuals do not follow a normal distribution, as demonstrated by the hypothesis, but the evidence presented in support of According to the alternative theory, the residuals are distributed regularly. The Jarque-Bera likelihood of 0.343330 exceeds the 0.05 percent limit. Therefore, the null hypothesis is not true, and we can say that residuals have a regular distribution at 5% but only start to matter at 10%.

#### **Table 4.6 Granger Causality Test**

##### ***Pairwise Granger Causality Test***

*Date: 12/10/22*

*Time: 19:54*

*Sample: 1 41*

*Lags 2*

<b><i>Null Hypothesis</i></b>	<b><i>Obs.</i></b>	<b><i>F-Statistic</i></b>	<b><i>Prob.</i></b>
<i>RE does not Granger Cause</i>	28	0.98968	0.3870
<i>GDP</i>		1.56910	0.2297

<i>GDP does not Granger cause RE</i>			
<i>REER does not Granger Cause GDP</i>	28	0.49072	0.6185
<i>GDP does not Granger Cause REER</i>		0.48125	0.6241
<i>RIR does not Granger Cause GDP</i>	28	0.66133	0.5257
<i>GDP does not Granger Cause RIR</i>		3.00495	0.0693
<i>REER does not Granger Cause RE</i>	28	0.06589	0.9364
<i>RE does not Granger Cause REER</i>		0.47514	0.6278
<i>RIR does not Granger Cause RE</i>	28	1.08739	0.3538
<i>RE does not Granger Cause RIR</i>		1.87326	0.1763
<i>RIR does not Granger Cause REER</i>	28	6.84321	0.0047**
<i>REER does not Granger Cause RIR</i>		1.18916	0.3225

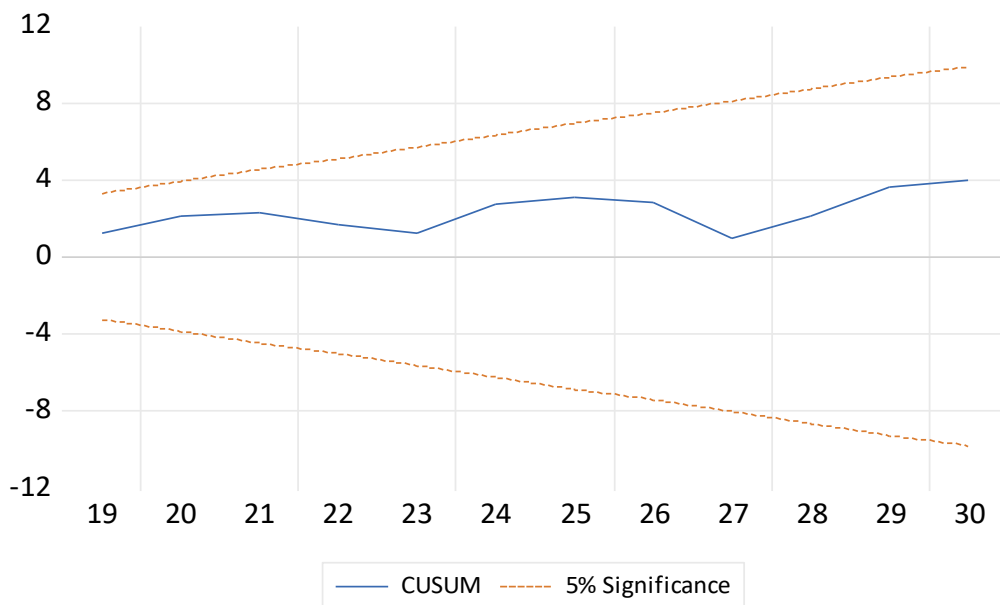
Source: This study

The conventional Granger test of causation entails the testing of the null hypotheses that the exchange rate does not create GDP and vice versa, that renewable energy does not affect GDP, and that the interest rate does not induce foreign direct investment. In addition, these hypotheses must be tested to determine whether or not they are true. The findings point to a one-way chain of causation between the different factors. According to this, only in the test mentioned earlier, at a level of 5%, the real exchange rate was determined by the real interest rate generator, which is important.

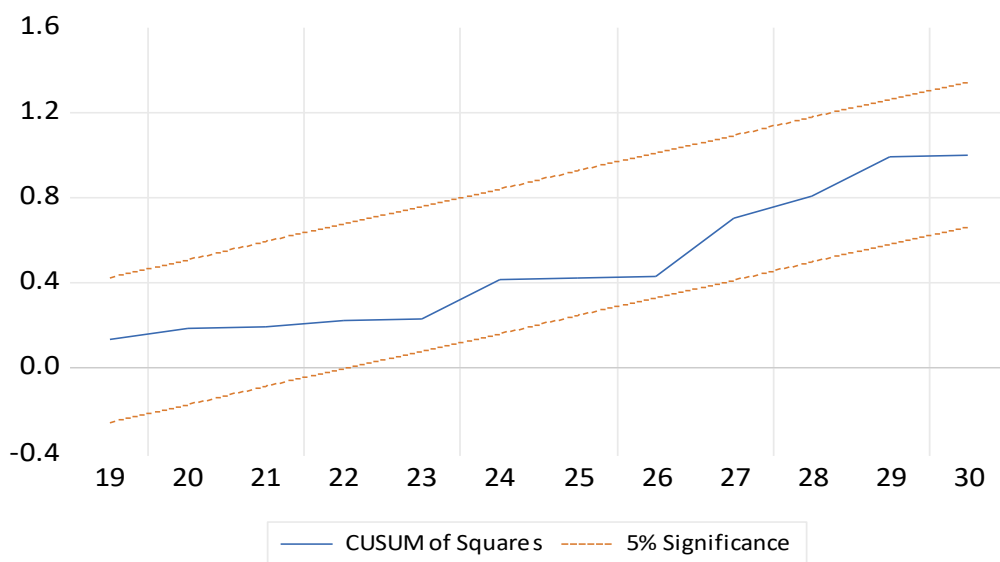


## Stability Test

**Figure 4.1 CUSUM Test**



**Figure 4.2 CUSUM of Square Test**



The null hypothesis holds that the parameters are always constant. The alternate theory, on the other hand, does not support the idea that the parameters are constantly identical. The test findings indicate that the blue line must remain inside the bounds of the red line, which limits its mobility. We have opted to accept the null hypothesis while rejecting the

alternative hypothesis because we would like to assume that the residual variances are stable rather than unstable. Everything would be much better than it is now. Furthermore, we may conclude that the residual variance is stable as compared to volatile. Finally, the ARDL model's long-term stability was examined using the cumulative sum of recursive residuals (CUSUM) and the cumulative sums of squares (CUSUMQ). relationship between currency rate movements over the long and short term, as well as economic growth variables. Both of these approaches were employed to evaluate the ARDL model's long-term stability and long-term coefficient. This was done so that a comparison could be made between the short-term dynamics of the variables and the long-term consistency of the long-term coefficient. The basis for the null hypothesis is on the assumption that none of the error correction coefficients contained in the error correction model change within a confidence range with a margin of error of 5%. (Oskooee & Bahmani 2002). Whenever any of the lines are shown to be crossed at a level of significance of 5%, Consistent coefficients as the null hypothesis cannot be supported. If any of the lines were discovered to be crossed, this would be the situation. The CUSUM and CUSUMQ data plot must remain inside the critical bounds given in the right image for the exchange rate coefficient to remain steady over time.

## CHAPTER V

### Summary, Conclusion, and Recommendations

#### Summary

The impact of exchange rates and renewable energy use on Nigeria's economic development are examined in this thesis (1990–2019). Due to the type of essential structural changes, such as decreased imports or increased non-oil exports, both of which result in a decline in the nominal exchange rate, rules governing exchange rates in emerging nations are frequently complicated and contentious. Domestic modifications are seen as detrimental to the economy because of short-term effects on price and demand. In developing nations that depend on imports for manufacturing and consumption, the challenges produced by an inflated exchange rate system are seldom discussed.

