THE EFFECT OF REAL EXCHANGE RATE VOLATILITY ON BALANCE OF PAYMENTS IN NIGERIA

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CERTIFICATION

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APPROVAL

This research work titled "The Effect of Real Exchange Rate Volatility on Balance of Payments in Nigeria" has followed due process and has been approved to have met the requirement for the award of Master of Science (M.sc) degree in Economics, University of Nigeria, Nsukka.

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DEDICATION

This research work is dedicated to GOD ALMIGHTY and the HOLY SPIRIT who inspired and enlightened my thoughts.

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ABSTRACT

This study empirically examined the effect of real exchange rate volatility on balance of payments in Nigeria from 1970q1-2015q4 using the Ordinary Least Squares (OLS) technique. Autoregressive-Exponential Generalized Autoregressive Conditional Heteroskedasticity (AR-EGARCH) model was estimated to examine the real exchange rate for volatility by obtaining the conditional variance from the estimated result, which was used to proxy exchange rate volatility. Empirical results showed that real exchange rate volatility had a positive and insignificant effect on the current account of balance of payments. Also, real exchange rate volatility had positive and insignificant effect on the capital account of balance of payments. It was also found that real exchange rate volatility had negative and insignificant effect on the financial account of balance of payments. The results also showed that the Marshall-Lerner condition does not hold for Nigeria. On the basis of the above, the study recommended that currency devaluation (or depreciation) should not be seen as a major policy option to maintain the exchange rate volatility at a rate that allows adjustment of the balance of payments. Ban on some of the goods that have high degree of importation such as the ban on foreign rice could go a long way to reduce importation expenditure, boost local production in quantity and quality and could be an appropriate complement to devaluation.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Economic influences from abroad have powerful effects on the domestic economies and domestic economic policies have substantial effects on foreign economies as well. Economies of the World are linked through trade in goods and services; and finance. The trade linkage implies that some of the country's production is exported to foreign countries, while some goods that are consumed or invested at home are produced abroad and imported. The finance linkage on the other hand implies that residents, whether households, banks or corporations can hold assets in foreign countries. Portfolio managers shop around the world for the most attractive yields. As international investors shift their assets around the world, they link asset markets home and abroad, and one of the effects is the fluctuations in exchange rates. Research related to exchange rate still remains a primary interest to economists, especially in developing countries, despite a relatively enormous body of literature in the area. This is because the exchange rate in whatever conceptualization is not only an important relative price, which connects domestic and world markets for goods and assets, but it also signals the competitiveness of a country's exchange power with the rest of the world in a pure market. Besides, it determines the balance of payments of a country at the medium-to-long term (Joseph & Akhanolu, 2011; and Dornbusch, Fischer, & Startz, 2008).

The balance of payments of a country is made up of different components. This includes the current account, the capital account and the financial account. The current account records trade in goods and services, as well as transfer payments. The trade balance records trade in goods. Services include interest payments, net investment income, etc. Transfer payments on the other hand, consist of remittances, gifts and grants. A country's current account is in surplus if her receipts from trade in goods and services and transfers exceed payments. The capital account in contrast, records purchases and sales of assets like stocks, bonds and land. The capital account becomes surplus when a country's receipts of the sale of stocks, bonds, bank deposits, etc. exceed payments for purchases of foreign assets. On the other hand, the financial account tracks financial flows coming in and going out of the economy. The three major categories included in the financial account are foreign direct investment (FDI), portfolio investment (PI), and official reserve transactions (ORT). Foreign direct investment consists in long-term financial investment abroad, characterized by large ownership stakes

(over 10 percent) in foreign firms. Portfolio investment is composed of more liquid financial investments, generally undertaken in the form of stocks, bonds, and of bank balances, while official reserve transactions tracks the international currency dealings of a country's central bank (Tang, 2013; and Dornbusch, et al 2008).

Exchange rate exerts a powerful influence on the components of a country's balance of payments position. Two forms of exchange rate are fixed and flexible exchange rates. Fixed exchange rate operates like any other price support scheme such as those in the agricultural market and other forms of subsidies. Given the demand and supply of the market, the price fixer has to make up the excess demand or take up the excess supply. To ensure that the exchange rate remains fixed, it is obviously necessary to keep an inventory of foreign exchange that can be provided in exchange for the domestic currency. If a country persistently runs deficits, the central bank is likely to decide to devaluate the currency. The reserve position of the devaluing country improves as a result of devaluation. This means that devaluation improves the balance of payments, since an improvement on the reserve position constitutes an improvement on the balance of payments position (Oladipupo & Onotaniyohuwo, 2011). Flexible or floating exchange rate removes any form of economic rigidity and bottlenecks and it is determined exclusively by market forces.

The exchange rate regime therefore, plays a key role in reducing the risk of fluctuations in the Real Exchange Rate (RER) which will affect the rate of inflation, balance of payments and hence the whole economy. The theoretical literature provides broad guidance on this choice. In accordance to the theory of optimal currency areas, real shocks are better dealt with through flexible exchange rates, and nominal shocks through fixed exchange rates. In Nigeria, fixed exchange parity had been maintained with the British Pound from the immediate post-independent period. However from 1986, attention shifted from fixed to flexible exchange rate system (Adelowokan, 2012;Akpan & Atan, 2012; and Rey, 2006).

A criterion by which one can judge a type of exchange rate is a matter of how sensible trade flows is to exchange rate variability. High sensitivity implies that a good exchange rate arrangement must permit to limit the negative impact on trade flows of an excessive variability. Two types of exchange rate variability are: volatility and misalignment. Volatilities manifest in different forms. These include fluctuations in terms of trade and real exchange rate. The real exchange rate measures international exchange of goods and services, the competitiveness of an economy to international trade and ensures viable

balance of payment position. Misalignment, on the other hand, refers to the unrelenting departure of an exchange rate from its long run competitive level (Adelowokan, 2012; and Rey, 2006).

Exchange rate plays an important role in international trade and investment as it affects the price of internationally traded goods and services. Exchange rate movements reflects the economy-wide effect of changes in trade flows, world commodity prices, and capital flows between economies that are highly integrated, both with each other and with global goods, services and financial markets. Exchange rate fluctuations therefore affect consumers and producers of internationally traded goods and services and firms with assets and liabilities dominated in foreign currencies and the balance of payment positions of the trading countries. Since exchange rates are shared macroeconomic variables, such fluctuations for any internationally integrated economy have counterpart effects in its trading partners' balance of payments (Makin, 2002). Specifically, as exchange rate depreciates (falls), BOP position will improve since net export balance is increased. Considering the reverse, an exchange rate appreciation makes a country's products more expensive relative to foreign goods and services and therefore leads to a shift of global demand away from domestic products towards foreign ones. This implies a reduction in exports and an increase in imports, resulting overall in deterioration in the trade balance and thus a reduction in the net trade. This therefore affects the balance of payments.

The effect of devaluation on trade balance depends on the elasticity of exports and imports. Devaluation makes the exchange rate to depreciates and, in turns make goods imported to be more expensive than goods exported. The volume of Production would be adjusted to respond to changes in prices which result to deterioration in the balance of trade in the short run. The is called the price effect of exchange rate depreciation. On the other hand, in the long run, cheaper exported goods could lead to increase in demand for domestic goods and services and the volume of production increases (Omojimite & Akpokodje, 2010; and Sek & Har, 2014). In other words, in the long run, the quantity effect could improve the balance of trade and the improvement in the balance of trade could results to better balance of payments positions. Such a situation where exchange rate depreciation improves the balance of trade in the long run is called the Marshall-Lerner condition.

The Marshall-Lerner condition explains the conditions under which a devaluation or depreciation will improve a country's balance of trade and, thus, the balance of payments.

The Marshall-Lerner condition states that exchange rate depreciation improves balance of trade in the long run, if the sum of the elasticities of demand for exports and imports (in absolute sense) is greater than one. The Marshall-Lerner condition is a condition that determines if a country's foreign exchange market is stable or not. If the Marshall-Lerner condition holds (quick adjustment of the relative exchange rate over time to changes in demand for exports), then, the Marshall-Lerner condition shows a stable market (Thi Van & Lin, 2011). It is determined by a flexible exchange rate system since currency devaluation reduces a deficit or corrects balance of payments surplus. This is related to this study because exchange rate volatility could influence revenue from exports, balance of trade and the balance of payments.

1.2 Statement of the Problem

Exchange rate connects domestic and world markets for goods and assets; signals the competitiveness of a country's exchange power with the rest of the world in a pure market; and an anchor which facilitates sustainable internal and external macroeconomic balances over the medium-to-long term. Countries all over the world, therefore allow their exchange rate policy to undergo substantial transformations from time to time (Adelowokan, 2012; and Omojimite & Akpokodje, 2010).

In Nigeria, the exchange rate policy has been subjected to substantial transformations from a fixed regime in the 1960s to a pegged regime between the 1970s and the mid-1980s and finally, to the various variants of the floating regime from 1986 with the deregulation and adoption of the structural adjustment programmes (SAP) (Akpan & Atan, 2012). In September 1986 for example, the Second-Tier Foreign Exchange Market (SFEM) was introduced on an auction basis. Also, was the deregulation of Naira exchange rate on Sept. 29, 1986. The institutional framework of the market witnessed a noticeable transformation from the Second Tier Foreign Exchange Market to Foreign Exchange Market (FEM), Nigeria had as well operated several variants of the auction system. These include the Dutch Auction System on July 22, 2002; Wholesale Dutch Auction System on February 20, 2006; and Retail Dutch Auction System, to serve the triple purposes of reducing the parallel market premium, conserve the dwindling external reserves and achieve a real exchange rate for the naira to US dollar (Akpan & Atan, 2012; and Usman & Adejare, 2012).

Before the introduction of structural adjustment programme (SAP) and the adoption of market determined exchange rate and managed floating rate policy in 1986, Nigeria

adopted a fixed exchange rate policy. During this regime, there was a massive importation of finished goods from foreign countries. This caused adverse effects on domestic production, balance of payments position and the nation's external reserves level and made the foreign exchange market in the fixed exchange rate period to be characterized by high demand for foreign exchange that cannot be adequately met with the supply of foreign exchange via the Central Bank of Nigeria (CBN). The records revealed that between the periods 1981-1985, the average exchange rate was 108.6. At this period, the average balance of payment current account balance (-1,951.3) showed an increase in reserves, while that of the capital account balance (950.6) showed a decrease in reserves. These among other reasons led to the adoption of the market determined exchange rate and managed floating rate policy in 1986, with the view of correcting internal and external imbalances (Adedayo, 2012; and CBN Statistical Bulletin, 2012).

One expects that after the adoption of the market determined exchange rate and managed floating rate policy, the problems with the fixed exchange rate system will be a thing of the past. However, it was discovered that most of the problems were still present. The economic considerations underpinning the exchange rate policy had important repercussions for the structural evolution of the economy, and the balance of payments accounts. Between 1986-1990; and 1991-1995, the average exchange rate falls from 108.6 in the pre-market determined exchange rate and managed floating rate regime to 19.2 and 3.4 and has continued to be volatile since then. The corresponding average balance of payment current account balances (10,231.0 and -41,159.9) showed a decrease and then an increase in reserves. But the average capital balances (-23,311.7 and -35,596.1) exhibited steady increase in reserves. On the other hand, when the average exchange rate increases drastically from 3.4 to 47.7 in 1996-2000 to 96.9 in 2001-2005; the average current account balance showed consistent decrease in reserve of 213,450.0 to 1,555,699.0 and the average capital account balance revealed a consistent increase in reserve of -265,025.7 to 983,083.1 within the corresponding periods (Adedayo, 2012; and CBN Statistical Bulletin, 2012). The exhibition above therefore puzzles one about the impact real exchange rate volatility has especially on the sub-accounts of balance of payments in Nigeria.

In addition, Alfred Marshall and Abba Lerner pointed out that, when the price elasticity of imports and exports in absolute sense is greater than unity then devaluation will improve the balance of trade and, therefore, the balance of payments accounts in the long run will improve. Dornbusch (1988) also stated that the efficacy of depreciation resulting from

devaluation in improving the balance of payments relies mainly on how demand is channeled to the appropriate direction and by the appropriate amount and also ability of the domestic economy to meet the increase demand because of increase supply. This is in addition to the fact that, though at times of relative tranquility in foreign exchange markets, the CBN can smooth out exchange rate volatility through various modest interventions, but more active policies are needed when there are more volatile exchange rates. Thus, testing the Marshall-Lerner condition is also of paramount importance in Nigeria. The policy implication is that the presence or absence of Marshall-Lerner condition is a revelation of the efficiency of Central Bank of Nigeria devaluation policy leading to depreciation and how appropriate the direction and amount. This would reveal empirically whether or not to continue with devaluation policies or to augment with more active policy measures.

Though, related studies are found, but much focus especially in Nigeria has been on real exchange rate and other macroeconomic variables and only a few has studied real exchange rate and balance of payments in Nigeria. Danmola (2013), Orji (2012), Ogbonna (2011), and Oladipupo & Onotaniyohuwo (2011) examined the relationship between the aggregate balance of payments and exchange rate in Nigeria. But Kandil (2009) has studied the effect of exchange rate fluctuations on major components of balance of payment in 21 developing and 25 industrial countries. This study following the study by Kandil (2009) examines the effect of real exchange rate volatility on the major components of balance of payments in Nigeria. It would also show the Marshall-Lerner condition, and, therefore reveal the efficacy of CBN devaluation policy within the study period, which many related studies in Nigeria have ignored.

1.3 Research Questions

The study seeks to answer the following research questions:

i. Does real exchange rate volatility affects the current account of balance of payments in Nigeria?
ii. What effect does real exchange rate volatility has on the capital account of balance of payments in Nigeria?
iii. What is the effect of real exchange rate volatility on the financial account of balance of payments in Nigeria?
iv. Does the Marshall-Lerner condition hold for Nigeria?

1.4 Objectives of the Study

The broad objective of this study is to examine the effect of real exchange rate volatility on balance of payments in Nigeria. The specific objectives are:

i. To investigate the effect of real exchange rate volatility on the current account of balance of payments in Nigeria
ii. To examine the effect of real exchange rate volatility on the capital account of balance of payments in Nigeria
iii. To determine the effect of real exchange rate volatility on the financial account of balance of payments in Nigeria
iv. To determine whether the Marshall-Lerner condition holds for Nigeria or not

1.5 Hypothesis of the Study

The hypotheses of the study are:

$H0_1$: Real exchange rate volatility has no significant effect on the current account of balance of payments in Nigeria

$H0_2$: There is no significant effect of real exchange rate volatility on the capital accountof balance of payments in Nigeria

$H0_3$: Real exchange rate volatility does not significantly affect the financial account of balance of payments in Nigeria

$H0_4$: The Marshall-Lerner condition does not hold for Nigeria

1.6 Significance of the Study

The findings of this study will be relevant to the government of Nigeria in general because it will reveal the effect of real exchange rate volatility on the various components of the balance of payments of Nigeria. The study will also be important to policy makers and the monetary authorities as it will show what aspect of the balance of payment needs more serious attention, which by extension will serve as a guide on the right decision on exchange rate policy. Also, Policymakers who hope to improve Nigeria's competitive position could benefit by learning from this study, effectiveness (or not) of the devaluation policy. This could lead to the implementation of more effective economic policies. Finally, academia, researchers as

well as students shall find the study relevant because the findings of this study will serve as a reference point in further related studies.