The discussion primarily centers on the size of exchange rate movements in response to internal and external shocks. There seems to be a universal agreement that depreciation or devaluation may increase domestic production by boosting the net export portion. This may be seen in the enhanced international competitiveness of domestic sectors, which leads to a shift in spending away from imported items whose prices have risen and toward homegrown ones. Guitan (1976) and Dornbusch (1988) claim that shifting demand in the appropriate direction and in the right amount, as well as the ability of the domestic economy to produce additional goods to satisfy the increased demand, are key factors in whether currency depreciation is successful in enhancing trade balance. Exchange rate fluctuations are projected to have an impact on economic performance overall. As a result, the consequences analysis of the effects of exchange rate changes on output growth and rising prices must be evaluated. Nigeria's currency policy has changed significantly since it was established at par with the British pound. During After the economy nearly completely collapsed between 1982 and 1985, the country entered its first post-independence era of floating currency in 1986. (Akpan et al. 2011). The Naira was tied to other currencies, notably the US dollar, throughout the 1970s and early 1980s. This currency rate strategy favored the naira's overvaluation, which fluctuated Between 1970 and 1985, the exchange rate varied between 0.71 and 0.89 to the US dollar, benefitting all imports while punishing non-oil exports. Due to Nigeria's high susceptibility to outside shocks, the Since the SAP, the currency rate of exchange has become more unstable.

Nigerian currency rates were significantly impacted by the recent global economic disaster, as evidenced by the Naira to Dollar exchange rate. increased astronomically between 2008 and 2009, from around N120 per \$1 to over N180 per \$1 (a 50% increase). Due to the prolonged decline in crude oil prices, which went from an all-time high of US\$147 per barrel in July 2007 to a record-low of US\$45 per barrel in December 2008, Nigeria's foreign profits have significantly decreased (CBN, 2008). Supply and demand analysis is an important first step in comprehending currency rates; we need to understand international financial investors' perspectives and actions, especially when dealing with floating exchange rates. The daily trading of billions of Naira in foreign exchange is claimed to be linked to both the cross-border exchange of goods and services as well as the placement or repositioning of the currency mix in the portfolios of global investors in the financial sector. The currency rate policy of a country consequently becomes extremely vulnerable to macroeconomic shocks. Countries typically pursue exchange rate policies that absorb shocks from both domestic and international commerce because the economy performs better and is more stable when shocks are less disruptive. Across international borders, money must also go oppositely from commodities and services. To do this, a rate of exchange between two trading partners' currencies to discharge obligations accrued as a consequence of their commerce (Nzotta, 2009) The current value at which a currency is controlled is called the exchange rate, and it changes at various periods. Some of the elements that impact exchange rate swings include Governmental decisions, the relationship between supply and demand, the acts of the international Nigerian Stock Exchange (NSE) business, oil oversupply, and recession. The vast majority of Formal education and data analysis, which are frequently used to obtain those conclusions in research projects, are the two sorts of data that are used to support those conclusions. These two types of data are used to obtain such results. The researcher who worked on this study used the same approach to the tasks as the researcher who worked on the study that came before it. To get quantitative data for a broad variety of diverse components and parts, it is essential to contact the World Bank Data Center as a resource. The project will begin collecting data on an annual basis in 1990 and will continue until 2019; this will represent a total of 30 years of data gathering beginning in 1980 and ending in 2019. To gain higher reliability and accuracy in one's findings, it is necessary to

evaluate economic factors such as real effective exchange rates, GDP growth, and renewable energy over an extended period. This may be accomplished through an extensive study on a protracted basis.

This thesis made use of the ARDL strategy, which is based on the Ordinary least square (OLS) methodology for cointegration across variables and is suitable for generating both short-run and long-run elasticities for a small sample size. This approach was created to investigate the link between many factors. Even though the ARDL technique is based on the OLS methodology, this remains true (Daura et al. 2007).

The ADF unit root test was utilized in this thesis. An ARDL model provides more flexibility because the variables are integrated in a specific order and may be modified at any moment throughout the modeling process. ARDL is effective when the independent variable can be either  $I(0)$ ,  $I(1)$ , or mutually cointegrated (Frimpong & Oteng, 2006). In the model, it is ineffective when any of the variables include  $I(0)$ . Various methods of testing for unit roots have been used throughout the years. demonstrate that it is not possible to reject the unit root hypothesis even when allowing or considering the potential occurrence of a single, unforeseen change in the series' mean using the Perron and Vogelsang (1992) method utilizing quarterly real exchange rates based in both dollars and Deutschmarks (from 1957 to 1995 for 17 OECD countries). Serletis and Zimonopoulos were inspired to undertake their investigation by these concerns. This thesis employs the Breusch-Godfrey serial correlation test, the Jarque-Bera test, and the Breusch-Pagan-Godfrey heteroskedasticity test normalcy test to evaluate the model's validity, robustness, and reliability. To effectively complete the modeling process, you will need to perform a wide range test for stability and diagnosis. Furthermore, the results of the many tests outlined in this body of work have the potential to significantly affect the model's validity. This body of work presents these results. The provision of a numerical number indicating the degree to which the data are connected to one another is an important first step. This may be performed by comparing the residual values to the anticipated values as well as displaying the value of the residual values with respect to the projected values. Alternatively, this may be performed by comparing the residual values to the anticipated values. Another way to accomplish this goal is to compare the residual values to the predicted values. Another viable technique for achieving this goal would be to utilize a

particular example. The null hypothesis was rejected as a result of comparing the probability value to the calculated F-statistics, and the conclusion that the model either exhibits heteroscedasticity or homoskedasticity. The null hypothesis is disproved after comparing the estimated F-statistics' probability value. When the probability value and the estimated F-statistics are compared, the null hypothesis is refuted. If the following conditions are met: then, the probability value and the calculated F-statistics are compared. This show to be incorrect and must be rejected. A stochastic process having structural failures, such as unit roots, is referred to as a "non-stationary time series." Alternatively, unit roots are important in non-stationarity. One of our variables, GDP, is stationary at level with a p value of 0.0169, but the other variables, REER, RE, and RIR, are stationary at first difference with 0.0003, 0.0002, and 0.0041 as the relevant p values. The ARDL method was utilized to create the bound test, which was used to assess whether or not the data set under review displayed no co-integration. Below the lower limit (critical values for I), F-statistics cannot be used to reject the null hypothesis (0). Whenever a statistic exceeds the upper bound I, the co-integration null hypothesis is rejected (1). The results are inconclusive when the number falls within acceptable ranges.

Using the F statistic, we may deduce that the independent and dependent variables are both present long-term statistically significant association that at the levels of significance is statistically significant of 1%, 5%, and 10% (5.217547). As a result, we reject the null hypothesis that co-integration does not exist and come to the conclusion that GDP and renewable energy are connected. Table 4.3 illustrates that economic growth and the currency rate have a long-term or negative link, with a significant level of 1% and a negative coefficient of -0.059. As a consequence, as long-term economic growth becomes scarcer, the exchange rate rises by 0.059 percent over time. This illustrates that, over time, the exchange rate complements rather than replaces economic advancement.

Despite having a coefficient of 0.140, renewable energy has a statistically significant chance of 0.0360 at a 5% level. As a result, renewable energy sources and economic expansion have a long-term, favorable link on interest rates that are also significant and having a favorable effect on Nigeria's economic expansion; this conclusion is similar to that of Ajibola et al. (2020), who estimated the effect of currency exchange rates on Nigeria's economy. The autoregressive distributed lag (ARDL) model was

applied to time series data between 1981 and 2017. Using the PP and ADF tests, it was determined whether or not real effective exchange rates, inflation rates, money supply, lending interest rates, real GDP, foreign direct investment, oil receipts, and trade openness (as a percentage of GDP) would remain stable in the data set. It was discovered that I (1 for 5 variables) and II (Zero for two variables) were stationary. The correlation test's findings reveal a connection between the money supply and oil revenues have the highest relationship, whereas both foreign direct investment and inflation rate have the weakest. The A test for ARDL co-integration revealed that over time, the variables were connected. The ARDL test's findings demonstrate that the genuine effective exchange rate has a negative and sizable impact on the long-term economic growth of Nigeria. When it comes to describing short-term fluctuations in the current pace of economic growth, the lag value of the real effective exchange rate is quite small. In explaining GDP, the money supply lag value is also substantial and unfavorable. But in the long run, it's advantageous and necessary for illuminating Nigeria's economic achievement. The rate of inflation has both a short-term and long-term negative and considerable impact on GDP. The 20.7% error correction term provides the long-run equilibrium adjustment rate. The results of the study indicate that Nigeria's interest rates are inflationary. In other words, rising interest rates will lead to higher inflation. As a consequence, the research project concludes that Nigeria's monetary authorities should adopt a flexible exchange rate since foreign currency rates have such an expansion on Nigeria's economy which is negatively and significantly impacted. Table 4.4 illustrates how the exchange rate affects economic progress. According to the statistics, the exchange rate has a -0.059 likelihood of having an influence statistically significant at a threshold of 5% on economic expansion. The exchange rate coefficient increases by -0.059 percent when economic growth slows. The null hypothesis is thus disproved, and we infer that the variables have a substantial short-run association. Renewable energy has a 0.169 probability and a 1% statistical significance. The null hypothesis is rejected because our data demonstrate that factors have a positive and negative short-term influence on each other or that variables have a negative and positive short-term connection. We show that using renewable energy does have a significant favorable impact on global currency economic expansion near term,

meaning that higher renewable energy use leads to big gains in the exchange rate. The transition from short to long runs leads to a 43 percent drop in speed.

This finding is consistent with Okoye et al. (2021) estimates of the effect of energy Consumption on Nigerian economic expansion from 1981 to 2017, which includes inflation, total fixed capital formation, and financial development for improved sturdiness. According to the study, the expansion of Nigeria's economic activity is significantly impacted by energy use and gross fixed capital creation, which is a proxy for infrastructure. In the study also offers empirical evidence for an endogenous variable's delayed response to shocks owing to explanatory variables. As a consequence, it states that a key factor influencing Nigeria's economic growth is energy usage progress, which is compatible with the energy-led hypothesis. The endogenous growth theory is supported by the favorable benefits of electricity and capital utilization. Increased investment in energy and infrastructure development by the both the public and private sectors are strongly encouraged.

The residual results of this investigation reveal that there is no serial correlation, conditional heteroskedasticity, or normal distribution. These findings are consistent with the residuals, which reveal a normal distribution. In contrast to the null hypothesis results, which suggest that serial correlation does not exist. According to the alternate theory, In the model, there is a serial correlation. The probability value of 0.1099 exceeds the 0.05% cutoff point. Due to this, the researcher adopted the null hypothesis and proved that the model does not include serial correlation. To be more specific, the heteroskedasticity test results support the assertion made by the null hypothesis the model does not exhibit heteroskedasticity at 5% but becomes stationary at 10%. The Remaining diagnostic testing demonstrates that the likelihood value of 0.9003 is higher than the 0.05 percent threshold, suggesting that the issue is more severe. So, based on the Rejecting the null hypothesis requires a 5% significance threshold, we cannot conclude that the model does not exhibit heteroskedastic behavior.

Finally, at the 5% significant level, the proof provided for the null hypothesis suggests that the revenues don't have a normal distribution, but the evidence presented in support of the alternative hypothesis indicates that the residuals do. Jarque-Bera's probability of 0.343330 is more than the 0.05 percent limit. As a consequence, the null



hypothesis is false, and we may claim that residuals have a normal distribution at 5% but only become significant at 10%.

The null hypothesis holds that the parameters are always the same. On the other hand, the alternate theory contradicts the notion that the parameters are always the same. The results of the tests show that the blue line must stay inside the borders of the red line, limiting its mobility. We choose to accept the alternate hypothesis while accepting the null hypothesis because we prefer to think of residual variances as stable rather than unstable. Everything would be much improved over what it is currently. Furthermore, we may deduce that the residual variance is more stable than volatile. Finally, the cumulative sums of squares (CUSUM) and the cumulative sum of recursive residuals (CUSUM) (CUSUMQ) were employed to test the stability of the relationship between long-term and short-term in the ARDL model. Exchange rates and economic growth parameters. Both methods analyzed to determine the ARDL model's long-term stability long-term coefficient. This was done comparing the variables' long-term and short-term patterns, long-term coefficient stability. The null hypothesis is predicated on the assumption that none of the error correction coefficients in the error correction model change within a 5% confidence interval. Ng, Bahmani, and Oskooee (2002) Consistent coefficients cannot satisfy the If any of the lines are shown to be crossed at, then the null hypothesis is supported at a level of significance of 5%. This would be the case if any of Lines were discovered to be crossed. For the exchange rate coefficient to remain constant over time, The CUSUM and CUSUMQ data plot should remain inside the critical bounds shown in the right figure.

## **Conclusion**

This research examines effects of exchange rates and renewable energy use on Nigeria's economic development (1990–2019). The currency rate regime in Nigeria has shifted dramatically from a set rate of exchange with the British pound during the country's first post-independence era to the currency's floating following the country's economic almost complete collapse between 1982 and 1985, in (since) 1986 (Akpan et al. 2011). The Naira was connected to other currencies, notably the US dollar, throughout the 1970s and early 1980s. This currency rate strategy favored the naira's overvaluation, which

fluctuated the US currency fluctuated between 0.71 and 0.89 during 1970 and 1985, boosting all forms of imports while penalizing exports of goods other than oil. Due to Nigeria's high susceptibility to outside shocks, Since the SAP, the currency rate has become more unstable. The recent financial crisis had a noticeable impact Considering the Naira's value against the US dollar on Nigerian exchange rates skyrocketed between 2008 and 2009, from around N120 per \$1 to over N180 per \$1 (a 50% increase). This is because Nigeria's foreign revenues have been significantly impacted by the continuous decline in crude oil prices, which fell from an all-time high of US\$147 per barrel in July 2007 to a low of US\$45 per barrel in December 2008 (CBN, 2008). Understanding currency rates requires first understanding supply and demand, which is a crucial first step we need to understand international financial investors' perspectives and actions, especially when dealing with floating exchange rates. The daily trading of billions of Naira in foreign exchange is claimed to be linked to both the positioning or currency mix of international financial investors' portfolios is being repositioned as well as international trade in goods and services. As a result, a country's exchange rate policy is very vulnerable to macroeconomic shocks. Countries typically undertake exchange rate regulations that take into account both domestic and global trade shocks because economy performs better and is more stable when shocks are less disruptive. The vast majority of research initiatives rely two different types of data to attain their conclusions: theoretical knowledge and data analysis, which is often employed to arrive at those conclusions. These two types of data are used to obtain such results. The researcher who worked on this study used the same approach to the tasks as the researcher who worked on the study that came before it. To get quantitative data for a broad variety of diverse components and parts, it is essential to contact the World Bank Data Center as a resource. The project will begin collecting data on an annual basis in 1990 and will continue until 2019; this will represent a total of 30 years of data gathering beginning in 1980 and ending in 2019. To gain higher reliability and accuracy in one's findings, it is necessary to evaluate economic factors such as real effective exchange rates, GDP growth, and renewable energy over an extended period. This may be accomplished through extensive study over an extended period.

The ARDL technique on the principle of ordinary least squares (OLS) methodology for it is appropriate to produce short-run- and long-run elasticities for small sample sizes using cointegration across variables. This approach was created to investigate the link between many factors. Despite the fact that the ARDL technique is based on the OLS methodology, this remains true (Daura et al. 2007).

An ARDL model provides more flexibility since the order of the variables' integration may be modified at any moment throughout the modeling process. ARDL is effective when Depending on the model, the independent variable could be I (zero), I (one), or mutual cointegration (Frimpong & Oteng, 2006). is ineffective when any of the variables include I. (0). (2). The ARDL method was utilized to create the bound test, which was used to assess whether or not the data set under review displayed co-integration. Below the lower limit (critical values for I), F-statistics cannot be used to disprove the null hypothesis (0). The null hypothesis that there is no co-integration is true if the statistic is higher than I, the upper limit is disregarded (1). The results are inconclusive when the number falls within acceptable ranges.

Using the F statistic, we can infer that both the independent variable and dependent variables are related over the long term statistically significant association that, when taken into account, is statistically significant of 1%, 5%, and 10% (5.217547). We thereby reject the null hypothesis of no co-integration and come to the conclusion that GDP and renewable energy are connected. Table 3 illustrates that the exchange rate and economic growth have a long-term, inverse relationship, with a significant level of 1% and a negative coefficient of -0.059. As a consequence, as long-term economic growth becomes scarcer, the exchange rate rises by 0.059 percent over time. This illustrates a long-term exchange rate will not fluctuate complements rather than replaces economic advancement. Despite having a coefficient of 0.140, In terms of statistical significance, renewable energy chance of 0.0360 at a 5% level. Because of this, Renewable energy sources and economic expansion are linked over time that is good for both. Interest rates are also significant and have a positive effect on Nigerian economic development; this conclusion is similar to that of Ajibola et al. (2020) who estimated the effect of currency rates on the expansion of Nigeria's economy. Data from time series from 1981 to 2017 are used with the autoregressive distributed lag model (ARDL). The ADF and PP tests were used to

evaluate if Real effective exchange rates, inflation rates, money supply, lending interest rates, real gross domestic product, foreign direct investment, oil revenues, and trade openness are among the data sets that are included (as a proportion of GDP) all remained steady. I (1 for 5 variables) and I showed stationarity ((Zero for two variables). Findings from the correlation test show that the money supply and oil revenues have the highest relationship, whereas the weakest are the foreign direct investment and inflation. The ARDL co-integration test illustrated the long-term linkages between the variables. The results of the ARDL test demonstrate that the real effective exchange rate considerably and negatively affects Nigeria's long-term economic growth. The actual effective exchange rate's short-term lag value is negligible when it comes to explaining variations in the growth of the economy's exchange rate. In addition, a negative and significant money supply lag value is needed to explain GDP. On the whole, nevertheless, it helps to explain Nigeria's economic strength and is essential. GDP is adversely impacted by inflation both immediately and over the long run the errors were corrected by 20.7%. It demonstrates how quickly the system is adjusting to long-run equilibrium. The study's findings indicate that Nigeria's interest rates are inflationary. In other words, rising interest rates will lead to higher inflation. As a consequence, the study's findings support the need for Nigeria's monetary authorities to implement a flexible exchange rate since foreign Exchange rates significantly harm the nation's ability to expand economically.