1.7 Scope and Limitations of the Study

The study seeks to evaluate the effect of real exchange rate volatility on balance of payment in Nigeria. The study covers the period 1970q1 to 2015q4. The choice of the study period is based on first, the fact that it covers the period (1971 – 1985) in which Nigeria operated a fixed exchange rate regime and periods starting from 1986 which marked the shift from fixed to flexible exchange rate regime. Availability of data was another consideration.

A number of measures of exchange rate volatility have represented for uncertainty. These include the short run measure of volatility defined as a 12-month rolling window of the standard deviation in the past monthly real exchange rate, a similarly defined measure over 5 years to obtain a long run measure of volatility, and the conditional volatility measure estimated from a GARCH model (Thi Van & Lin, 2011). This study uses only the conditional volatility measure estimated from a GARCH model to proxy for exchange rate volatility. The superiority of this measure over the other measures however cannot be guaranteed in this study. Also, there is no consensus about the appropriateness of one measure relative to others.

1.8 Organization of the study

This study is organized into five chapters. Following this chapter one is the chapter two. In chapter two, the key concepts in this study are conceptualized. Also, relevant theories are discussed in the chapter as well as a review of the empirical literature. Chapter three presents the methodology of the study. This chapter contains the theoretical framework of the study, the models specified to capture the respective objectives of the study and the source of data for the study. Chapter four is set aside for the presentation of estimation results and findings would be discussed in the chapter. This study would be rounded off in chapter five with summary of findings, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Literature

For the purpose of this study, it is necessary to clarify key concepts in this study, as they are used. This section is therefore set aside for this purpose. These include real exchange rate volatility and balance of payment.

2.1.1 Real Exchange Rate Volatility

Umoru & Odjegba (2013) put forward that exchange rate is the price of one currency in terms of another, while MacDonal (2007) defined real exchange rate as that measured by adjusting the nominal exchange rate by relative prices. Mukhtar & Malik (2010) defined exchange rate volatility as the amount of uncertainty or risk about the size of changes in a currency's value. This means that the price of the currency can change dramatically over a short time period in either direction. A lower volatility means that a currency's value does not fluctuate drastically, but changes in value at a steady pace over some time period. While a higher volatility means that a currency's value can potentially be spread out over a larger range of values. However, to Jamil, Streissler, & Kunst (2012); the volatility of exchange rate describes uncertainty in international transactions both in goods and in financial assets. Exchange rate volatility refers to the swings or fluctuations in the exchange rates over a period of time or the deviations from a benchmark or equilibrium exchange rate (Adedayo, 2012).

In this study, real exchange rate volatility is defined as the amount of uncertainty or risk about the size of changes in relative price of foreign goods and financial assets in terms of the domestic goods and financial assets.

2.1.2 Balance of Payments

Dornbusch (2008) defined balance of payments as the records of the transactions of the residence of a country with the rest of the world. Umoru & Odjegba (2013) view balance of payments as a country’s state of affairs in international trade. However, Barasa (2013) expressed balance of payments as a record of all the transactions between the residents of the economy and the rest of the world over a period of time. It records all the money flows between the economy and the rest of the world and it is made up of the current account, the

capital and financial account. To Egai (2011), balance of payment is the relationship between the amount of money a nation spends abroad and the income it receives from other nations.

However in this study, balance of payment is defined following the line of definition of Egai (2011).It refers to the relationship between the amounts of money Nigeria spends abroad and the income it receives from abroad. It includes the records of all economic transactions between residence of Nigeria and residence of other nations, including the governments. There are different accounts within the balance of payments. These include the current account, capital account and the financial account.

The current account records the flows of goods, services, and income between residents and non-residents. The balance in this account shows the difference between the sum of exports and income receivable and the sum of imports and income payable. The capital account records the non-produced non-financial assets such as land sold to embassies, sales of leases and licenses, changes in the country's foreign assets and liabilities, capital movements and changes in international investment positions.

One of the major channels through which the exchange rate traditionally affects balance of payment is through its impact on prices. The main direct effect occurs through the impact on import and export prices, which further reflects along the pricing chain to consumer prices. These price changes give rise to important indirect and second-round effects through their impact on real incomes, consumer spending and trade flows, with feedback effects on overall price pressures (Mauro, Rüffer & Bunda, 2008).

Another channel through which the exchange rate traditionally affects balance of payment is through its expenditure-switching effect on trade flows. An economy's supply of foreign exchange arise from exports and asset sales to foreigners as well as income received from abroad, whereas its demand for foreign currencies stems from imports and foreign assets demand and income payable abroad. An exchange rate appreciation makes a country's products more expensive relative to foreign goods and services and therefore leads to a shift of global demand away from domestic products towards foreign ones. This implies a reduction in exports and an increase in imports, resulting overall in deterioration in the trade balance and thus a reduction in the net trade. This therefore affects the balance of payments. The reverse however is the case for exchange rate depreciation (Mauro, et al 2008; and Makin, 2002). As exchange rate depreciates (falls), balance of payment position will improve since net export balance is increased. An increase in money supply raises the level of income,

reduces interest rates and worsens balance of payments. The economic explanation of this fact is that expansionary monetary policy necessarily leads to a deficit in the balance of payments. As real output increases, balance of payment position improves, this is because with increase in real output, prices reduce, thereby making domestic products more attractive both in the internal and external markets. Increase in domestic price level leads to a fall in balance of payments position.

2.2 Theoretical Literature

It is no longer a doubt that theories exists in this area of study. For the purpose of this study, the theories to review are exchange rate theories and balance of payment theories.

2.2.1 Theories of Exchange Rate

2.2.1.1 The Purchasing Power Parity (PPP)

The purchasing power parity is associated to Gustav Cassel in 1920. The theory is of the view that equilibrium exchange rate between two currencies is determined by the quality of the relative change in relative prices in the two countries. That is, exchange rate between two countries is determined by the levels of their relative prices. The theory is based on the 'law of one price', which states that if Dollar price of a good be multiplied by the exchange rate (US$/#) then it will result in an equal price of the good in naira. In other words, if for example the exchange rate between the US $ and # stands at 1/1.2, then goods that cost US$ 20 should cost # 22 in Nigeria. Otherwise, arbitrage profits will occur. As the theory postulates, the exchange rate between two countries is determined at a point which shows the equality between the various purchasing powers of the two countries. Therefore with every change in price level, the exchange rate also changes. However, it is finally the market that through supply and demand will force accordingly the US dollar and naira prices to the equilibrium point. Thus, the law of one price will be reinstated, as well as the purchase power parity between the US dollar and naira. The currency of the country with the higher rate of inflation will depreciate against the other country's currency by approximately the inflation deferential (Jhingan 1997).

In conclusion, it can be argued that the theory, although it describes in a sufficient way the determination of the exchange rates, is criticized based on the f following ground. Firstly, not all goods are traded internationally. Secondly, the transportation cost should represent a small amount of the good's worth. Thirdly, capital is mobile. Fourthly, it is applicable in the long

run and fails to determine exchange rate in the short run. Fifthly, it neglects the elasticities of reciprocal demand; and finally, the theory is not applicable to the capital account of balance of payments (Jhingan 1997).

2.2.1.2 The Balance of Payments (BOP) Theory of Exchange Rate

The balance of payments theory is another theory that explains what the factors are that determine the supply and demand of a country's currency. As stated by the theory, under free exchange rate, a country's exchange rate depends on it balance of payments. The exchange rate rises when the balance of payment is favourable, and reduces when the balance of payments is unfavourable. In essence, a currency's price depreciation or appreciation (the change in the value of money), directly affects the volume of a country's imports and exports and, consequently, a likely fluctuation in the exchange rates can add to BOP discrepancies. The theory in other words implies that the rate of exchange is determined by the demand for, and the supply of foreign exchange (Jhingan 1997).

A fall in the rate of exchange below the equilibrium rate in a case of adverse balance of payments, the country's exports increases and the adverse balance of payments is removed, and the equilibrium rate of exchange will be restored. However, in a case of favourable balance of payments, the rate of exchange rises above the equilibrium level, the country's exports falls, the favourable balance of payments will be eliminated and the equilibrium rate of exchange will be restored back. A change in the factors of demand or supply reflects itself in a change in the rate of exchange, and at the leading rate the balance of payments accounts balances daily or every moments. The theory is considered to have given most satisfactory explanation of the determination of exchange rate because, it implication of adjustments in balance of payments can be made from currency devaluation and revaluation in case of balance of payments deficit and surplus (Jhingan 1997).

2.2.2 Theories of Balance of Payments

2.2.2.1 Monetary Approach to Balance of Payment (MABP)

The MABP, viewed balance of payments as a monetary phenomenon. It showed the relationship between a country‘s balance of payments and its money supply. The key propositions of the monetary approach are that:

- balance of payments is a monetary phenomenon and requires analysis with the tools of monetary theory and not barter or 'real' trade theory;

- money is a stock and
- the money stock can be changed in two alternative ways, through domestic credit creation or destruction and through international reserve flows.

According to the MABP, the overall balance of payments is affected by imbalances prevailing in the money market. In a fixed exchange rate system, excess money supply produces an increased expenditure, therefore increased domestic demand for foreign goods and services. The high domestic demand needs to be financed by running down foreign exchange reserves, thus worsening the balance of payments. The outflow of foreign exchange reserves reduces money supply until it is equal to money demand, thereby restoring monetary equilibrium and hampering an outflow of foreign exchange reserves. An excess demand for money produces an opposite adjustment, which in turn attracts foreign exchange reserves inflow; and therefore causes a balance of payments surplus. This induces domestic monetary expansion and perhaps a restored balance of payments equilibrium position (Adamu & Itsede, 2010; and Johnson, 1977).

The MABP concentrated on stock and flow equilibrium, with greater attention on stock equilibrium for money. In this direction, it looks at inter-relationships among various markets and, thus, the inter-relationship between stock and flow equilibrium. This is the major difference between the MABP and other approaches such as the elasticity and absorption approaches, where the flow equilibrium only is considered. This approach emphasis the need to cut-down domestic expenditure relative to income, so as to eliminate a deficit in the balance of payments.

It views at the balance of payments as the variation in the monetary base minus the variation in the domestic component.

Keeping all other factors constant, an increase in demand for money, and of factors that impact positively on it should lead to a balance of payments surplus. As well, other factors remaining constant, an increase in domestic money should worsen it. Therefore a positive change of real output in an economy with fixed interest rates causes her residents to demand a growing stock of real and nominal cash balances. This is an indication that the economy is running a surplus in the balance of payments. As a way to prevent a balance of payments surplus, the increase in money must be satisfied through domestic open market operations. In order to have a deficit, domestic money stock has to rise faster than real income growth.

Domestic assets are the variables which the monetary authorities control, and invariably control the balance of payments. In terms of the domestic assets, the MABP assumes that the components of domestic assets of the monetary base are not affected by balance of payments flows. Its controls through open market operations are the international component of the monetary base(Ardalan, 2003).

2.2.2.2 Elasticity Approach to Balance of Payments and the Marshall-Lerner Condition

The elasticity approach to balance of payments is associated with Robinson (1937). The approach places its emphasis on the effects of exchange rate changes on the exports and imports of a country and, hence, on the trade account balance, whilst ignoring all other variables like income. This approach to balance of payments is chronologically the first of the 'neoclassical' or 'Keynesian' approaches to the analysis of devaluation, which involves a direct application of Marshall-Lerner partial equilibrium condition. The condition states that the sum of the elasticities of demand for imports and exports must be greater than one in an absolute terms for a devaluation to improve the balance of payments. The assumption is that capital movements are fixed exogenously (or excluded). In this way, an excess or deficiency of the value of exports in relation to the value of imports gives rise to a balance of payments surplus or deficit (reserve inflow or outflow) as one aspect of equilibrium.

According to the elasticity approach of balance of payments, if the elasticity of demand for exports is zero, exports in domestic currency will be the same as before devaluation. If on the other hand, the sum of the elasticities is greater than one, the elasticity of demand for imports must be greater than one, in that way the value of imports falls. With a fall in the value of imports, and the value of exports not falling, the balance of payments position improves.

Assuming the elasticity for demand for imports is zero. The value of imports increases by the entire percentage of devaluation. If however the elasticity of demand for exports is more than one, the value of exports will rise by more than the percentage of devaluation. Thus, the balance of payments will improve. If each of the elements of the elasticity of demand is less than one, but the sum is more than one, the balance of payments will improve. This is because exports expansion in domestic currency will exceed the value of imports (Adamu & Itsede, 2010; and Johnson, 1977).

2.2.2.3 The Keynesian 'Economic Policy Approach'

The 'economic policy approach,' was developed by Tinbergen (1952) and Meade (1951). The model assumes that the country under analysis has a Policy authority which utilizes" financial"(fiscal and monetary) and exchange rate policies in order to implement objectives with respect to full employment (internal balance) and BO P (external balance). The rationale behind this approach is that, if a country tends to attain a BOP surplus while maintaining full employment, the solution is to put together a devaluation with a deflation in exactly the right amounts to maintain full employment total demand for output (foreign plus domestic) while reducing total domestic demand for foreign and domestic goods below the level of total domestic output by fiscal or monetary restraint. Similarly, the non-devalue must inflate expenditure.

A trade balance improvement together with devaluation relies on fulfillment not only of the "elasticity criterion"(the sum of the elasticities of import demand being greater than unity) but also of the "classical transfer criterion" (the sum of the marginal propensities to import Out of expenditure being less than unity).This could mean that a devaluation will improve a country's trade balance if the stability condition and the transfer condition are both satisfied, and that, apart from the introduction of the 'transfer condition,' which economists conventionally assume will normally be satisfied, the effect of devaluation on the balance of payments relies on the elasticities of demand for imports, in this way the 'economic policy approach' in fact does not alter the central substance of the 'elasticity approach.' This explanation, however, is quite doubtable: because the analysis is not about 'the effect of a devaluation on a trade balance' but about the proper policies combination to employ to achieve certain desired policy results; and the fulfillment of the elasticity and transfer conditions serves only to ensure that the policy recommendations the model suggests will be in conformity with ordinary common sense.

The 'economic policy approach' has been commended over the elasticity approach for explicitly asserting that if one is concerned about mass unemployment then, he should apply the right policy combination to remove it, instead of to ask whether devaluation would help, and over the 'absorption approach' in asserting that if one is faced with an inflationary situation he should do, something about it directly, rather than rely on further inflation of prices induced by devaluation to have a deflationary effect. However, this

approach is criticized on the ground that it ignores the stock-flow adjustment consequences of reserve flow associated with a BOP deficit or surplus (Johnson, 1977).