Table 4 illustrates how the exchange rate affects economic progress. According to the statistics, the exchange rate has a -0.059 likelihood of having an influence on economic expansion which is statistically at a 5% level, substantial. The rate of change factor increases by -0.059 percent when economic growth slows. The null hypothesis is thus disproved, and we infer that the variables have a substantial short-run association. Renewable energy has a 0.169 probability and a 1% statistical significance. The null hypothesis is rejected because our data demonstrate that factors have a positive and negative short-term influence on each other or that variables have a negative and positive short-term connection. We demonstrate that the use of renewable energy significantly boosts the growth of the world's currencies near term, meaning that higher renewable energy use leads to big gains in the exchange rate. The transition from short to long runs leads to a 43 percent drop in speed.

This finding is consistent with Okoye et al. (2021) estimates of the impact from 1981 and 2017, taking into account financial development, gross fixed capital formation, and inflation for added sturdiness. The study finds that the expansion of Nigeria's economic activity is significantly impacted by energy usage and total fixed capital creation (a proxy for infrastructure). The investigation also offers empirical evidence for an endogenous variable's delayed response to shocks owing to explanatory variables. As a consequence, it claims that a significant factor in global warming is the use of energy. Predictor of Nigeria's economic progress, which is compatible with the energy-led hypothesis. The endogenous growth theory is supported by the favorable benefits of electricity and capital utilization. Increased investment in energy and infrastructure development by the public and private sectors is strongly encouraged. The macroeconomic environment seems to be pretty stable, but the fundamentals of the economy, such as inflation, savings, investment, expansion, unemployment, and poverty, do not continue to be contentious issues. As a consequence, authorities' and development partners' emphasis has shifted to macroeconomic policy regarding domestic investment, economic expansion, and the interest rate and exchange rate.

### **Recommendations**

The thesis suggests increased economic diversification through the prudent investment of proceeds from crude oil in productive sectors of the economy. Furthermore, it is well known that the number of surplus reserves held by Nigeria functions as the primary anchor for the prices and exchange rate. Hence, even in the face of diminishing oil revenues, exchange rate stability might be attained by making a determined effort to build the infrastructure and diversify the export base of the economy.

Therefore, monetary policy aims should be congruent with fiscal policy objectives to promote macroeconomic stability consistent with sustained real GDP growth and low inflation. In this context, a framework for efficient fiscal and monetary policy coordination should be established. Furthermore, the Depreciation of the REER is caused by a decreased nominal effective exchange rate, which tends to improve net exports and thus production growth. In a 100% currency rate pass-through situation, however, nominal depreciation may be inflationary. Maintaining a steady exchange rate requires permitting

the exchange rate to decrease within a certain range. This policy advice is compatible with the West African Monetary Zone's (WAMZ) 13 convergence condition on the exchange rate, which states that member nations' currencies should decrease within a 15% range. Take into account the crucial factor of the exchange rate component of the global economic system since it is the principal method for moving foreign money from savers to borrowers. This is crucial to remember since the exchange rate's function in the economy is vital for the whole globe.

When it comes to the influence of macroeconomic factors on the three are both advantages and disadvantages to the exchange rate The Nigerian government should undertake a variety of things to ensure that the nation is politically stable, that enough infrastructure is constructed, and that foreign currencies and interest rates remain stable via sound macroeconomic policy. According to the conclusions of this study, techniques for maintaining a stable inflation rate should be applied. Nigeria's GDP has expanded recently, which would be a sign that foreign investors are beginning to have faith in the nation's economy and ability to maintain stability in the face of a turbulent world economy. The results of the study demonstrate that a high-interest rate is only tangentially connected with economic growth, and the central bank of Nigeria should set an interest rate that would help in luring investors to the nation. Because it has been shown to have a positive impact on the country's economic development, it is advised that the government establish a policy to create an environment conducive to the execution of business operations to aid in the expansion of the economy growth in the exchange rate might stifle an economy's growth. As a consequence of this fact, authorities should strive to keep exchange rates stable at levels that do not stifle economic progress. Foreign currency should be forbidden in developing countries like Nigeria, and all foreign cash should be exchanged for local currency at the Nigerian Central Bank or a commercial bank in your city.

### Reference

- Acha, I. A., & Acha, C. (2011). Interest rates in Nigeria: An analytical perspective. Acha, Ikechukwu Anthony, and Acha, Chigozie Kelechi (2011), Interest Rates in Nigeria: An Analytical Perspective, *Research Journal of Finance and Accounting*, 2(3), 71-81.
- Adedokun, A. J. (2012). Employment effect of exchange rate volatility in Nigeria's manufacturing sector. *Journal of Economic Theory*, 6(1), 14-25.
- Adedayo V. (2012). Poultry waste management techniques in urban agriculture and its implications: A case of metropolitan Lagos, Nigeria. *Asian Journal of Agricultural Sciences*, 4(4), 258-263.
- Adejare and Usman (2012) Wang, S., Wang, S., Wang, H., & Wolstencroft, P. (2021). Growth rate of US state-level biomass consumption. *Renewable Energy*, 179, 911-917.
- Adekanye, F. (2010). *Elements of banking in Nigeria*. Lagos.
- Adelowokan, O. A. (2012). Exchange rate pass-through in Nigeria: A Dynamic Evidence. *European Journal of Humanities and Social Sciences*, 16(1), 785-801.
- Ajibola I. O., Udoette, S. U., Muhammad, R. A., & Anigwe, J. O. (2020). Currency substitution and exchange rate volatility in Nigeria: An autoregressive distributed lag approach. *CBN Journal of Applied Statistics*, 11(2), 1-28.
- Ahmed, S., & Zlate, A. (2014). Capital flows to emerging market economies: A brave new world?. *Journal of International Money and Finance*, 48, 221-248.
- Akinlo, A. E., & Odusola, A. F. (2003). Assessing the impact of Nigeria's naira depreciation on output and inflation. *Applied Economics*, 35(6), 691-703.
- Akpan E. O., & Atan, J. A. (2011). Effects of exchange rate movements on economic growth in Nigeria. *CBN Journal of Applied Statistics*, 2(2), 1-14.
- Akpokodje, G. (2009). Exchange rate volatility and external trade: The experience of selected African countries. In. Adeola Adenikinju, Dipo Busari and Sam Olofin (ed.) *Applied Econometrics and Macroeconomic Modelling in Nigeria*.
- Aliyu, S. U. R. (2009). Impact of oil price shock and exchange rate volatility on economic growth in Nigeria: An empirical investigation.