2.2.2.4 The Absorption Approach to Balance of Payments (AABP)

Alexander (1952) was the first to present the Absorption Approach to Balance of Payments (AABP). His view of the balance of trade was from the point of view of balance of payment; with great emphasis laid on the current account balance. The AABP was interested in how devaluation could change the relationship between expenditures or between absorption and income, in terms of nominal and real. This approach is of the view that when a currency is devalued, it would lead to arise in inflationary prices, which in turn would remove the initial effect of a rise in prices. When total absorption (or expenditure) is greater than income, then imports will rise above exports, which will in turn lead to a balance of payments deficit. If on the other hand, income is greater than the total absorption (or expenditure);the balance of payments will be in surplus. In this regard, a balance of payments deficit can only be corrected if the level of absorption varies according to the level of income (Adamu & Itsede, 2010).

If there is unemployment, devaluation aids the balance of payments and also helps the economy move towards full employment. However, if the economy is at full employment, then It cannot hope to improve its trade balance by increasing real income. Here, it has to depend on its ability to reduce absorption. How can devaluation achieve this? Alexander argued that the rise in the price level consequent upon the devaluation would tend to discourage consumption and investment expenditures out of a given level of income. One way this will happen is through the real balance effect - a reference to the public's curtailment of expenditure in order to rebuild their stock of real cash balances that was diminished by the increase in the price level.

2.3 Empirical Literature

The empirical literature is divided into two. These are the foreign evidence and evidence from Nigeria. The foreign evidence focused mainly on foreign studies. While the studies from Nigeria is reviewed under the sub-section titled evidence from Nigeria.

2.3.1 Foreign Evidence

There are quite a lot of foreign studies in the area of this study. The studies focused on different objectives at different period of time. For example, Bandyopadhyay (2016) tested the validity of the Marshall-Lerner Condition in India during the pre reform period covering from 1962-1990 and the post reform era spanning through 1991-2013. The study employed the cointegration technique. The study showed an evidence of Marshall - Lerner condition in the Pre-reform and the Post-reform periods in India.

Jiang (2014) investigated the effect of nominal RMB exchange rate volatility on economic growth in China from 1981 to 2012. ADF stationary test, the co -integration test, and the associated econometric model were used. The author concluded that in the long run, exchange rate change had a positive impact on import and export trade.

Barasa (2013) also contributed to the literature through His study titled the relationship between exchange rate volatility and BOP in Kenya. The study adopted a quantitative comparative design to determine the relationship between the two variables. According to the author, the exchange rate affects the prices at which a country trades with the rest of the world and is important for economic analysis and policy formulation. The study concluded that apart from the exchange rate there are other factors having greater influence on the level of balance of payments.

Also in Kenya, The study by Mwito, Muhia, Kiprop & Kibet (2015) examined the Marshall-Lerner condition in the country's bilateral trade using extended trade Balance Model. The authors employed Mean Group estimation technique in the analysis. The results of the study showed that the Marshall-Lerner condition was only fulfilled for trade between Kenya and China, UAE, India and South Africa.

Covering the period 1985 - 2014, the study by Begum & Alhelal (2014) tested the Marshall - Lerner condition for Bangladesh using the Johansen and Johansen and Juselius Cointegration approach. The study found that the Marshall - Lerner condition holds for Bangladesh in the long run.

In Malaysia, Sek & Har (2014) examined the validity of Marshall-Lerner condition using Least Square and Fully Modified Least Square approaches. The analyses of their study were directed towards five pairs of bilateral trades between Malaysia and its main trading partners

of China, EU, Japan, Singapore and U.S. respectively. The study found no evidence of Marshall-Lerner condition holding in all the five pairs of bilateral trades.

Bristy (2013) in His study investigated the empirical explanation of real exchange rate and its volatility on export of Bangladesh in the long and short run. The data for the study period covered from 1980-2010. The study applied cointegration test and short run dynamic adjustment from a vector error correction model. The results of the author's stability test found no existence of structural break point for aggregate model. However, aggregate trade model showed that depreciation improved export but volatility of exchange rate offsets the export growth by increasing uncertainty.

Carranza, Cayo, & Galdón-Sánchez, (2013) Studied the relationship between exchange rate volatility and economic performance of the republic of Peru in South America using financial information from 163 non-financial listed firms. The study reveals that firms holding dollar-denominated debt, investment decisions are negatively affected by real exchange rate depreciation.

The impact of Real Exchange Rate changes on the performance of Indian manufacturing firms over the period 2000-2012 was studied by Dhasmana (2013). The author through the results of the study revealed that real exchange rate movements had a significant impact on Indian firms' performance through the import cost channel but not the export competitiveness channel. It was further added that appreciation and depreciation affect firms' performance differently.

The macroeconomic determinants of exchange rate volatility in India were studied by Mirchandani (2013).Twenty years annual data for the period of 1991 to 2010 were collected for the study. The results of the study found indirect correlation between inflation rate and exchange rate; moderate positive relationship between GDP and exchange rate; none significant relationship between the Current Accounting and exchange rate; and mild positive relationship between the FDI and Exchange rate. On the basis of the results, the author concluded that Indian Rupee showed high volatility over the period of study.

Nyahokwe & Ncwadi (2013) investigated the impact of exchange rate volatility on aggregate South African exports flows to the rest of the world for the period 2000 to2009.The methodology adopted for their study was Vector autoregressive models (VARs) and Johansen cointegration technique. The authors concluded from their findings that, depending on the

measure of volatility used, exchange rate volatility either does not have a significant impact on South Africa's exports flows, or it has a positive impact on aggregate goods and services.

Otuori, (2013) also studied the determinant factors of exchange rates and their effects on the performance of commercial banks in Kenya. The author adopted a descriptive design and primary data was collected through self administered questionnaires. The findings of the study revealed that interest rate and external debt had positive and significant effects on performance while inflation rate and external debt had negative and significant effects on performance. The author concluded that higher levels of exports and imports lead to higher profitability in commercial banks in Kenya.

Rahutami (2013) studied the impacts of exchange rate volatility on trade of ten AMSs during 2001-2011. Panel regression method was used. Their result showed evidence that the exchange rate volatility was not statistically significant on the export and import of AMSs. The author concluded that the increased term of trade induced the export value.

Zakaria (2013) as well conducted a studied to investigate the relationship between export and exchange rate volatility; based on the Trade between Malaysia and Its trading partners. A monthly data from January 2000 to August 2012 were used for the study. The method of analysis for the study was regression analysis of standard export demand models, and GARCH (1, 1) models to measure exchange rate volatilities. The findings of the author revealed that that Malaysian exports to the US and Japan were significantly related with exchange rates volatility. Also revealed was that the impact of exchange rate volatility on Malaysia export to US was found negative; while for Japan, was positive.

The Marshall-Lerner (ML) condition for the Kenyan economy has also been examined by Gil-Alana & Mudida (2012), using fractional integration and cointegration approaches. The period of the study spans through 1996q1 – 2011q4. The results showed that the Marshall-Lerner condition is holds in the long run but the convergence process was relatively slow.

The focus of the study of Jamil, et al (2012)was on the impact of exchange rate volatility on industrial production before and after the introduction of common currency for eleven European countries included in European Monetary Union and for four European countries that did not adopt 'Euro' as common currency. Their Study employed monthly data of exchange rate and macroeconomic variables from January 1980 to April 2009 for the analysis. The methodology employed was AR (k)-EGARCH (p, q) models. They concluded

from their findings that all the countries enjoyed benefits after the introduction of common currency by reduction in negative impacts of real exchange rate volatility even some countries also faced increase in real exchange rate volatility.

The impact of real exchange rate volatility on economic growth in Kenyan was examined by Musyoki, Pokhariyal, & Pundo (2012). The period of study was from 1993 – 2009. Their study employed the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and computation of the unconditional standard deviation of the changes to measure volatility and Generalized Method Moments (GMM) to assess the impact of the real exchange rate volatility on economic growth. The findings of their study showed that real exchange rate was very volatility for the entire study period. The authors concluded that real exchange rate volatility reflected a negative impact on economic growth in Kenya.

Ngowani (2012) studied RMB exchange rate volatility and its impact on FDI in Zambia, using daily exchange rate data from January, 2009 to April, 2011. The study applied GARCH (1, 1) model and multiple regression analysis, using Ordinary Least Square (OLS) method. The result from the GARCH (1, 1) model showed that volatility of the RMB was relatively high and posed greater impact on FDI flow into Zambia. On the other hand, the multiple regression results showed that there was a negative correlation between RMB exchange rate fluctuation and FDI into Zambia. The author therefore concluded that a slowdown therefore, negatively affects the flow of FDI from China into Zambia.

Bakhromov (2011) investigated the effect of exchange rate volatility on the international trade in Uzbekistan during the 1999-2009 period. Johansen's cointegration technique was adopted. The author revealed that the real exchange rate volatility had a substantial impact on the exports and imports of the country during the given period and that increases in the volatility of the real exchange rate had significant negative effects on equations of exports and imports in the long-run dynamics.

Huchet-Bourdon & Korinek (2011) examined the impact of exchange rates and their volatility on trade flows in China, the Euro area and the United States in two sectors, agriculture; and manufacturing and mining. The period of study was from 1999-2009. The study applied GARCH model. From the findings, the author revealed that exchange volatility impacted on trade flows only slightly; and exchange rate levels, on the other hand, affected trade in both agriculture and manufacturing and mining sectors but do not explain in their entirety the trade imbalances in the three countries examined.

The study of Mukhtar & Malik (2010) investigated the impact of exchange rate volatility on exports of three South Asian countries, India, Pakistan and Sri Lanka. The period of studied was from 1960 to 2007. Their study adopted cointegration and vector error correction model (VECM) techniques. The findings of their study indicated the presence of a unique cointegrating vector linking real exports, relative export prices, foreign economic activity and real exchange rate volatility in the long run. Real exchange rate volatility exerted significant negative effects on exports both in the short run and the long run. They therefore concluded that improvements in the terms of trade and real foreign income exerted positive effects on export activity.

Arize, (2009) investigated the impact of real exchange-rate volatility on the export flows of 13 less developed countries (LDC's) over the quarterly period 1973-1996. The study used Johansen's multivariate procedure. The short- run dynamics were obtained for each country using the error-correction techniques. The authors concluded from the results of their study that increased volatility of the real effective exchange rate, approximating exchange- rate uncertainty, exerted a significant negative effect on export demand in both the short-run and the long-run in each of the 13 LDC's.

The focus of the study of Kandil (2009) was on the effects of exchange rate fluctuations on major components of the balance of payments in a sample of industrial and developing countries. The author used a sample of 21 developing countries and 25 industrial countries over the sample period 1971-2000. The author concluded that across developing and industrial countries, currency appreciation does not seem to matter much or yield significant results on the current account balance. In contrast, the evidence provided a stronger support for an improvement in the current account balance with currency depreciation in many developing and industrial countries.

Adjasi, Harvey, & Agyapong (2008)were concerned about the relationship between Stock Markets and Foreign Exchange market, and determined whether movements in exchange rates have an effect on stock market in Ghana. The study used Exponential Generalized Autoregressive Conditional Heteroskedascity (EGARCH) model. It was found that there was negative relationship between exchange rate volatility and stock market returns. The authors also revealed that there was the presence of leverage effect and volatility shocks in stock returns on the Ghana Stock Exchange.

Gross (2008) however focused on the treatment effect of capital control policy on real exchange rate volatility. The author applied Propensity Score Matching in a logistic regression. Based on the results of the study, the author concluded that the treatment effect of adopting relatively liberal capital controls is a decrease in real exchange rate volatility.

Kandilov (2008) studied the impact of exchange rate volatility on agricultural trade from the G-10 group of countries. The data for the study was a disaggregated times series data of bilateral trade between 87 countries. The author concluded from his findings that: the impact of exchange rate volatility on agricultural trade for developed exporters was small and comparable to the impact on aggregate exports; and a large negative effect of exchange rate volatility on trade among G-10 members.

Serenis & Serenis (2008) investigated the impact of exchange rate volatility on real aggregate exports for the countries: Norway, Poland, Hungry and Switzerland for 1973:q12006:q4. They used the standard deviation of the moving average of the log of real exchange rate as a measure of exchange rate volatility. From their findings, they concluded that exchange rate volatility has no major effects on aggregate exports for the E.U. countries.

The study of Zheng, Yi, & Chen, (2007)was directed to the revaluation of the Chinese Currency and Its Impacts on China. The period of study spanned through 1979-2005. Based on the findings of the study, the authors concluded that exchange rate movements caused domestic inflation.An invisible balance had no direct relationship with the exchange rate. A visible balance on the other hand, was affected by exchange rate movements.

Ozturk (2006) studied the effects of exchange rate volatility on trade. The author concluded that: the general cause of change in exchange rate was inflation differentials between each country and the United States, and those differences had no significant effects on foreign trade if exchange rate evolve accordingly to PPP; Deviation of exchange rates from PPP had no significant impact on real Exports.

Rey (2006) also conducted a study to investigate the impact of nominal and real effective exchange rate volatility on exports of six Middle Eastern and North Africa (MENA) countries to 15 member countries of the European Union (EU), for the period 1970Q1-2002Q4. Moving average standard deviation and ARCH model were used. The author's cointegration results indicated a significant relationship: negative for Algeria, Egypt, Tunisia, and Turkey; and positive for Israel and Morocco, between MENA exports and exchange rate volatility.

The Granger – causality showed that the effects of volatility on real exports were significant, whereas the effects of real exchange rate and the gross domestic product of EU were more contrasted.

Bhattarai & Armah (2005) examined the effects of exchange rates on the trade balance of Ghana. The authors used annual time series data from 1970-2000. Cointegration analyses of both single equation models and VAR-Error correction models were applied. The results of their study showed stable long-run relationship between both exports and imports and the real exchange rate; and the short-run elasticity of imports and exports indicated contractionary effects of devaluation in terms of the Marshall-Lerner-Robinson conditions added up to almost 1 in the long-run estimates.

Broda & Romalis (2004) studied the relationship between trade and exchange rate volatility. The authors used disaggregated trade data for a large number of countries for the period 1970-1997. The findings of the authors showed an evidence of severe simultaneity problem between volume of trade and exchange rate volatility. They also found that deeper bilateral trading relations dampen real exchange rate volatility and are much more likely to lead to a currency union. The authors concluded that the estimated effect of currency unions on trade reduced from 300 percent to be between 10 and 25 percent.

Vergil (2003) investigated the impact of real exchange rate volatility on the export flows of Turkey to the United States and its three major trading partners in the European Union for the period 1990-2000. The author employed the standard deviation of percentage change in the real exchange rate to measure the exchange rate volatility. Cointegration and error-correction models were as well used to obtain the estimates of the cointegrating relations and the short-run dynamics. From the results of the study, the author concluded that the real exchange rate volatility had a significant negative effect on real exports.