- Anyanwu, F. A., Ananwude, A. C., & Okoye, N. T. (2017). Exchange rate policy and Nigeria's economic growth: A granger causality impact assessment. *International Journal of Applied Economics, Finance and Accounting*, 1(1), 1-13.
- Apergis N., & Payne, J. E. (2011). The renewable energy consumption–growth nexus in Central America. *Applied Energy*, 88(1), 343-347.
- Azlina A. A., Law, S. H., & Mustapha, N. H. N. (2014). Dynamic linkages among transport energy consumption, income and CO2 emission in Malaysia. *Energy Policy*, 73, 598-606.
- Bahmani Oskooee, M., & Ng, R. C. W. (2002). Long-run demand for money in Hong Kong: an application of the ARDL model. *International journal of business and economics*, 1(2), 147.
- Barry A. A. (2022). The Impact of Interest Rates on Business Loans Demand in The Gambia.
- Barro, R. J., & Gordon, D. B. (1983). A positive theory of monetary policy in a natural rate model. *Journal of political economy*, 91(4), 589-610.
- Ben David, S., Blitzer, J., Crammer, K., Kulesza, A., Pereira, F., & Vaughan, J. W. (2010). A theory of learning from different domains. *Machine learning*, 79(1), 151-175.
- Berg, A., Borensztein, E., & Mauro, P. Working Paper 67 An Evaluation of Monetary Regime Options for Latin America.
- Berg, A., Mauro, P., Mussa, M., Swoboda, A. K., Jadresic, E., & Masson, P. R. (2000). Exchange rate regimes in an increasingly integrated world economy. In *Exchange Rate Regimes in an Increasingly Integrated World Economy*. International Monetary Fund.
- Berman, N., Martin, P., & Mayer, T. (2012). How do different exporters react to exchange rate changes?. *The Quarterly Journal of Economics*, 127(1), 437-492.
- Bhattacharya M., Paramati, S. R., Ozturk, I., & Bhattacharya, S. (2016). The effect of renewable energy consumption on economic growth: Evidence from top 38 countries. *Applied Energy*, 162, 733-741.
- Bibi, A., & Li, X. M. (2022). The asymmetric dilemma of renewable energy, financial development, and economic growth: fresh evidence from Pakistan. *Environmental Science and Pollution Research*, 29(21), 31797-31806.



- Bierens, H. J. (1997). Cointegration analysis. System dynamics in economic and financial models, 217-246.
- Borensztein E., & Lee, J. W. (2002). Financial crisis and credit crunch in Korea: evidence from firm-level data. *Journal of Monetary Economics*, 49(4), 853-875.
- Bowden N., & Payne, J. E. (2009). The causal relationship between US energy consumption and real output: a disaggregated analysis. *Journal of Policy Modeling*, 31(2), 180-188.
- Bowden, N., & Payne, J. E. (2010). Sectoral analysis of the causal relationship between renewable and non-renewable energy consumption and real output in the US. *Energy Sources, Part B: Economics, Planning, and Policy*, 5(4), 400-408.
- Boykorayev B. (2008). Factors that determine nominal exchange rates and empirical evidence of cross-sectional analysis. MSc in Finance and International Business. Aarhus School of Business, 1-65.
- Branson, W. H., & Love, J. P. (1998). The Real Exchange. Employment and Output in Manufacturing in the USA and Japan. NBER Working Paper, (2491).
- Bulut, U., Shahbaz, M., & Vo, X. V. (2022). Renewable energy-economic growth nexus revisited for the USA: do different approaches for modeling structural breaks lead to different findings?. *Environmental Science and Pollution Research*, 29(20), 30134-30144.
- Bunting, F. H. (1939). The purchasing power parity theory reexamined. *Southern Economic Journal*, 282-301.
- Calvo G. A. (2003). Explaining sudden stop, growth collapse, and BOP crisis: the case of distortionary output taxes. *IMF Staff papers*, 50(1), 1-20.
- Calvo, G. A., & Reinhart, C. M. (2002). Fear of floating. *The Quarterly journal of economics*, 117(2), 379-408.
- Cassel, G. (1916). The present situation of the foreign exchanges. *The Economic Journal*, 26(101), 62-65.
- Cassel, G. (1919). The depreciation of the German mark. *The Economic Journal*, 29(116), 492-496.

- Chang C. L., & Fang, M. (2022). The connectedness between natural resource commodities and stock market indices: Evidence from the Chinese economy. *Resources Policy*, 78, 102841.
- Chen Y., Sensini, L., & Vazquez, M. (2021). Determinants of leverage in emerging markets: empirical evidence. *International Journal of Economics and Financial Issues*, 11(2), 40.
- Chiemeké, S. C., Ewwiekpaefe, A. E., & Chete F. O. (2006). The adoption of Internet banking in Nigeria: An empirical investigation. *Journal of Internet banking and Commerce*, 11(3), 1-10.
- Choudhry, T. (2005). Exchange rate volatility and the United States exports: evidence from Canada and Japan. *Journal of the Japanese and International economies*, 19(1), 51-71.
- Daura Jorge, F. G., Rossi-Santos, M. R., Wedekin, L. L., & Simões-Lopes, P. C. (2007). Behavioral patterns and movement intensity of *Sotalia guianensis* (PJ van Bénédén) (Cetacea, Delphinidae) in two different areas on the Brazilian coast. *Revista Brasileira de Zoologia*, 24, 265-270.
- Dornbusch, R. (1988). Real exchange rates and macroeconomics: a selective survey.
- Duasa J. (2007). Determinants of Malaysian trade balance: An ARDL bound testing approach. *Global Economic Review*, 36(1), 89-102.
- Dornbusch, R., & Frankel, J. (1988). The flexible exchange rate system: experience and alternatives. In *International finance and trade in a polycentric world* (pp. 151-208). Palgrave Macmillan, London.
- Edwards S., & Savastano, M. A. (2000). The Mexican Peso in the Aftermath of the 1994 Currency Crisis. *Currency crises*, 183-236.
- Egwaikhide, F., Chete, L. N., & Falokun, G. (1994). Exchange rate depreciation, budget deficit, and inflation-The Nigerian experience.
- Eichengreen B., & Gupta, P. (2015). Tapering talk: The impact of expectations of reduced Federal Reserve security purchases on emerging markets. *Emerging Markets Review*, 25, 1-15.
- Eichengreen, B., Masson, P., Savastano, M., & Sharma, S. (1999). Transition strategies and nominal anchors on the road to greater exchange-rate flexibility (No. 213).

International Economics Section, Department of Economics Princeton University,.

- Ekpo, A. H. (2003). *Macro-Economic Model of the Nigerian Economy*. Vantage Publishers.
- Engle R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: journal of the Econometric Society*, 251-276.
- Ewing B. T., & Thompson, M. A. (2007). Dynamic cyclical comovements of oil prices with industrial production, consumer prices, unemployment, and stock prices. *Energy Policy*, 35(11), 5535-5540.
- Fang Y. (2011). Economic welfare impacts from renewable energy consumption: The China experience. *Renewable and sustainable energy Reviews*, 15(9), 5120-5128.
- Fishkin, J., Keniston, K., & McKinnon, C. (1973). Moral reasoning and political ideology. *Journal of Personality and social Psychology*, 27(1), 109.
- Frankel J. A. (2003). Experience of and lessons from exchange rate regime in emerging economies.
- Essien, E. B., Dominic, A. O., & Sunday, E. R. (2011). Effects of price and exchange rate Fluctuations on agricultural exports in Nigeria. *International Journal of Economic development research and investment*, 2(1), 1-10.
- Frankel J., & Rose, A. (2002). An estimate of the effect of common currencies on trade and income. *The quarterly journal of economics*, 117(2), 437-466.
- Frenkel A., Shefer, D., Koschatzky, K., & Walter, G. H. (2001). Firm characteristics, location and regional innovation: A comparison between Israeli and German industrial firms. *Regional studies*, 35(5), 415-429.
- Frenkel R. (2004). Real exchange rate and employment in Argentina, Brazil, Chile and Mexico. *Group of*, 24.
- Frimpong, J. M., & Oteng-Abayie, E. F. (2006). Bivariate causality analysis between FDI inflows and economic growth in Ghana.
- Ghosh, A. R., Gulde, A. M., & Wolf, H. (2003). Exchange rate regimes. *Choices and*.

- Ghosh, A. R., Gulde-Wolf, A. M., Wolf, H. C., & Wolf, H. C. (2002). Exchange rate regimes: choices and consequences (Vol. 1). MIT press.
- Gibson, E. Z. (2011). Determinants of commercial banks interest rate margins in post-war Liberia (Doctoral dissertation).
- Guitan, M. (1976). The Balance of Payment as a Monetary Phenomenon in Frenkel, JA, and Johnson, HG. Monetary Approach to Balance of Payment.
- Hossain, M., & Ahmed, M. (2009). An assessment of exchange rate policy under floating regime in Bangladesh. *The Bangladesh Development Studies*, 35-67.
- Inal V., Addi, H. M., Çakmak, E. E., Torusdağ, M., & Çalışkan, M. (2021). Energy Reports.
- Işık, C., Ongan, S., Bulut, U., Karakaya, S., Irfan, M., Alvarado, R., ... & Rehman, A. (2022). Reinvestigating the Environmental Kuznets Curve (EKC) hypothesis by a composite model constructed on the Armeý curve hypothesis with government spending for the US States. *Environmental Science and Pollution Research*, 29(11), 16472-16483.
- Jiang, S., Mentel, G., Shahzadi, I., Jebli, M. B., & Iqbal, N. (2022). Renewable energy, trade diversification and environmental footprints: Evidence for Asia-Pacific Economic Cooperation (APEC). *Renewable Energy*, 187, 874-886.
- Johansen S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with appucations to the demand for money. *Oxford Bulletin of Economics and statistics*, 52(2), 169-210.
- Johansen S., & Juselius, K. (1990). Some structural hypotheses in a multivariate cointegration analysis of the purchasing power parity and the uncovered interest parity for UK (No. 90-05).
- Krugman P. R., & Obstfeld, M. (2007). *Economia internazionale* (Vol. 2). Pearson Italia Spa.
- Lin, J. Y. (2001). WTO Accession and Chinese Economy: Impacts on Agriculture, Financial Sector, and State-owned Enterprises. *Cato Journal*, 21(1).
- McKinnon, R. I. (1963). Optimum currency areas. *The American economic review*, 53(4), 717-725.

- McKinnon R., & Schnabl, G. (2003). Synchronised business cycles in East Asia and fluctuations in the yen/dollar exchange rate. *World Economy*, 26(8), 1067-1088.
- Mmaduabuchi, E. F., & Ifeanyi, A. E. (2014). Exchange rate and manufacturing performance in Nigeria. *Journal of Empirical Economics*, 3(6), 352-361.
- Montiel, M. P., & Ostry, M. J. D. (1991). Real Exchange Rate Targeting Under Capital Controls: Can Money Provide a Nominal Anchor?. *International Monetary Fund*.
- Montiel, P. J. (2011). *Macroeconomics in emerging markets*. Cambridge University Press.
- Mordi, C. N. (2006). Challenges of exchange rate volatility in economic management in Nigeria.
- Muhammad, I. (2019). *Forage and Fodder Production in Nigeria: Its Sensitivity in Sustainable Ranching*.
- Mundell R. A. (1961). A theory of optimum currency areas. *The American economic review*, 51(4), 657-665.
- Musa S. (2014). *An impact of exchange rate volatility on Nigeria's export: using ARDL approach (Doctoral dissertation)*.
- Namahoro, J. P., Wu, Q., Xiao, H., & Zhou, N. (2021). The impact of renewable energy, economic and population growth on CO2 emissions in the East African region: evidence from common correlated effect means group and asymmetric analysis. *Energies*, 14(2), 312.
- Nelson, C. R., & Plosser, C. R. (1982). Trends and random walks in macroeconomic time series: some evidence and implications. *Journal of monetary economics*, 10(2), 139-162.
- Nelson, C. R., & Plosser, C. R. (1982). Trends and random walks in macroeconomic time series: some evidence and implications. *Journal of monetary economics*, 10(2), 139-162.
- Ngandu, S. (2008). Exchange rates and employment. *South African Journal of Economics*, 76, S205-S221.
- Nzotta, S. M., & Okereke, E. J. (2009). Financial deepening and economic development of Nigeria: An empirical investigation. *African Journal of Accounting, Economics, Finance and Banking Research*, 5(5).

- Obadan, M. I. (2006). Overview of exchange rate management in Nigeria. *Bullion*, 30(3), 1.
- Obamuyi, T. M. (2009). An investigation of the relationship between interest rates and economic growth in Nigeria, 1970-2006. *Journal of economics and International Finance*, 1(4), 93.
- Obamuyi, T. M. (2009). An investigation of the relationship between interest rates and economic growth in Nigeria, 1970-2006. *Journal of economics and International Finance*, 1(4), 93.
- Obi, K. O., Oniore, J. O., & Nnadi, K. U. (2016). The impact of exchange rate regimes on economic growth in Nigeria. *Journal of Economics and Sustainable Development*, 7(12), 115-127.
- Ocal O., & Aslan, A. (2013). Renewable energy consumption–economic growth nexus in Turkey. *Renewable and sustainable energy reviews*, 28, 494-499.
- Odhiambo N. M. (2008). Financial depth, savings and economic growth in Kenya: A dynamic causal linkage. *Economic Modelling*, 25(4), 704-713.
- Odhiambo N. M. (2010). Interest rate deregulation, bank development and economic growth in South Africa: an empirical investigation. *International Business & Economics Research Journal (IBER)*, 9(11).
- Odusola, A., & Akinlo, A. (2001). Output, inflation, and exchange rate in developing countries: An application to Nigeria. *The Developing Economies*
- Okoroafor, O. K. D. (2010). Money, inflation and economic growth in Nigeria: 1970-2008. *Nigeria Macroeconomic Development: Issues and Challenges*. Edited by Adam, JA & Obansa, SAJ. Abuja-Nigeria, 1-49.
- Okorontah, C. F., & Odoemena, I. U. (2016). Effects of exchange rate fluctuations on economic growth of Nigeria. *International Journal of Innovative Finance and Economics Research*, 4(2), 1-7.
- Okoye E., & Adesanya, O. (2021). EFFECT OF ELECTRONIC TAXATION ON REVENUE GENERATION IN LAGOS STATE. *Journal of Global Accounting*, 7(1), 38-62.
- Okoye L. U., Modebe, N. J., Erin, O. A., & Evbuomwan, G. O. (2017). Effect of external debt on economic growth: Evidence from Nigeria (Proceedings of the 29th

- International Business Information Management (IBIMA) Conference, May 3-4, 4046-4058). Austria, Vienna-Austria.
- Oladipupo, O., & Onotaniyohuwo, O. (2011). Impact of Exchange Rate on Balance of Payment in Nigeria. *African Research Review: An international Multidisciplinary Journal*.
- Olokoyo, F. O. (2012). Foreign direct investment and economic growth: A case of Nigeria. *BVIMSR'S Journal of Management Research*, 4(1), 1-30.
- Omojimate, B. U., & Akpokodje, G. (2010). The impact of exchange rate reforms on trade performance in Nigeria. *Journal of social sciences*, 23(1), 53-62.
- Opaluwa, D., & Abu, A. A. (2010). The effect of exchange rate fluctuations on the Nigerian manufacturing sector. *African journal of business management*, 4(14), 2994-2998.
- Owoeye O., & Onafowora, O. A. (2007). M2 targeting, money demand, and real GDP growth in Nigeria: Do rules apply. *Journal of Business and Public affairs*, 1(2), 1-20.
- Oyovwi, O. D. (2012). Exchange rate volatility and imports in Nigeria. *Academic Journal of Interdisciplinary Studies*, 1(2), 103-103.
- Pao, H. T., & Fu, H. C. (2013). Renewable energy, non-renewable energy and economic growth in Brazil. *Renewable and Sustainable Energy Reviews*, 25, 381-392.
- Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica: journal of the Econometric Society*, 1361-1401.
- Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica: journal of the Econometric Society*, 1361-1401.
- Perron, P., & Vogelsang, T. J. (1992). Testing for a unit root in a time series with a changing mean: corrections and extensions. *Journal of Business & Economic Statistics*, 10(4), 467-470.
- Perron, P., & Vogelsang, T. J. (1992). Testing for a unit root in a time series with a changing mean: corrections and extensions. *Journal of Business & Economic Statistics*, 10(4), 467-470.
- Pesaran M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, 16(3), 289-326. Peter, E.

- A., & Lyndon, M. E. (2016). Dividend payment policy and performances evidence from Nigeria. *Social sciences learning education Journal*, 1(1), 6-9.
- Polodoo, V. (2011). Exchange rate volatility and macroeconomic performance in small island developing states. Available at SSRN 2078443.
- Reinert, K. A. (2012). *Instructor's Manual An Introduction to International Economics: New Perspectives on the World Economy*.
- Richard O. (2018). Effect of interest rate mechanisms on the economic development of Nigeria, 1986-2016. *IIARD International Journal of Economics and Business Management*, 4(4), 91-115.
- Samea, M. B. A., & Ali, M. F. (2014). Geographic Analysis of the Livestock in Iraq and its Natural and biotic problems and its development potentialities. *Adab Al-Kufa*, 1(18).
- Sanni G. K. (2006). Nigeria's external trade and the new perspectives for its enhancement. *Bullion*, 30(1), 7.
- Sari R., & Soytas, U. (2004). Disaggregate energy consumption, employment and income in Turkey. *Energy economics*, 26(3), 335-344.
- Sari, R., Ewing, B. T., & Soytas, U. (2008). The relationship between disaggregate energy consumption and industrial production in the United States: An ARDL approach. *Energy Economics*, 30(5), 2302-2313.
- Schnabl, G. (2008). Exchange rate volatility and growth in small open economies at the EMU periphery. *Economic Systems*, 32(1), 70-91.
- Schnabl, G., & De Grauwe, P. (2005). Exchange rate stability, inflation and Growth in (south) Eastern and Central Europe. *Review of Development Economics*, Forthcoming.
- Serletis, A., & Zimonopoulos, G. (1997). Breaking trend functions in real exchange rates: evidence from seventeen OECD countries. *Journal of Macroeconomics*, 19(4), 781-802.
- Serletis, A., & Zimonopoulos, G. (1997). Breaking trend functions in real exchange rates: evidence from seventeen OECD countries. *Journal of Macroeconomics*, 19(4), 781-802.