Esquivel & Larraín (2002) described G-3 exchange rate volatility and evaluated its impact on developing countries. Their results indicated that G-3 exchange rate volatility has a robust and significantly negative impact on developing countries' exports. The authors through their results concluded thatG-3 exchange rate volatility has a negative influence on foreign direct investment to certain regions, and increases the probability of occurrence of exchange rate crises in developing countries.

2.3.2 Evidence from Nigeria

In Nigeria also, much has being done in this area of study. For instance, Sulaimon, Omotunde, & Haorayah (2017) examined the impact of devaluation of exchange rate on Nigerian trade balance, using the Johansen cointegration and the error correction techniques. They found a long run negative relationship between trade balance and real exchange rate in Nigeria.

The impact of exchange rate volatility on macroeconomic variables has been studied by Danmola (2013). The study adopted Correlation Matrix, Ordinary Least Square (OLS) and Granger Causality test. The author found that exchange rate volatility had a positive influence on Gross Domestic Product, Foreign Direct Investment and Trade Openness, but had negative influence on the inflationary rate in the country.

However, the study of Oriavwote & Oyovwi (2013) concerned the real effective exchange rate and agricultural productivity in Nigeria. The cointegration technique with its implied ECM was applied to estimate the data which covered the period between 1980 and 2011. The results of the study showed that the Real Effective Exchange Rate had significant impact on the level of agricultural output in Nigeria. It was also revealed that the prices of exports and real agricultural exports had positive and significant impact on agricultural output. The authors concluded that the Real Effective Exchange Rate matters for agricultural output in Nigeria.

The study of Sanya (2013) focused on impact of exchange rate behavior on the growth of Nigerian Economy. Using OLS, the author found that poorly managed exchange rate in Nigeria affected the growth of the Nigerian Economy during the study period. It was further revealed that sustained real exchange rate depreciations increase the relative profitability of investing in tradable and act in a second best fashion to alleviate the economic cost of distortions.

Taiwo & Adesola (2013) investigated the impact of exchange rate policy on bank performance in Nigeria for the period between 1970—2005 using three time periods of pre-SAP, post-SAP and a combination of both. Their study adopted OLS regression. According to the authors, Loan loss to total advance ratio showed that fluctuating exchange rate affect the ability of lenders to manage loans resulting into high level of bad loans while capital deposit ratio does not have significant relationship with exchange rate. They

concluded that a stable exchange rate regime and good loan policy are vital to good performance by banks.

the impact of exchange rate volatility on export in Nigeria was the major objective of Umaru, Sa'idu, & Musa (2013). The period of study was from 1970-2009. Their study employed Ordinary Least Square (OLS); Granger causality test; and ARCH and GARCH techniques and also Augmented Dickey-Fuller technique was used in testing the presence of unit root. The results of their study showed that there was causation between export and exchange rate in the country, but the causation flows from exchange rate to export. It was also revealed that the exchange rate was volatile; nevertheless export was found to be non-volatile. The authors concluded that exchange rate was impacted positively on export.

The relationship between exchange rate misalignment and balance of payments (BOP) mal-adjustment in Nigeria over the sample period of 1973 through to 2012 was the study of Umoru & Odjegba (2013). Their study adopted vector error correction econometric modeling technique. The authors through the results observed that exchange rate misalignment exhibited a positive impact on the Nigerian's balance of payments position. The authors also added that there was a unidirectional causality running from exchange rate misalignment to balance of payments adjustment in Nigeria.

Umoru & Oseme (2013) studied the J-curve effect based on Nigerian data. The study adopted the vector error correction methodology. The results of the study indicated a cyclical feedback between the trade balance and the real exchange rate depreciation in Naira. The author found no empirical evidence in favour of the short-run deterioration of the trade balance as implied by the J-curve hypothesis. Rather, what was empirically supported was the cyclical trade effect of exchange rate shocks.

Similarly, Akpan & Atan (2012) investigated the effect of exchange rate movements on real output growth in Nigeria for the period 1986 to 2010. A Generalized Method of Moments (GMM) technique was explored for their study. Their findings revealed that there was no strong direct relationship between changes in exchange rate and output growth. Rather, Nigeria's economic growth had been directly affected by monetary variables. They therefore concluded from their findings that improvements in exchange rate management are necessary but not adequate to revive the Nigerian economy.

Adelowokan (2012) investigated the channel of exchange rate pass-through in Nigeria. The period of study spans through 1970 and 2010. Two-variants of the adapted model and the classical ordinary least square method was adopted for estimation. The author found that only previous exchange rate of naira through U.S dollar that pass-through interest rate in Nigeria, while neither current exchange rate of naira through U.S dollar nor previous exchange rate of naira through U.S dollar pass-through inflation rate in Nigeria during the period of study.

Bolaji (2012) in his study formulated and estimated the linear absolute PPP model, price and monetary balances models using a data that spanned between 1980 and 2008. The author applied the ordinary least square analysis. The estimated long-run models revealed that exchange rate of naira vis-a-vis U.S dollar were more responsive to domestic prices and foreign interest rate. Also, the existence of long-run relationship was established in the estimated absolute PPP model using the Engle-Granger cointegration test. The author established that monetary balance was more responsive to capital account balance in relation to trade, real output level and foreign external reserves but insignificantly determined by the level of government excessive spending proxied as gross fiscal deficit.

Oriavwote & Eshenake (2012) studied the relationship between real exchange rate and inflation in Nigeria, using data covering the period between 1970 and 2010. Their cointegration test results showed a long run relationship between inflation and real exchange rate. The speed of adjustment indicated by the error correction model supported long run relationship; and the ARCH result indicated the persistence of volatility between rate of inflation and the real exchange rate. The authors concluded that real exchange rate in Nigeria had been susceptible to fluctuations in the rate of inflation.

Orji (2012) examined the relationship between balance of payment and exchange rate. The study period spans through 1970 to 2010. The study used the ordinary least square regression (OLS) method. The author concluded that there was a negative relationship between balance of payment and trade openness, and the existence of a positive relationship between exchange rate and foreign direct investment in Nigeria.

Oyovwi (2012) as well studied the impact of real exchange rate volatility on Nigeria's imports. After applying the Augmented Dickey-Fuller (ADF) and co-integration test of the model; Parsimonious ECM model was estimated. The results of the study showed that real exchange rate volatility had no significant effect on Nigeria's imports. The author concluded

that devaluation as a policy instrument to reduce trade imbalance had not discouraged massive importation.

In a study by Usman & Adejare (2012), the effect of foreign exchange regimes on industrial growth in Nigeria was examined, covering the period of 1985 to 2005. Multiple regressions were employed to analyze data. The authors found that exchange rate had significant effects on Economic Growth in Nigeria.

However, the focus of the study of Essien, Dominic, & Sunday (2011) was on the effects of price and exchange rate fluctuations on Agricultural exports (cocoa) in Nigeria. Ordinary Least Squares Regression was used in their study. The results of their study showed that exchange rate fluctuations and agricultural credits positively affect cocoa exports in Nigeria. The authors also concluded that relative prices of cocoa were insignificantly related to quantity of export, but, the sign was in line with a priori expectation.

Joseph & Akhanolu (2011) investigated the impact of exchange rate volatility on trade flow in Nigeria. Their study used annual data for the period of 1970 – 2009. The study applied Generalized Autoregressive Conditional Heteroskedasticity (GARCH). Based on the findings of the study, the author concluded that there was an inverse and statistical insignificant relationship existed between aggregate trade and exchange rate volatility in Nigeria.

Ogbonna (2011) examined the empirical relationship between the real exchange rate and aggregate trade balance of Nigeria, from 1970-2005. The econometric procedures used to assess the impact of exchange rate variations on the aggregate trade balance were: Unit root tests (ADF and PP),Johansen and Juselius approach to estimation of multivariate cointegration system and ordinary least square (OLS).The results suggested no co-integration for the trade balance model. It was further revealed that depreciation/devaluation improved trade balance and that Marshall-Learn (ML) condition holds for Nigeria.

The study of Oladipupo & Onotaniyohuwo (2011) investigated the impact of exchange rate on the balance of payments position, using the Ordinary Least Square (OLS) method of estimation for data covering the period between 1970 and 2008. The authors found that exchange rate had a significant impact on the balance of payments position in Nigeria.

Stephen & Sanmi (2011) tested the validity of the purchasing power parity (PPP) either as a compliment or an option to the present floating exchange rate system. The period of study was from 1990 – 2010. Their study used ordinary least square multiple regression method and time series secondary data for the data analysis, which was subjected to stationarity test and co-integration. The authors concluded from their finding that the purchasing power parity (PPP) was the better option for the determination of exchange rate and the realistic value of naira.

The long-run relationship between real oil price, real effective exchange rate and productivity differentials in Nigeria was examined by Suleiman & Muhammad (2011).Annual data over the period 1980 to 2010 was used for the study. The findings revealed that real oil price exercised a significant positive effect on the real exchange rate in the long run; and Productivity differentials exercised a significant negative influence on the real exchange rate. The author concluded that the real exchange rate appreciation of 2000-2010 was driven by oil prices.

Campbell (2010) studied the relationship between foreign exchange market and monetary management in Nigeria. From the results of the study, the author concluded that beside growths in M1 and M2 cause inflation, there was an established relationship among Minimum Reserve Requirement (MRR), bank lending rate / savings deposit rate on one hand and inflation on the other.

Similarly, Englama, Duke, Ogunleye, & Isma'il (2010) examined the effects of oil price volatility, demand for foreign exchange, and external reserves on exchange rate volatility in Nigeria using monthly data for the period 1999:1 to 2009:12. The authors utilized cointegration technique and vector error correction model. Based on the findings of the study, the authors concluded that there was a direct link of demand for foreign exchange and oil price volatility with exchange rate movement in Nigeria.

Omojimite & Akpokodje (2010) also investigated the effect of exchange rate reforms on Nigeria's trade performance during the period 1986-2007.The authors found a small positive effect of exchange rate reforms on non-oil exports through the depreciation of the value of the country's currency. It was also found that the structure of imports which is pro consumer goods remained unchanged even after the adoption of exchange rate reforms in Nigeria.

While the study of Asher (2008) aimed at the impact of exchange rate fluctuation on Nigeria's economic growth with special emphasis on purchasing power of the average Nigeria and the level of international trade transaction. The period of study was from 1980-2010. The method of analysis for the study was the ordinary least square (OLS) techniques. Based on the results of the study, the author concluded that real exchange rate had a positive effect on GDP.

2.4 Summary of Literature and Value Added

Though, related studies are found, but much focus especially in Nigeria has been on real exchange rate and other macroeconomic variables and only a few has studied real exchange rate and balance of payments in Nigeria. For example, Danmola (2013), Orji (2012), Ogbonna (2011), and Oladipupo & Onotaniyohuwo (2011) examined the relationship between the aggregate balance of payments and exchange rate in Nigeria. To the best of our knowledge, no known study in Nigeria has studied the relationship between real exchange rate and the subaccounts of the balance of payments in Nigeria. But Kandil (2009) has studied the effect of exchange rate fluctuations on major components of balance of payments in 21 developing and 25 industrial countries. This study, following the study by Kandil (2009) examines the effect of real exchange rate volatility on the major components of balance of payments in Nigeria. It would also show the Marshall-Lerner condition, and, therefore reveal the efficacy of CBN devaluation policy within the study period, which many related studies in Nigeria have ignored.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Theoretical Framework

This study examines the effect of exchange rate volatility on balance of payments in Nigeria. It is underpinned by the monetary theory of balance of payments and the general framework of balance of payments (BOP) as described by Kallon (1994) in Tijani (2014). The analysis of the monetary approach to balance of payment centers on the sub-accounts of the balance of payments in the context of a general equilibrium analysis. The monetary theory of balance of payments or monetary approach to balance of payments originated from Humes David's price flow mechanism in 1752 and was extended further by Johnson (1976) and Mussa (1976). The theory assumes that balance of payments is a monetary phenomenon, and observes balance of payments instability as disequilibrium in the demand and supply of money stock. It assumes that money is a stock and money stock can be changed in two alternative ways, through domestic credit creation and through international reserve flows. It states that exchange rate is determined by the relative supply and demand for money. Excess demand for money would be met by inflow of money from abroad, hence the trade balance will improve, while excess supply of money is eliminated by outflow of money to other countries and this will worsen the trade balance.

The monetary theory of balance of payments posits that the overall balance of payments is affected by imbalances prevailing in the money market. In a fixed exchange rate system, excess money supply produces an increased expenditure, therefore increased domestic demand for foreign goods and services. The high domestic demand is financed by running down foreign exchange reserves, thus worsening the balance of payments. The outflow of foreign exchange reserves reduces money supply until it is equal to money demand, thereby restoring monetary equilibrium and hampering an outflow of foreign exchange reserves. An excess demand for money produces an opposite adjustment, which in turn attracts foreign exchange reserves inflow; and therefore, causes a balance of payments surplus. This induces domestic monetary expansion and perhaps a restored balance of payments equilibrium position. In a like manner, increase in the money supply in a flexible exchange rate system results to capital outflows which increase the demand for foreign currency and consequently exchange rate increase. The exchange rate will continue to depreciate until domestic interest rate equals the foreign interest rate, and balance of payments equilibrium position is restored.

According to Tijani (2014) the formal monetary approach to balance of payments model based on Johnson (1976) specifies a money supply identity, a money demand function and an equilibrium condition as follows:

$$M^s = (R + D) \quad . \quad . \quad . \quad (3.1)$$

$$M^d = L(Y, P, I) \quad . \quad . \quad . \quad (3.2)$$

$$M^s = M = M^d \quad . \quad . \quad . \quad (3.3)$$

where:

M^s = money supply

R = international reserves

D = domestic credit

M^d = money demand

Y = level of real domestic income

P = price level

I = interest rate

M = equilibrium stock of money

Equation (3.1) puts forward that money supply is determined by the availability of international reserves and the level of domestic credit created by the country's monetary reserves, while equation (3.2) reveals real demand for money as a function of real income, the inflation rate and the interest rate. The monetary theory postulates that there is a direct relationship between money held and income:

$$\partial \mathrm{M^d} / \partial \mathrm{Y} > 0$$

and money held and the price level

$$\partial \mathrm{M^d} / \partial \mathrm{P} > 0$$

and an inverse relationship between money held and the interest rate

$$\partial \mathrm{M}^{\mathrm{d}} / \partial \mathrm{I} < 0$$

Equation (3.3) is the equilibrium condition in the money market. The combination of equations (3.1), (3.2) and (3.3), placing the variables in percentage changes, and keeping reserves as the dependent variable, may yield the reserve flow equation as follows:

$$\partial R = f[L(Y, P, I)] - \partial D \quad . \quad . \quad . \quad (3.4)$$

∂D is thus known as an offset coefficient. It shows the extent to which changes in domestic credit are offset by changes in international reserves. Equation (3.4) is the fundamental monetary approach to balance of payments equation. It shows that the balance of payments is the outcome of the divergence between the growth of the demand for money and the growth of domestic credit, with the monetary consequences of the balance of payments bringing the money market into equilibrium. An increase in domestic credit brings about an opposite and equivalent change in international reserves; given a stable demand function for money (Tijani, 2014). The simple open-economy LM model is further adopted to derive the long-run balance of payment (BOP) equation. The money market equilibrium model following Tijani (2014) is:

$$M_t = \pi_1 Y_t + \pi_2 IR_t + \pi_3 DP_t \quad (\pi_1 > 0, \pi_2, \pi_3 < 0) \quad . \quad . \quad . \quad (3.5)$$

The balance of payment (BOP) equilibrium equation is written as:

$$BOP_t = \delta_1 Y_t + \delta_2 R^*{}_t + \delta_3 P^f{}_t \quad (\pi_1 > 0, \pi_2, \pi_3 < 0) \quad . \quad . \quad . \quad (3.6)$$

where:

$_{\mathrm{Y}}$ = real income

IR = domestic interest rate

DP = domestic inflation rate

P^{f} = relative price of imported goods

R^{*} = Foreign interest rate, exchange rate, and domestic interest rate

The monetary approach to balance of payment is preferable to other theories of balance of payment and is chosen because unlike other theories of balance of payments that considered the current account balance only, it focuses on both the current and capital accounts of the balance of payments, therefore consistence with the focus of this study. Also, the monetary theory makes it possible to examine the balance of payments not only in terms of the demand for goods and services, but also in terms of the demand for the supply of money; and explains in a simple form the long run devaluation as a means of improving the balance of payments.