- Shehu, A. A., & Youtang, Z. (2012). Exchange rate volatility, trade flows and economic growth in a small open economy. *International Review of Business Research Papers*, 8(2), 118-131.
- Somoye, O. A., Ozdeser, H., & Seraj, M. (2022). The impact of renewable energy consumption on economic growth in Nigeria: fresh evidence from a non-linear ARDL approach. *Environmental Science and Pollution Research*, 29(41), 62611-62625.
- Soyibo, A. O., & Olayiwola, K. (2010). Interest rate policy and the promotion of savings, investment and resource mobilization (Vol. 24). Research Report.
- Tiwari A. K. (2011). A structural VAR analysis of renewable energy consumption, real GDP and CO2 emissions: evidence from India. *Economics Bulletin*, 31(2), 1793-1806.
- Tiwari, A. K. (2014). The asymmetric Granger-causality analysis between energy consumption and income in the United States. *Renewable and Sustainable Energy Reviews*, 36, 362-369.
- Udoka C. O., & Anyingang, R. A. (2012). The effect of interest rate fluctuation on the economic growth of Nigeria, 1970-2010. *International Journal of Business and Social Science*, 3(20).
- Ufoeze, L. O., Okuma, C. N., Nwakoby, C., & Alajekwu, U. (2018). Effect of foreign exchange rate fluctuations on Nigerian economy. *Annals of Spiru Haret University. Economic Series*, 18(1), 105-122.
- Wen, C., Akram, R., Irfan, M., Iqbal, W., Dagar, V., Acevedo-Duqued, Á., & Saydaliev, H. B. (2022). The asymmetric nexus between air pollution and COVID-19: Evidence from a non-linear panel autoregressive distributed lag model. *Environmental research*, 209, 112848.
- Yeager, L. B. (1958). A rehabilitation of purchasing-power parity. *Journal of Political Economy*, 66(6), 516-530.
- Yildirim E., & Aslan, A. (2012). Energy consumption and economic growth nexus for 17 highly developed OECD countries: Further evidence based on bootstrap-corrected causality tests. *Energy Policy*, 51, 985-993.

## Appendix X

### UNIT ROOT TEST

#### GDP

Null Hypothesis: LGDPP has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
<u>Augmented Dickey-Fuller test statistic</u>	-0.472114	0.8830
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

Null Hypothesis: D(LGDPP) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
<u>Augmented Dickey-Fuller test statistic</u>	-4.135134	0.0034
Test critical values:		
1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

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

#### REER

Null Hypothesis: REER has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
<u>Augmented Dickey-Fuller test statistic</u>	-2.464151	0.1343
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

Null Hypothesis: D(REER) has a unit root  
 Exogenous: Constant  
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-5.037755</b>	<b>0.0003</b>
Test critical values: 1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

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

## RE

Null Hypothesis: RE has a unit root  
 Exogenous: Constant  
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-1.571269</b>	<b>0.4841</b>
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

Null Hypothesis: D(RE) has a unit root  
 Exogenous: Constant  
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-5.237584</b>	<b>0.0002</b>
Test critical values: 1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

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

Augmented Dickey-Fuller Test Equation  
 Dependent Variable: D(RE,2)

**RIR**

Null Hypothesis: RIR has a unit root  
 Exogenous: Constant  
 Lag Length: 3 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-2.091064</b>	<b>0.2495</b>
Test critical values: 1% level	-3.711457	
5% level	-2.981038	
10% level	-2.629906	

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

Null Hypothesis: D(RIR) has a unit root  
 Exogenous: Constant  
 Lag Length: 2 (Automatic - based on SIC, maxlag=7)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-4.089021</b>	<b>0.0041</b>
Test critical values: 1% level	-3.711457	
5% level	-2.981038	
10% level	-2.629906	

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

**PP UNIT ROOT TEST**

Null Hypothesis: LGGDPP has a unit root  
 Exogenous: Constant  
 Lag length: 1 (Spectral OLS AR based on AIC, maxlag=7)

	Adj. t-Stat	Prob.*
<b>Phillips-Perron test statistic</b>	<b>-0.661986</b>	<b>0.8410</b>
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

PP UNIT ROOT TEST

Null Hypothesis: LGGDPP has a unit root

Exogenous: Constant

Lag length: 1 (Spectral OLS AR based on AIC, maxlag=7)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-0.661986	0.8410
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

Null Hypothesis: D(LGGDPP) has a unit root

Exogenous: Constant

Lag length: 0 (Spectral OLS AR based on AIC, maxlag=7)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-4.135134	0.0034
Test critical values:		
1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

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

## RE

Null Hypothesis: RE has a unit root

Exogenous: Constant

Lag length: 0 (Spectral OLS AR based on AIC, maxlag=7)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.571269	0.4841
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

Null Hypothesis: D(RE) has a unit root

Exogenous: Constant

Lag length: 0 (Spectral OLS AR based on AIC, maxlag=7)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-5.237584	0.0002
Test critical values:		
1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

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

**REER**

Null Hypothesis: REER has a unit root

Exogenous: Constant

Lag length: 0 (Spectral OLS AR based on AIC, maxlag=7)

	Adj. t-Stat	Prob.*
<b>Phillips-Perron test statistic</b>	<b>-2.464151</b>	<b>0.1343</b>
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

Null Hypothesis: D(REER) has a unit root

Exogenous: Constant

Lag length: 5 (Spectral OLS AR based on AIC, maxlag=7)

	Adj. t-Stat	Prob.*
<b>Phillips-Perron test statistic</b>	<b>-6.037351</b>	<b>0.0000</b>
Test critical values:		
1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

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

**RIR**

Null Hypothesis: RIR has a unit root

Exogenous: Constant

Lag length: 3 (Spectral OLS AR based on AIC, maxlag=7)

	Adj. t-Stat	Prob.*
<b>Phillips-Perron test statistic</b>	<b>-3.330382</b>	<b>0.0226</b>
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

**ARDL Short Run**

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGDPP(-1))	0.220893	0.154714	1.427747	0.2265
D(LGDPP(-2))	0.659998	0.155420	4.246556	0.0132
D(LGDPP(-3))	-0.036922	0.116359	-0.317309	0.7669
D(LGDPP(-4))	0.354967	0.131786	2.693510	0.0545
D(RE)	-0.070788	0.010765	-6.575671	0.0028
D(RE(-1))	-0.027002	0.011125	-2.427185	0.0722
D(RE(-2))	0.036595	0.009898	3.697244	0.0209
D(RE(-3))	0.061816	0.013659	4.525690	0.0106
D(REER)	-0.002666	0.000626	-4.255304	0.0131
D(REER(-1))	-0.000706	0.000314	-2.251408	0.0875
D(REER(-2))	0.000528	0.000292	1.805729	0.1453
D(REER(-3))	0.000630	0.000350	1.798983	0.1464
D(RIR)	-0.024950	0.003588	-6.954129	0.0022
D(RIR(-1))	-0.004613	0.002335	-1.975251	0.1194
D(RIR(-2))	-0.006533	0.002181	-2.995429	0.0401
D(RIR(-3))	-0.016934	0.004025	-4.207215	0.0136
CointEq(-1)*	-0.060719	0.012019	-5.051879	0.0072

**ARDL Long Run**

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.879235	1.776139	1.621065	0.1803
LGDPP(-1)*	-0.060719	0.070987	-0.855354	0.4406
RE(-1)	-0.028348	0.021584	-1.313391	0.2593
REER(-1)	0.000299	0.001501	0.198873	0.8521
RIR(-1)	-0.012907	0.018608	-0.693632	0.5261
D(LGDPP(-1))	0.220893	0.390395	0.565819	0.6017
D(LGDPP(-2))	0.659998	0.255127	2.586937	0.0609
D(LGDPP(-3))	-0.036922	0.198264	-0.186225	0.8613
D(LGDPP(-4))	0.354967	0.237029	1.497567	0.2086
D(RE)	-0.070788	0.023962	-2.954241	0.0418
D(RE(-1))	-0.027002	0.028200	-0.957528	0.3925
D(RE(-2))	0.036595	0.019407	1.885730	0.1324
D(RE(-3))	0.061816	0.025697	2.405603	0.0739
D(REER)	-0.002666	0.001588	-1.678986	0.1685
D(REER(-1))	-0.000706	0.000873	-0.808826	0.4640
D(REER(-2))	0.000528	0.000748	0.706007	0.5191
D(REER(-3))	0.000630	0.000650	0.969733	0.3871
D(RIR)	-0.024950	0.007572	-3.294927	0.0301
D(RIR(-1))	-0.004613	0.010316	-0.447122	0.6779
D(RIR(-2))	-0.006533	0.009026	-0.723761	0.5093
D(RIR(-3))	-0.016934	0.006068	-2.790811	0.0493

Levels Equation				
Case 1: No Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RE	0.140216	0.059375	2.361546	0.0360
REER	-0.056672	0.045453	-1.246810	0.2363
RIR	-0.409993	0.300397	-1.364837	0.1973

## Bound Test

F-Bounds Test Null Hypothesis: No levels relationship

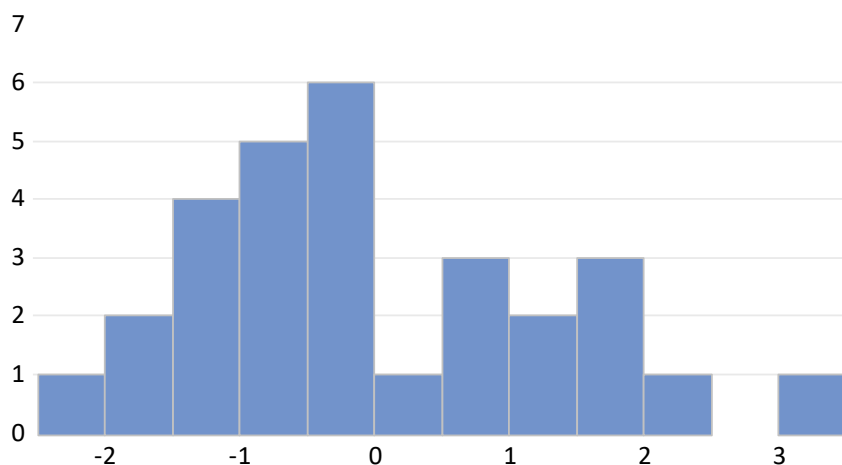
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	5.217547	10%	2.01	3.1
k	3	5%	2.45	3.63
		2.5%	2.87	4.16
		1%	3.42	4.84

## Residual Diagnostic Test

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.023155	Prob. F(2,10)	0.3942
Obs*R-squared	4.416627	Prob. Chi-Square(2)	0.1099



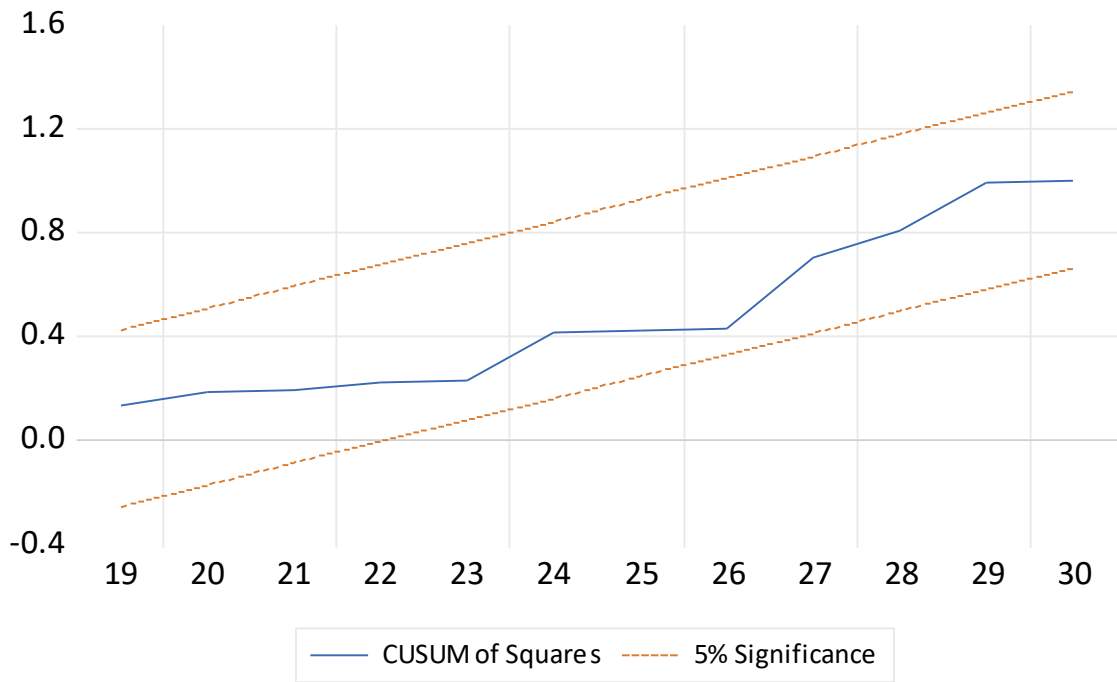
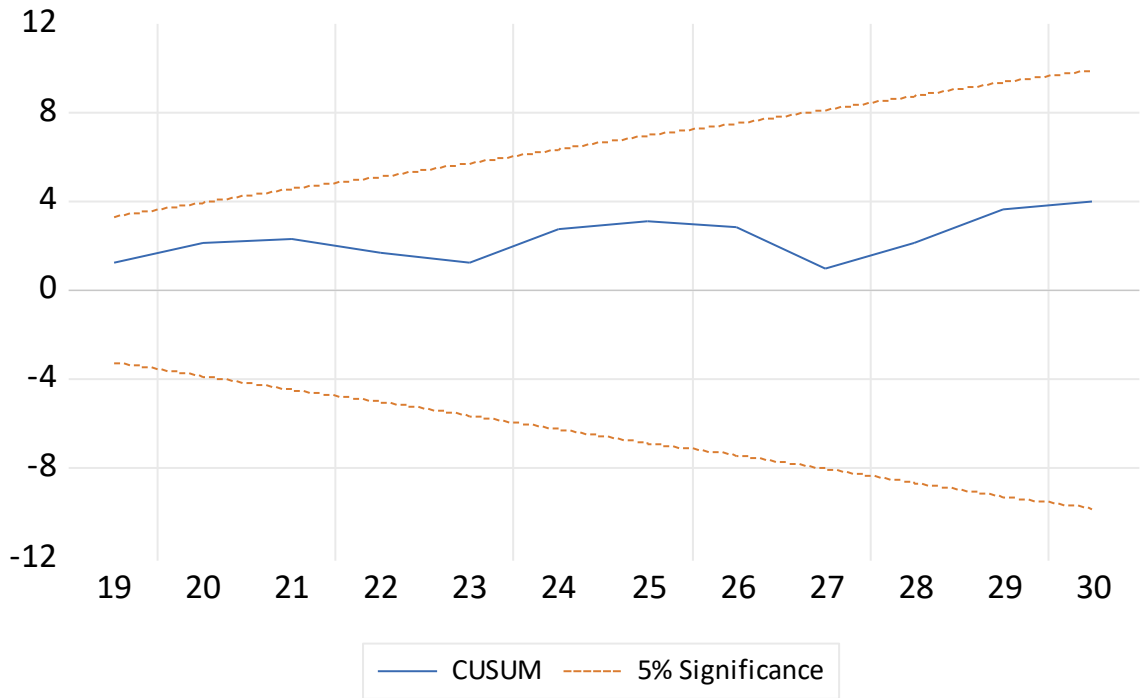
Series: Residuals	
Sample 2 30	
Observations 29	
Mean	2.99e-14
Median	-0.280933
Maximum	3.351403
Minimum	-2.030099
Std. Dev.	1.340551
Skewness	0.647108
Kurtosis	2.692614
Jarque-Bera	2.138124
Probability	0.343330

Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

F-statistic	0.265274	Prob. F(14,11)	0.9889
Obs*R-squared	6.562515	Prob. Chi-Square(14)	0.9503
Scaled explained SS	2.681887	Prob. Chi-Square(14)	0.9995



**Stability Test**

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