3.1.1 The ARCH and GARCH Framework

Since this study focused on exchange rate volatility, a volatility model such as the Autoregressive-Exponential Generalized Autoregressive Conditional Heteroskedasticity (AR-EGARCH) model will be used to capture the volatility of the exchange rate and effect of the exchange rate volatility on balance of payment will then be examined using the Ordinary Least Square (OLS) technique. The EGARCH model is credited to Nelson (1991), and it captures information asymmetries. Assuming that y_t follows an autoregressive process of order k,the general framework of the mean equation is specified as:

$$y_t = \beta_0 + \sum_{i=1}^{k} \beta_i y_{t-i} + \varepsilon_t \quad . \quad . \quad . \quad (3.7)$$

The complete model will include the following variance equation:

$$log\sigma_t^2 = \varphi + \sum_{i=1}^{q} \alpha_i log\sigma_{t-i}^2 + \sum_{i=1}^{p} \beta_i \left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right| + \sum_{k=1}^{r} \gamma_k \left(\frac{\varepsilon_{t-k}}{\sigma_{t-k}}\right) \quad . \quad . \quad . \quad (3.8)$$

The left-hand side of equation (3.8) is the logarithm of the conditional variance. The logarithmic form of the EGARCH (p, q) model certifies the non-negativity of the conditional variance without the need to constrain the model's coefficients. The asymmetric effect of positive and negative shocks (information) is represented by the inclusion of the term $\varepsilon_{t-i}/\sigma_{t-i}$. If $\gamma_k > 0$ (< 0) volatility tends to rise (fall) when the lagged standardized shock, $\varepsilon_{t-i}/\sigma_{t-I}$ is positive (negative). The persistence of volatility to the conditional variance is given by $\sum_{i=1}^{q} \alpha_i$.

3.2 Model Specification

To analyze the effect of real exchange rate volatility on balance of payments in Nigeria, an econometric model of multiple regression analysis is used following Nyahokwe & Ncwadi (2013), Bobai (2013), and Oladipupo & Onotaniyohuwo (2011) with little modification of variables. The reason for the modification of variables is that they focused respectively on the relationship between exchange rate volatility and exports; and the aggregate balance of payments and not the components as in the case of this study.

Model for Objective One

Model one is a multiple regression model specified to capture objective one of this study. The functional relationship is represented as follows:

$$CAB = f(EXR_{t,}RGDP_{t,}PRICEL_{t,}BOT_{t,}MS_{t,}\sigma_{exr}^{2}) \quad . \quad . \quad . \quad (3.9)$$

where:

CAB = current account balance of balance of payment

EXR = exchange rate

RGDP = real gross domestic product as a measure of national income

PRICEL = price level

MS = money supply

BOT = balance of trade

σ_{exr}^{2}= conditional variance of exchange as a measure of exchange rate volatility

t = time period

The structural model for estimation is:

$CAB_t = \alpha_0 + \alpha_1 EXR_t + \alpha_2 RGDP_t + \alpha_3 PRICEL_t + \alpha_4 MS_t + \alpha_5 BOT_t + \alpha_6 \sigma_{exr}^{2} + \varepsilon_{1t}$ ...(3.10)

Where:

ε_{1t} = the stochastic error term

$\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \& \alpha_6$ are parameters to be estimated and other variables remain as defined previously

Model for Objective Two

This model is also a multiple regression model specified to capture the effect of real exchange rate volatility on the capital account balance of balance of payment. The relationship can be mathematically written as:

$$KAB = f(EXR_{t,} INT_{t,} DC_{t,} MS_{t,} \sigma^2_{exr}) \quad . \quad . \quad . \quad (3.11)$$

where:

KAB = capital account balance of balance of payments

EXR = exchange rate

INT = interest rate

DC = domestic credit

MS = money supply

σ^2_{exr}= conditional variance of exchange as a measure of exchange rate volatility

t = time period

The structural model is:

$$KAB = \beta_0 + \beta_1 EXR_t + \beta_2 INT_t + \beta_3 DC_t + \beta_4 MS_t + \beta_5 \sigma^2_{exr} + \varepsilon_{2t} \quad . \quad (3.12)$$

where:

ε_{2t}= stochastic error term

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \& \beta_6$ are parameters to be estimated and other variables remain as previously defined

Model for Objective Three

Objective three is to determine the effect of real exchange rate volatility on the financial account balance of balance of payments in Nigeria. The functional form of the multiple regression model for objective three is specified as shown below:

$$FAB = f(EXR_{t,}FDI_{t,}MS_{t,}PRICEL, \sigma^2_{exr}) \quad . \quad . \quad . \quad (3.13)$$

where:

FAB = financial account balance

EXR = exchange rate

MS = broad money supply

FDI = foreign direct investment

PRICEL = price level

σ^2_{exr}= conditional variance of exchange as a measure of exchange rate volatility

t = time period

The structural model is:

$$FAB = \gamma_0 + \gamma_1 EXR_t + \gamma_2 FDI_t + \gamma_3 MS_t + \gamma_4 PRICEL_t + \gamma_5 \sigma^2_{exr} + \varepsilon_{3t} \ldots (3.14)$$

where:

ε_{3t}= stochastic error term

$\gamma_0, \gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5,$ andγ_6 are parameters to be estimated and all the variables remain as previously defined.

A-priori signs of the explanatory variables are as follows:

EXRT < 0, MS < 0, RGDP> 0, PRICEL< 0, and INTR < 0

The a-priori signs come from economic theory, as exchange rate depreciates (falls); balance of payment [CAB, KAB and FAB] position will improve since net export balance is increased. An increase in money supply raises the level of income, reduces interest rates and worsens balance of payments. The economic explanation of this fact is that expansionary monetary policy necessarily leads to a deficit in the balance of payments. As real output increases, balance of payment position improves, this is because with increase in real output, prices reduce, thereby making domestic products more attractive both in the internal and external markets. Increase in domestic price level leads to a fall in balance of payments position. Also, increase in interest rate worsens the balance of payments position.

Model for Objective Four

To test whether or not the Marshall-Lerner condition holds for Nigeria, we follow the study by Caporale, Gil-Alana & Mudida (2012). They defined balance of trade (BT) as the ratio of nominal exports to nominal imports. Nominal exports is obtained by multiplying domestic price level (P) with volume of export (X), while nominal imports is estimated as foreign price level (P^x) multiplied by nominal spot exchange rate (S) and the volume of import (M). This is presented as:

$$BT = \frac{P\,X}{P^x S\,M} \quad . \quad . \quad . \quad (3.15)$$

We take the logarithm and express equation (3.15) as:

$$bt = x - m - (s - p + p^x) \quad . \quad . \quad . \quad (3.16)$$

where lower case letters represent logarithm of the variables.

Let $(s - p + p^x) = EXR$

Therefore, equation (3.16) can be written as:

$$bt = x - m - EXR \quad . \quad . \quad . \quad (3.17)$$

where $(s - p + p^x) = EXR$ represents the real exchange rate. The long run exports and imports demand functions are as follows:

$$x = \theta_x + \varphi^x incomex + \alpha_x EXR \quad . \quad . \quad . \quad (3.18)$$

$$m = \theta_m + \varphi income + \alpha_m EXR \quad . \quad . \quad . \quad (3.19)$$

where $income^*$ and $income$ represent respectively the foreign and domestic incomes (in US Dollar), while α_x and α_m stand for the elasticities of exports and imports respectively. When we substitute equations (3.18) and (3.19) into equation (3.17), we obtain the long run trade balance equation as:

$$bt = (\theta_x - \theta_m) + \varphi^x incomex - \varphi income + (\alpha_x + \alpha_m - 1)EXR \quad . \quad . \quad . \quad (3.20)$$

This can be written as:

$$bt = \theta + \varphi^{x} incomex - \varphi income + \alpha EXR\,. \quad . \quad . \quad (3.21)$$

where $\theta = (\theta_x - \theta_m)$ and $\alpha = (\alpha_x + \alpha_m - 1)$

However, for us to find the long run relationship by implementing the bounds testing technique, equation (3.21) is modeled is as a conditional Auto Regressive Distributed Lag (ARDL) Model as shown below:

$$bt = \theta + \vartheta bt_{t-1} + \varphi^{x} incomex_{t-1} + \varphi income_{t-1} + \alpha EXR_{t-1} + \sum_{k=1}^{p} \Omega\, \Delta bt_{t-k} + \sum_{j=1}^{p} \beta \Delta incomex_{t-j} + \sum_{j=1}^{p} \eta \Delta income_{t-j} + \sum_{j=1}^{p} \psi \Delta EXR_{t-j} + u_{1t} \quad . \quad . \quad . \quad (3.22)$$

where: u_{1t} is white noise error term and $\theta, \vartheta, \varphi^{x}, \varphi, \alpha, \Omega, \beta, \eta,$ and ψ, are parameters to be estimated, while EXR is real exchange rates and *bt*, *incomex* and *income* are respectively export-import ratio, foreign (US) income, and domestic income (in US dollar). The effects in the short run are inferred from the estimates of $\Omega, \beta, \eta,$ and ψ, and long run effects by the estimates of $\vartheta, \varphi^{x}, \varphi$ and α. A linear combination of the lagged level of all the variables included in equation (3.22) is commonly known as an error correction or adjustment term. The adjustment coefficient in absolute sense lies between zero and one. The larger the adjustment or error correction parameter, the quicker is the economy's convergence to its equilibrium after a shock.

In equation (3.22), the coefficient (especially the long run coefficient) of real exchange rates (EXR) determines the present or not, of the Marshall-Lerner condition for a currency devaluation. For the Marshall-Lerner condition to hold, the coefficients of the relative (US) income has to be statistically significant and positive. The conditions to be fulfilled are:

$$(\varphi^{x} + \varphi - 1) > 0$$

$$(\varphi^{x} + \varphi) > 1$$

3.3 Estimation Technique, Procedure and Justification

To achieve objectives one, two and three, the study employed a step by step estimation approach. First the variables shall be tested for unit root. Second the Autoregressive-Exponential Generalized Autoregressive Conditional Heteroskedasticity (AR-EGARCH) model shall be estimated to examine exchange rate for volatility by obtaining the conditional variance from the estimated results. Next the impact of exchange rate volatility on balance of payment shall be examined by estimating the models in equations (3.10), (3.12) and (3.14) using the conditional variance obtained from the AR-EGARCH model as measure of exchange rate volatility.

The EGARCH model was developed by Nelson (1991) to capture information asymmetries and also ensure that the conditional variance is always positive. Assuming y_t follows an autoregressive process of order k the mean equation is specified as:

$$y_t = \beta_0 + \sum_{i=1}^{k} \beta_i y_{t-i} + \varepsilon_t \quad . \quad . \quad . \quad (3.23a)$$

The complete model will include the following variance equation:

$$log\sigma_t^2 = \varphi + \sum_{i=1}^{q} \alpha_i log\sigma_{t-i}^2 + \sum_{i=1}^{p} \beta_i \left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right| + \sum_{k=1}^{r} \gamma_k \left(\frac{\varepsilon_{t-k}}{\sigma_{t-k}}\right) \quad . \quad . \quad . \quad (3.23b)$$

The left-hand of (3.7b) is the logarithm of the conditional variance. The logarithmic form of the EGARCH (p, q) model certifies the non-negativity of the conditional variance without the need to constrain the model's coefficients. The asymmetric effect of positive and negative shocks (information) is represented by the inclusion of the term $\varepsilon_{t-i}/\sigma_{t-i}$. If $\gamma_k > 0$ (< 0) volatility tends to rise (fall) when the lagged standardized shock, $\varepsilon_{t-i}/\sigma_{t-I}$ is positive (negative). The persistence of volatility to the conditional variance is given by $\sum_{i=1}^{q} \alpha_i$.

We may consider a special case EGARCH(1,1) model as follows:

$$log\sigma_t^2 = \varphi + \alpha log\sigma_{t-1}^2 + \beta \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| + \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \quad . \quad . \quad . \quad (3.24)$$

For a positive shock, $\varepsilon_{t-1}/\sigma_{t-1} > 0$ eqn. (3.8) becomes:

$$log\sigma_t^2 = \varphi + \alpha log\sigma_{t-1}^2 + (\beta + \gamma) \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \quad . \quad . \quad . \quad (3.25)$$

and for negative shocks, $\varepsilon_{t-1}/\sigma_{t-1}<0$ it becomes:

$$log\sigma_t^2 = \varphi + \alpha log\sigma_{t-1}^2 + (\beta - \gamma)\frac{\varepsilon_{t-1}}{\sigma_{t-1}} \quad . \quad . \quad . \quad (3.26)$$

Therefore the presence of a leverage effect can be tested by the hypothesis $\gamma=0$. There is an asymmetric effect if $\gamma\neq0$. Furthermore, the parameter α governs the persistence of volatility shocks for the EGARCH (1, 1) model. The benefits in using the EGARCH model are: (i) Since the logarithm of volatility is used as the regressand, imposing nonnegative constraint on the parameters of variance dynamics is no longer necessary; (ii) the EGARCH model takes into consideration the asymmetric effect of volatility; and (iii) only the coefficients of the GARCH term determines the persistence of volatility shocks. Thus, this study will also provide empirical evidence regarding the asymmetric of volatility in exchange rate in Nigeria.

On the other hand, the ARDL model specified to capture objective four would be estimated by OLS with lags to be determined by the Akaike's Information Criterion (AIC). The ARDL method as established by Pesaran, Shin, & Smith (2001), is used to investigate long run relationship between variables based on the standards of F-tests or t-tests. The strength of ARDL model has to do with its ability to handle relationships irrespective of whether the regressors are I(0) or I(1). Assuming there is a long-run relationship among the variables in the model, without having any prior information about the direction of the long-run relationship among the variables, the ARDL approach enables us to estimate an unrestricted conditional error-correction model (UECM) taking each of the variables in turn as dependent variables.

Pesaran, Shin, & Smith (2001) proposed the F-test or the t-test with optimal lags to conduct bounds test with new critical values. The F-test or the t-test asymptotic critical value bounds provide a test for co-integration when the independent variables are integrated of different order. A lower critical value is considered if all the variables are stationary at level or I(0). Whereas, an upper critical value is established if all the variables are integrated of order one or I(1). If the test statistics are greater than the respective upper critical values, then we would conclude that long run relationship exists among the variables. But if the test statistics are lower than the critical values, then the null hypothesis of no co-integration would be accepted. However, if the test statistics fall within their respective bounds, then the test would be considered inconclusive.

Conducting various diagnostic tests is also of great importance in detecting econometric problems in specified models to capture stated objectives. Therefore, the Durbin-Watson d-test and Breusch-Godfrey LM Chi-square test would be carried out to test for no autocorrelation of residuals, while the Ramsey RESET F-test would be conducted to test for functional misspecification. Also, the Brown, Durbin, & Evans (1975) CUSUM and CUSUMSQ tests would be employed to test for the stability of short run and long run coefficient estimates.

3.4 Data, Sources and Estimation Software

The data for this study is a quarterly time series sourced mainly from the Central Bank of Nigeria's Statistical Bulletin and from the data bank of World Bank. The data for the relative (US) income (incomex and income) are sourced from the data bank of World Bank, while the data for the rest of the variables are sourced from various issues of the Central Bank of Nigeria's Statistical Bulletin. The Econometric software for estimation is STATA 13.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction

The Autoregressive-Exponential Generalized Autoregressive Conditional Heteroskedasticity (AR-EGARCH) model was estimated to examine the real exchange rate for volatility by obtaining the conditional variance from the estimated result. Thereafter, the impact of exchange rate volatility on balance of payments was examined by estimating the models in equations (3.10), (3.12) and (3.14) using the conditional variance obtained from the AR-EGARCH model as measure of exchange rate volatility. Also, the Autoregressive Distributed Lag (ARDL) model specified in equation (3.22) was estimated and the coefficients were used to test the Marshall-Lerner condition, in line with objective four. However, before the estimation of the equations for the respective objectives, the descriptive statistics of the variables were examined. Also, the variables were subjected to unit root and cointegration tests and the lag order was selected using the Akaike information model selection criteria. In this chapter, the estimation results are presented and the findings are discussed. The chapter begins with presentation and discussion of the descriptive statistics and rounded off with the results and discussion of findings of the respective objectives.

4.2 Descriptive Statistics of the Variables

To have some clue of the time series behaviour of the data set, the descriptive statistics of the variables were determined and the results are reported respectively in Tables 4.1a and 4.1b. The descriptive statistics presented in Table 4.1a showed that the values of BOT, INT, PRICEL , EXR and bt, in the data set cantered around their respective mean values, as indicated by the respective small standard deviation values (close to the mean values). But the values of the rest of the variables in the data set are farther away from their respective mean values as showed respectively by the very high standard deviation values far greater than their mean values. All the minimum values of the variables are less than the mean values respectively while the maximum values are all greater than the respective mean values except BOT and MS which are less than the respective mean values.

Table 4.1a: Mean, Standard Deviation Maximum Values and Minimum Values of the Variables

Variables	Obs.	Mean	Standard Deviation	Minimum value	Maximum value
BOT	188	5.79	5.60	-2147.3	5.45
CAB	188	-108754.7	451691.3	-4123357	44731.2
DC	188	343045.1	600045.9	-310.3	2688236
EXR	188	74.66373	38.77016	0.7416667	113.2
FDI	188	367690.5	798934.4	128.6	5367297
INT	188	15.12637	5.941113	6.00	29.8
KAB	188	-584.0993	23097.66	-138755.6	34627.4
MS	188	3232825	5543293	978.2	1.79
FAB	188	-4408.896	11344.05	-65896.16	13128.9
RGDP	188	71764.7	62369	1028.021	267650.6
PRICEL	188	57.77823	66.97768	0.224631	220.195
income	188	25.8774	.4892247	25.22836	25.22836
income*	188	29.74608	2.170353	.6258047	30.57428
bt	188	1.008664	.7342579	1.0700	2.587257

Source: Author's Computation

Table 4.1b: Skewness and Kurtosis

Variables	Obs.	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	p-value
BOT	188	0.0000	0.0000	-	0.0000
CAB	188	0.0000	0.0000	-	0.0000
DC	188	0.0000	0.0000	62.79	0.0000
EXR	188	0.0000	0.0000	30.26	0.0000
FDI	188	0.0000	0.0000	-	0.0000
INT	188	0.6572	0.0000	19.90	0.0000
KAB	188	0.0000	0.0000	-	0.0000
MS	188	0.0000	0.0118	41.73	0.0000
FAB	188	0.0000	0.0000	46.30	0.0000
RGDP	188	0.0000	0.1868	21.64	0.0000
PRICEL	188	0.0000	0.0000	27.80	0.0000
income	188	0.0000	0.0058	22.95	0.0000
income*	188	0.0000	0.0000	-	0.0000
bt	188	0.9014	0.0001	12.85	0.0016

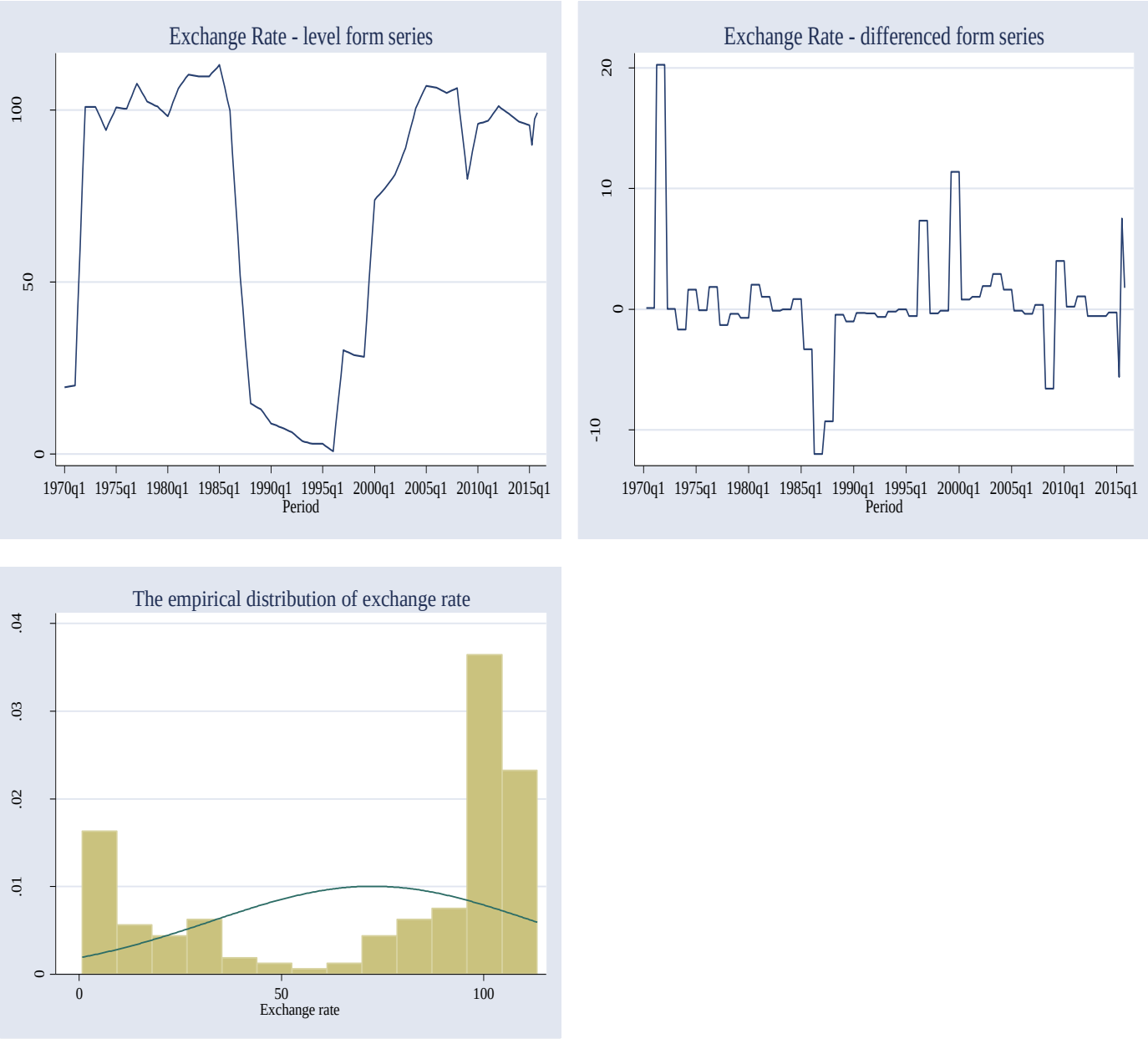
Source: Author's Computation

Skewness is the symmetry of a distribution of the data set. The positive skewness coefficient of Interest Rate (INT) and balance of trade (bt) indicate that the distribution is perfectly symmetrical and right skewed. In other words, the series of interest rate and balance of trade clustered to the left with the tail extending to the right. Whereas, the 0 skewness coefficients of the rest of the variables means that the variables did not deviate from normal distribution. That is, none of the rest of the variables apart from interest rate and balance of trade deviate from normal distribution. Kurtosis on the other hand describes the peakedness of a distribution. The Kurtosis coefficients are all exactly 0 except, money supply, the price level, and income, with a Kurtosis coefficients of 0.0118, 0.1868 and 0.0058 respectively, indicating peak. The probability values of all the variables are significant at 5 percentage level, indicating the rejection of the hypothesis that these variables are normally distributed.

4.3 Determination of the Real Exchange Rate Volatility

In order to obtain the volatility of the exchange rate, and the asymmetric of volatility in exchange rate in Nigeria, the Autoregressive-Exponential Generalized Autoregressive Conditional Heteroskedasticity model was estimated. However, before the model was estimated, the level form series and the differenced series of real exchange rate were plotted. The graph of the empirical distribution of exchange rate was also examined. The graphs are shown in Figure 4.1.

Figure 4.1: Graph of the Exchange Rate



Author's Plots

The exchange rate at the level form showed a fluctuating trend. The differenced series on the other hand are characterized by random, rapid changes and are said to be volatile. The volatility change over time as well with evidence of volatility clustering (volatility clustering helps quantify impact of any shock on variance that continues to transmit itself during adjacent time interval, as a large shock is followed by a larger one and a small shock is followed by a smaller one). For instance, from the early 1970s to mid-1970s, exchange rate was highly volatile. However, exchange rate experiences a relatively sedate (calm) period from the mid-1970s to 1985. Then, exchange rate becomes much more volatile until late

1980s. Volatility increases again at the end of the sample period. Exchange rate generally exhibits periods of relative calm followed by increased volatility.

The graph of the empirical distribution of exchange rate showed that the exchange rate series are not leptokurtic. That means they have lots of observations that are not around the average and a relatively large number of observations that are far from average; the center of the histogram has a low peak and the tail is relatively light compared to the normal.

The graph of the differenced series of exchange rate showed periods of high volatility and other periods of relative tranquility. This makes the series good for ARCH modeling. Though, exchange rate has been a common target of ARCH family of models, we fit a constant-only model by OLS and test ARCH effects in exchange rate by using Engle's Lagrange multiplier test. This is to make sure that our AR-EGARCH model is appropriate for the data. The result is reported in Table 4.2.

Table 4.2: Result of Engle's Lagrange multiplier test for ARCH effects in exchange rate

Result of a constant-only model by OLS used to test for ARCH effect				
D.EXR	Coefficient	Standard Error	t	p
Constant	0.4358576	0.3374028	1.29	0.198
LM test for autoregressive conditional heteroskedasticity (ARCH)				
chi2	102.427			
Prob.	0.0000			
Lags	2			
The lag length of 2 was empirically determined using the Akaike's final Prediction Error (FPE), and Akaike's information criterions				

Source: Author's computation

The Engle's LM test showed a p-value of 0.0000,which is well below 0.05 in absolute sense. Since the probability value is less than the 5 percent critical value, we reject the null hypothesis of no ARCH effects at the 5 percent level. Thus, there is an ARCH effect in exchange rate. Because ARCH effect is confirmed, we went further to estimate the

Autoregressive-Exponential Generalized Autoregressive Conditional Heteroskedasticity model specified in chapter three. The result is reported in Table 4.3.

Table 4.3: Result of the AR-EGARCH model

EXR	Coefficient	OPG Standard Error	z-value	p-value
EXR				
-constant	98.8528	0.4091	241.62	0.000
ARCH				
earch(L2)	0.1199	0.2602	0.46	0.645
earch_a(L2)	1.7748	0.4291	4.14	0.000
egarch (L2)	0.8762	0.0507	17.27	0.000
Constant	0.5737	0.2689	2.13	0.033
The lag length was empirically determined using the Akaike's final Prediction Error (FPE), and Akaike's information criterions				

Source: Author's computation

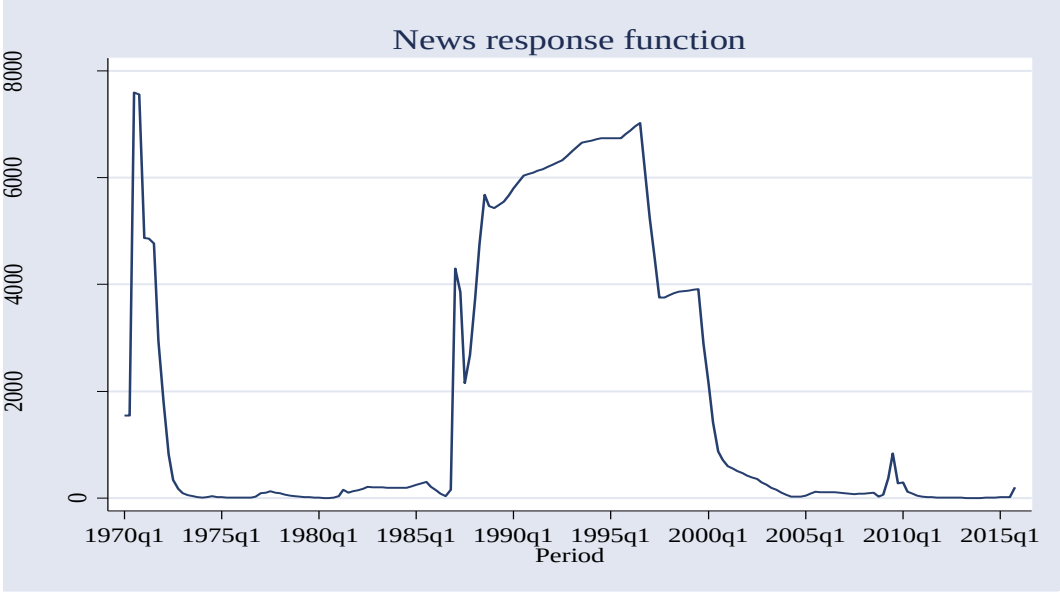
The result showed a weak indication for leverage effect (leverage effect helps expose the shock, which may strongly influence the variance because a "negative shock" causes greater loss in returns than the gains from a "positive shock.") and strong indication for asymmetric effect (asymmetric effect measures the significance and proportional contribution of negative shock that destabilizes variance). The positive earch (L2) coefficient means that positive innovations (unanticipated increase in exchange rate) are more destabilizing than negative innovations(unanticipated decrease in exchange rate). Though, the effect appears weak (0.1199) and is substantially smaller than the symmetric effect (1.7748). In specific terms, the relative scales of the two coefficients showed that the symmetric effect completely dominates the positive leverage.

The result for the EGARCH asymmetry coefficient showed the opposite to what would have been expected in the case of the application of a GARCH model to exchange rate. Specifically, for a positive exchange rate shock, the egarch (L2) coefficient (0.8762) suggests decreasing exchange rate. That is, less naira per dollar and therefore a strengthening naira and a weakening dollar. The EGARCH results suggest that strengthening naira (weakening

dollar) leads to higher next period volatility in exchange rate than when the naira is weakening by the same amount.

In order to capture the volatility of the exchange rate, we generate the conditional variance of exchange. The generated series of the volatility of the exchange rate (the conditional variance of exchange) are shown in Appendix A, while the plot of the generated series is shown in figure 4.2

Figure 4.2: Conditional variance – exchange rate volatility



Source: Author's plot

It is shown that positive asymmetry does dominate the shape of the news response function of exchange rate. The response is a fluctuating function of positive news about exchange rate. The exchange rates were much more volatile between the 1st quarter of 1970 to the 4th quarter of 1974 and became relatively tranquil from the 1st quarter of 1975 until the 1980s. The early 1990s until the mid-2000s also marked periods of much more volatile exchange rate. In the end periods of the study (2005q1 – 2015), the exchange rates remained tranquil all through.

4.4 Unit Root Test

Unit root test on the variables in equations (3.10), (3.12) and (3.14) was carried out using the Augmented Dickey-Fuller and Philips Perron tests and the results are reported in Table 4.2. bellow:

Table 4.4: Augmented Dickey – Fuller and Philips–Perron Unit Root Test Result

Variable	Augmented Dickey – Fuller Result		Philips–Perron Result		Lag order	~I(d)
	Level	1st Difference	Level	1st Difference		
DC	-2.671	-9.263*	-2.222	-7.278*	2	I(1)
FDI	-3.550	-9.558*	-3.503	-13.224*	2	I(1)
INT	-2.308	-8.450*	-1.810	-6.879*	2	I(1)
KAB	-3.145	-7.630*	-2.918	-6.531*	2	I(1)
MS	-1.060	-4.239*	1.312	-6.636*	2	I(1)
BOT	-3.418	-21.574*	-3.118	-14.118*	2	I(1)
CAB	-2.556	-21.476*	-3.011	-11.383*	2	I(1)
EXR	-1.721	-6.499*	-1.559	-5.862*	2	I(1)
FAB	-2.053	-3.932*	-3.296	-13.665*	2	I(1)
RGDP	-1.308	-10.308*	-2.387	-11.586*	2	I(1)
PRICEL	-2.292	-8.252*	-2.338	-13.905*	2	I(1)
EXR_V ($\boldsymbol{\sigma^2_{exr}}$)	-1.711	-8.051*	-1.571	-16.352*	2	I(1)
income	-1.188	-5.636*	-0.404	-5.270*	2	I(1)
incomex	-1.912	-3.775*	-1.845	-13.845*	2	I(1)
bt	-3.539*	-	-5.481*	-	2	I(1)

Where * denotes significance at 5% and the rejection of the null hypothesis of presence of unit root. The optimal lag lengths were chosen according to Akaike's final Prediction Error (FPE), and Akaike's information criterions. The ADF critical value at levels is -3.439 and the 1st difference is -3.439. Whereas, the Philips–Perron critical value at levels is -3.438 and 1st difference on the other hand is -3.439. Trend was included in the models estimated.

Source: Author's Computation (2017)

At the level form, the ADF-statistics for all the variables are less than the 5 percent critical value of -3.439 except balance of trade (bt), which is greater than the critical value. This means that unit root exists in all the variables at level except balance of trade. That is, none of the variables is stationary in their level form apart from balance of trade. The non-stationary variables were therefore differenced once. At their 1st difference, the ADF-statistics have all become greater than the 5 percent critical value of -3.439. This result means that there is no unit root at 1st difference of the variables.

Also, the Philips Perron test showed that the variables are not stationary at the level form at 5 percent level except balance of trade. The Philips Perron test statistics are less than the critical value at 5 percent level except balance of trade. The non-stationary variables were therefore tested again at their first difference. The test statistics became greater than the 5 percent critical value. The null hypothesis that the variables have unit root is therefore rejected at their first difference at the 5 percent significant level. This result supports the result of the Augmented Dickey Fuller test that the variables are all stationary at 1^{st} difference except the balance of trade.

Since the variables are all integrated of the same order, I(1) except the balance of trade variable in equation (3.22), which is integrated of order zero, I(0) there is the possibility that the variables especially in equations (3.10), (3.12) and (3.14) could be cointegrated. It is however best known when tested empirically. This is why in the next section, the Johansen cointegration test respectively for the variables in equations (3.10), (3.12) and (3.14) is conducted and reported, while the bounds test would be conducted for the variables in equation (3.22) later in this chapter due to the mix of order of integration of the variables (bt, income and incomex) in this equation.

4.5 Johansen Cointegration Test

Cointegration test is usually carried out to show if long run relationship exists between variables in a regression model. The Johansen cointegration test among the variables in equations (3.10), (3.12) and (3.14) was conducted and the result is reported in Tables 4.5a, 4.5b and 4.5c respectively.

The results showed 2 cointegrating equations among the variables in equations (3.10) and (3.12) while 1 cointegrating equation was indicated among the variables in equation (3.14). Specifically, for the variables in equations (3.10) and (3.12), the trace statistics were all greater than the critical values at the 5-percentage significant level up to the 1^{st}maximum rank. The null hypothesis of no cointegration is therefore rejected at the 5 percent level of significant in both equations. For the variables in equation (3.14), the trace statistics of maximum rank 0 was found to be greater than the 5 percent critical value. This means that 1 cointegrating equation exists among the variables. Thus, we conclude that long run relationship exists amongst the variables in the respective regression models.

Table 4.5a: Results of Johansen test for cointegration between CAB, EXR, RGDP, PRICEL, MS, BOT and EXR_V

Maximum Rank	Eigen value	Trace Statistics	5% critical value
0	-	362.2439	109.99
1	0.66528	158.6765	82.49
2	0.44134	50.3849*	59.46
3	0.14295	21.6918	39.89
4	0.07618	6.9532	24.31
5	0.02410	2.4149	12.53
6	0.01289	0.0010	3.84
7	0.00001	-	-

Source: Author's Computation (2017)

Table 4.5b: Results of Johansen test for cointegration between KAB, INT, EXR, DC, MS, and EXR_V

Maximum Rank	Eigen value	Trace Statistics	5% critical value
0	-	111.8537	82.49
1	0.20234	69.8047	59.46
2	0.16261	36.7962*	39.89
3	0.13814	9.1446	24.31
4	0.03319	2.8673	12.53
5	0.01471	0.1115	3.84
6	0.00060	-	-

Source: Author's Computation (2017)

Table 4.5c: Results of Johansen test for cointegration between FAB, EXR, FDI, MS, PRICE and EXR_V

Maximum Rank	Eigen value	Trace Statistics	5% critical value
0	-	91.5720	82.49
1	0.40521	46.8907*	59.46
2	0.19761	27.9570	39.89
3	0.13523	15.4621	24.31
4	0.12339	4.1367	12.53
5	0.04168	0.4752	3.84
6	0.00551	-	-

Source: Author's Computation (2017)

The existence of long run relationship of the variables warrants the estimation of an error correction model to ascertain the speed of adjustment. The error correction models were estimated and the result is shown in appendix B. The error correction coefficients were all negative as expected. The results showed that 3.17 percent of the error among CAB, EXR, RGDP, PRICEL, MS, BOT and EXR_V in the short run is corrected quarterly and the variables adjust and converge to equilibrium in the long run. Similarly, KAB, INT, EXR, DC, MS, and EXR_V adjust and converge to equilibrium in the long run with a speed of 3.05 percent in every quarter of the year. Also, FAB, EXR, FDI, MS, PRICE and EXR_V significantly adjust and converge to equilibrium in the long run with a speed of 34.87 percent in every quarter of the year.

4.6 Test for Multicollinearity

A multicollinearity test of the explanatory variables in equations (3.10), (3.12) and (3.14) was also conducted using the Variance inflation factors (VIFs) technique and the results are reported in Tables 4.6a, 4.6b and 4.6c respectively. This test is necessary in order to avoid the consequences of multicollinearity and to ensure unique estimates of the regression parameters. As pointed out by Asteriou & Hall (2004), two or more variables with a variance inflation factor of 10 and above cause problem of multicollinearity in a regression while variables with VIF of less than 10 has no problem of multicollinearity.

Table 4.6a: Variance inflation factors (VIFs) of the explanatory variables in equation (3.10)

Variables	VIF	1/VIF
EXR_V	10.75	0.093038
EXR	10.29	0.097191
PRICEL	4.79	0.208582
MS	3.10	0.322453
RGDP	2.18	0.459665
BOT	1.14	0.880515
Mean VIF	5.37	

Source: Author's Computation (2017)

Table 4.6b: Variance inflation factors (VIFs) of the explanatory variables in equation (3.12)

Variables	VIF	1/VIF
EXR_V	10.81	0.092540
EXR	11.49	0.087034
INT	3.53	0.283106
MS	1.97	0.507215
DC	1.95	0.513016
Mean VIF	5.95	

Source: Author's Computation (2017)

Table 4.6c: Variance inflation factors (VIFs) of the explanatory variables in equation (3.14)

Variables	VIF	1/VIF
EXR_V	17.58	0.056875
EXR	18.81	0.053159
PRICEL	3.31	0.301727
MS	2.59	0.386271
FDI	1.84	0.542435
Mean VIF	8.83	

Source: Author's Computation (2017)

The VIFs of the explanatory variables in the respective equations are very low except for exchange rate volatility (EXR_V) and real exchange rate (EXR) variables, which were as

high as 10.29 and above. But the mean VIF values were 5.37, 5.95 and 8.83 respectively for equations (3.10), (3.12) and (3.14). This specifically means that exchange rate and exchange rate volatility variables are having multicollinearity problem and the inclusion of the two variables in the same regression equation(s) will not be appropriate because the ordinary least square estimates would not be unique. Also, the variances and consequently the standard errors will tend to be substantially larger than those obtained in the absence of multicollinearity. Whereas, the low mean VIF values (less than 10) point out that jointly using the explanatory variables (after dropping either of exchange rate or exchange rate volatility) in the respective equations would cause no problem.

Therefore, as a way forward, we would drop one of either exchange rate or exchange rate volatility variables. However, since the main focus of this study is to examine the effect of real exchange rate volatility on balance of payments, we would retain the real exchange rate volatility variable and drop the real exchange rate variable. Though, before dropping the real exchange rate variable, we would estimate the respective models with real exchange rate volatility and real exchange rate variables included. In the subsequent sections, the results of the estimates of the models for the respective objectives are presented and discussed.

4.7 Real Exchange Rate Volatility and the Current Account Balance of Balance of Payments

To achieve objective one, equation (3.10) was estimated. However, due to identified multicollinearity between real exchange rate and real exchange rate volatility, we dropped real exchange rate from the model and retained the real exchange rate volatility variable. Though, first of all, the model containing the two variables (real exchange rate and real exchange rate volatility variables) alongside other control variables was estimated. Thereafter, the exchange rate variable was dropped and the model was again estimated. Our primary concern here is the result of the model with exchange rate volatility (without the exchange rate variable) due to the identified multicollinearity between the two variables. The result of the model containing real exchange rate and real exchange rate volatility alongside other control variables is shown in Appendix E, while the result of the model with exchange rate volatility (without the exchange rate variable) is shown in Table 4.7 below.

The result showed a coefficient of exchange rate volatility of 0.1205 percent with a t-statistics of 0.06. Since the t-value of 0.06 is less than 2 in absolute sense, we accept the null hypothesis that real exchange rate volatility has no significant effect on the current account

balance of balance of payments in Nigeria at the 5 percent level. This is also confirmed by the probability value of 0.956 which shows that there is a significant error in rejecting the null hypothesis at the 5 percent level. In specific terms, though not statistically significant, the positive relationship (coefficient) can be implied that large devaluation of Nigerian naira makes the domestic products less expensive relative to foreign goods and services and therefore leads to a shift of global demand away from foreign products towards domestic ones. This in other words, means an increase in exports (increase in the receipts from export of goods, services and unilateral receipts) and a decrease in imports (decrease in payments for import of goods, services and unilateral payments), resulting to an overall improvement in the trade balance and thus a reduction in the net trade. This therefore, affects (improves) the current account balance of balance of payments. These result is consistent with the interpretation of J-curve effects, which presupposes that a real depreciation of domestic currency will lead to positive changes in balance of payments accounts due to an increase in export and a decrease in import, simultaneously. These results are also consistent with other previous studies concluding that short run effects of real exchange rate volatility are likely to follow a specific (positive) pattern (Bristy, 2013; Danmola, 2013 Nyahokwe & Ncwadi, 2013; and Zakaria, 2013 for instance).

As for the effects of real GDP, consistent with some econometric studies, this variable (RGDP) is significant at the 5 percent level. Thus, the null hypothesis of real GDP having no significant effect on the current account balance of balance of payments is rejected. It means that national income plays an important role in determining the current account balance of balance of payments. To be exact, an increase in real GDP leads to 0.1629 naira improvement in the current account balance of balance of payments.

As regards the domestic price level, the result showed a coefficient of -37.7095 with a t-statistics of -0.24. The t-value in absolute terms is less than 2 and, therefore, the null hypothesis of the domestic price level having no significant effect on the current account balance of balance of payments is clearly accepted. The probability value of 0.809, which is greater than 0.05 means that there is a significant error in rejecting the null hypothesis at the 5 percent level. Specifically, an increase in the domestic price level leads to a decrease in the current account balance by 37.7095 naira. In other words, though the domestic price level negatively affects the current account balance of balance of payments, but the negative effect is statistically insignificant and the domestic price level plays an unimportant role in determining the current account balance of balance of payments. This however is in the short

run and there is need to take caution against high and sustainable (long time) price increase. As stated by the balance of payments theory of exchange rate, change in the value of money (in essence, a currency's price depreciation or appreciation) could directly affects the volume of a country's imports and exports (especially in the long run) and, consequently, a likely fluctuation in the exchange rates can add to balance of payments discrepancies.

The result with respect to money supply and the current account balance of balance of payments showed that money supply worsen the balance of payment current account balance. The money supply coefficient of -0.0392 with a t-statistics of -5.34 specifically means that an increase in money supply leads to significant 0.0392 naira deficit in the current account balance of balance of payments. Since the t-value of -5.34 is greater than 2 in absolute sense, we reject the null hypothesis of money supply having no significant effect on the current account balance of balance of payments. The rejection of the null hypothesis is also confirmed by the significant probability value of 0.000, indicating that there is an insignificant error in rejecting the null hypothesis. The negative money supply coefficient in this case implies excess money supply and the excess supply of money is eliminated by outflow of money to other countries and this will worsen the trade balance and consequently the current account balance of balance of payments. This is in line with the monetary theory of balance of payments, which posits that excess money supply produces an increased expenditure, therefore increased domestic demand for foreign goods and services which increases the demand for foreign currency and consequently exchange rate increase. The high domestic demand for foreign goods and services is financed by running down foreign exchange reserves, thus worsening the balance of payments.

With respect to the balance of trade, the coefficient is 6.7300 with a t-statistics of 383.58. Since the t-value is greater than 2 in absolute sense, at the 5 percent level, we reject the null hypothesis that balance of trade has no significant effect on the current account balance of balance of payments. The country's balance of payment is a positive and significant determinant of the current account balance of balance of payments. In exact terms, an increase in the balance of trade leads to an improvement in the current account balance of balance of payments by 383.58 naira. This implies that the current account balance of balance of payments improves significantly for any improvement in the trade balance. It means that the more the trade surplus the country obtains, the better the current account balance of balance of payments. This points out that, all things being equal, when the country gets less

imported goods in exchange for a unit of domestic goods and services, thereby, a unit of imported goods would give higher number of units of domestic goods. Eventually, the domestic economy (Nigeria) buys fewer imports while foreign economies purchase relatively more domestic goods. Ultimately, the trade balance would become surplus, and the current account balance of balance of payments improves.

Table 4.7: Estimates of the effect of real exchange rate volatility on the current account balance of balance of payments

CAB	Coefficients	Standard Errors	t-Statistics	P-value
EXR_V	0.1205	2.1648	0.06	0.956
RGDP	0.1629	0.0738	2.21	0.028
PRICEL	-37.7095	156.0534	-0.24	0.809
MS	-0.0392	0.0073	-5.34	0.000
BOT	6.7300	1.7600	383.58	0.000
Constant	947.7856	1544.816	0.61	0.540
R^2	0.8988			
Adjusted R-Squared	0.8388			
F-statistics	30297.99 (0.0000)			
Durbin-Watson d-statistic (6, 187)	1.0541			
Breusch-Godfrey LM Chi-square Statistics	0.035 (0.8513)			
Ramsey RESET F-stat (3, 181)	2.59 (0.0545)			

Source: Author's computation

As for the diagnostics reported in Table 4.7, the coefficient of determination (R^2) showed a value of 0.8988. The R^2 indicates the variance of the dependent variable that is accounted for by the independent variables. It is also the measure of the goodness of fit of the model. The R^2 value (0.8988) means that the variables in the model account for 89.88 percent variation in the current account balance of balance of payments (which indicates quite good predictive accuracy), while the remaining 10.12 percent variation is due to other variables that were not included in the regression model. The F-statistics on the other hand, is 30297.99 with a probability value of 0.0000. Since the probability value is less than 0.05, the null hypothesis of no joint significant effect of the explanatory variables on the current account balance of balance of payments is rejected at the 5 percent level. Thus, the variables together significantly effects the current account balance of balance of payments. Whereas, the

Durbin-Watson statistic and the Breusch-Godfrey LM Chi-square statistics are used to check for serial correlation. The Durbin-Watson statistic is 1.0541, which falls into the area of indecision. This means that the test is inconclusive. Breusch-Godfrey LM Chi-square statistics however is 0.035 with a probability value of 0.8513. Since the probability value is not significant at the 5 percent level, we accept the null hypothesis of no serial correlation. This means that the Breusch-Godfrey LM test supports autocorrelation-free residuals. Ramsey's Reset test for functional misspecification also showed that the model do not have functional misspecification.

4.8 Real Exchange Rate Volatility and the Capital Account Balance of Balance of Payments

In order to examine the effect of real exchange rate volatility on the capital account balance of balance of payments, equation (3.12) was estimated. The estimation was done first, on the model containing both real exchange rate and real exchange rate volatility together with the other control variables (see Appendix E for the output). Thereafter, the real exchange rate variable was dropped and the model was estimated again and the result is reported in Table 4.8 below. This decision was taken because of existence of multicollinearity between the two variables (real exchange rate and real exchange rate volatility). The real exchange rate volatility variable was retained since our main focus here is to examine the effect of real exchange rate volatility on the capital account balance of balance of payments.

The real exchange rate volatility coefficient showed 0.2971with a t-statistics of 0.49. Since the t-value of 0.49 is less than 2 in absolute term, the null hypothesis of real exchange rate volatility having no significant effect on the capital account balance of balance of payments is accepted at the 5 percent level. This is also supported by the probability value of 0.624 which posits that there is a significant error in rejecting the null hypothesis. In specific terms, though not statistically significant, the positive coefficient means that large devaluation of Nigerian naira makes the domestic products less expensive, therefore, leads to an increase in exports (increase in the transactions, which lead to inflow of foreign exchange like receipt of loan from abroad, sale of assets or shares in foreign countries, etc.) and a decrease in imports (decrease in transactions, which lead to outflow of foreign exchange, like repayment of loans, purchase of assets or shares in foreign countries, etc.), resulting to an overall improvement in the trade balance and thus a reduction in the net trade. This affects (improves) the capital account balance of balance of payments. These result also is in line with the interpretation of

J-curve effects, which posits that a real depreciation of domestic currency will lead to positive changes in balance of payments accounts due to an increase in export and a decrease in import, simultaneously.

The coefficient of the interest rate variable on the other hand, showed -4550.598 with a t-statistics of -10.77. In absolute sense, the t-value is greater than 2. Therefore, the null hypothesis of interest rate having no significant effect on the capital account balance of balance of payments is rejected. The significant probability value also showed that there is an insignificant error in rejecting the null hypothesis. In exact terms, a percentage increase in interest rate leads to over 100 percent decrease in the capital account balance of balance of payments. This means that any percentage increase in interest rate worsen the capital account balance of balance of payments. In other words, increase in interest rate worsens the balance of payments position of the country. This result implies that the capital account balance of balance of payments is also affected by imbalances prevailing especially in the money market. An excess demand for money resulting from high interest rate changes discourages foreign exchange reserves inflow and therefore, worsen the capital account balance of balance of payments.

The coefficient of domestic credit is 0.0020 with a t-statistics of 2.70. Since the t-value of 2.70 is significant at 5 percent level; we say that domestic credit has significant positive effect on the capital account balance of balance of payments such that if domestic credit increases by 1 naira, the capital account balance of balance of payments will increase by 0.0020 naira. This is confirmed by the probability value of 0.004 which shows that there is insignificant error in rejecting the null hypothesis.

The result also showed that money supply had negative effect on the capital account balance of balance of payments, such that, an increase in money supply will lead to 0.0006 naira decrease in the capital account balance. This is with a t-statistics of -0.29. Since the t-value of -0.29 is less than 2 in absolute sense, we accept the null hypothesis that money supply has no significant impact on the capital account balance of balance of payments in Nigeria at 5 percent level of significant. This finding is a confirmation of the monetary theory of balance of payments in which states that excess money supply produces an increased expenditure, therefore increased domestic demand for foreign products. The high domestic demand for foreign product needs to be financed by running down foreign exchange reserves, thus worsening the balance of payments.

Table 4.8:Estimates of the effect of real exchange rate volatility on the capital account balance of balance of payments

KAB	Coefficients	Standard Errors	t-Statistics	P-value
EXR_V	0.2971	0.6046	0.49	0.624
INT	-4550.598	422.3943	-10.77	0.000
DC	0.0020	0.0008	2.70	0.004
MS	-0.0006	0.0021	-0.29	0.772
Constant	346.3531	434.5545	0.80	0.426
R^2		0.6894		
Adjusted R-Squared		0.6360		
F-statistics		29.02 (0.0000)		
Durbin-Watson d-statistic (5, 187)		0.6096		
Breusch-Godfrey LM Chi-square Statistics		1.442 (0.2299)		
Ramsey RESET F-stat (3, 183)		2.44 (0.0661)		

Source: Author's computation

The R^2 value of 0.6894 showed that the explanatory variables explained 68.94 percent variance of the capital account balance of balance of payments in Nigeria. The F-statistics F(5, 187) value of 29.02 indicates significant. The null hypothesis that the variables jointly have no significant impact on the capital account balance of balance of payments is therefore rejected. This is also confirmed by the significant probability value of 0.0000, indicating that there is an insignificant error in rejecting the null hypothesis. Thus, we say that exchange rate volatility, interest rate, domestic credit and money supply together significantly affect the capital account balance of balance of payments in Nigeria. The Durbin-Watson statistics value of 0.6096 which is approximately 1 again means that the test is inconclusive. However, the Breusch-Godfrey LM Chi-square Statistics of 1.442 with the probability value of 0.2299 means that the explanatory variables have no serial correlation. The Ramsey RESET F-statistics and probability values are 2.44 and 0.0661 respectively. Since the probability value of 0.0661 is insignificant at 5 percent level, the null hypothesis that the model has no omitted variables is accepted. Thus, we say that the functional form was correctly specified.

4.9 Real Exchange Rate Volatility and the Financial Account Balance of Balance of Payments

To achieve objective three, equation (3.14) was estimated using the Ordinary Least Squares techniques. Again, due to multicollinearity between real exchange rate and real exchange rate volatility, we dropped real exchange rate from the model and retained the real exchange rate volatility variable (since this is our major target variable). Though, before dropping the variable, the model containing the two variables (real exchange rate and real exchange rate volatility variables) alongside other control variables was estimated and the result is shown in Appendix E. We report the result of the model with exchange rate volatility (without the exchange rate variable) in Table 4.9.

Exchange rate volatility showed a negative coefficient (-2.0272) with a t-statistics of -0.63. The t-value of -0.63 is less than 2 in absolute sense. Therefore, the null hypothesis that real exchange rate volatility has no significant effect on the financial account balance of balance of payments in Nigeria is accepted at the 5 percent level. The insignificant probability value of 0.527 also supports our decision of accepting the null hypothesis by showing that there is a significant error in rejecting the null hypothesis. Specifically, the result showed that real exchange rate volatility has a negative influence on the financial account balance of balance of payments. If real exchange rate depreciates by a percentage, the financial account balance of balance of payments deteriorates by 2.03 points. In other words, though not statistically significant, the negative coefficient can be implied that volatility of the exchange rate resulting from large depreciation of Nigerian naira discourages inflow of foreign direct investment (FDI), portfolio investment (PI), and official reserve transactions, which negatively affects the financial account balance of balance of payments, and therefore, reduces the financial account balance by 2.03 naira.

Similarly, the coefficient of foreign direct investment showed a negative coefficient (-0.0090) with a t-statistics of -7.64. Since the t-value of -7.64 is greater than 2 in absolute terms, we reject the null hypothesis that foreign direct investment has no significant effect on the financial account balance of balance of payments at the 5 percentage level. The probability value of 0.000 also confirms that there is an insignificant error in rejecting the null hypothesis. In exact terms, an increase in foreign direct investment significantly reduces the financial account balance of balance of payments by 0.01 points. This is however not in line

with our a priory expectation. This could be the inflow of the foreign direct investment is low that it could not improve the financial account balance.

The price level, on the other hand, showed that it has a positive influence on the financial account balance of balance of payments. It showed a value of 15.4777 with a t-statistics of 0.27. Since the t-value of 0.27 is less than 2 in absolute sense, the null hypothesis that the price level has no significant influence on the financial account balance of balance of payments is accepted at the 5 percent level. The insignificant probability value of 0.784 also showed that there is a significant error in rejecting the null hypothesis at the 5 percent level. This means that, though not statistically significant, when the price level increases, the financial account balance of the balance of payments also improves by 15.48 naira.

The domestic money supply also showed a positive coefficient of 0.0194 with a t-statistics of 5.91. The t-value in absolute terms is greater than 2. Thus, the null hypothesis that the price level has no significant effect on the financial account balance of balance of payments is rejected at the 5 percent level. The probability value of 0.000 as well supports that there is an insignificant error in rejecting the null hypothesis at the 5 percent level. This means that money supply, especially when it is not excess, improves the financial account balance of balance of payments.

Table 4.9: Estimates of the effect of real exchange rate volatility on the financial account balance

FAB	Coefficients	Standard Errors	t-statistics	P-value
EXR_V	-2.0272	3.1936	-0.63	0.527
FDI	-0.0090	0.0012	-7.64	0.000
PRICEL	15.4777	56.4010	0.27	0.784
MS	0.0194	0.0033	5.91	0.000
Constant	346.3531	434.5545	0.80	0.426
R^2		0.5341		
Adjusted R-Squared		0.5114		
F-statistics		23.50 (0.0000)		
Durbin-Watson d-statistic (5, 87)		1.0276		
Breusch-Godfrey LM Chi-square Statistics		0.290 (0.5905)		
Ramsey RESET F-stat (3, 80)		0.08 (0.9692)		

Source: Author's computation

As regards the diagnostics reported in Table 4.9, the coefficient of determination (R^2) showed a value of 0.5341. Thus, the variables in the model account for 53.41 percent variation in the financial account balance of balance of payments, while 46.59 percent variation is due to other variables that were not included in the regression model. The F-statistics on the other hand, is 23.50 with a probability value of 0.0000. Since the probability value is less than 0.05, the null hypothesis of no joint significant effect of the explanatory variables on the financial account balance of balance of payments is rejected at the 5 percent level. Thus, the variables together significantly effects the financial account balance of balance of payments. The Durbin-Watson statistic is 1.0276, which falls into the area of indecision. This means that the test is inconclusive. Breusch-Godfrey LM Chi-square statistics however is 0.290 with a probability value of 0.5905. Since the probability value is not significant at the 5 percent level, we accept the null hypothesis of no serial correlation. Ramsey's Reset test for functional misspecification also showed that the model do not have functional misspecification problem.

4.10 The Marshall-Lerner condition

To test whether or not the Marshall-Lerner condition holds for Nigeria, we estimated equation (3.22), beginning with the Pesaran, Shin, and Smith (2001) Bounds test for level for relationship. The result of the test is presented in Table 4.10.

Table 4.10: Bounds Test Results for Level form Relationship (Level Effect) of the Variables in equation (3.22)

Critical Values (0.1-0.01), F-statistic, Case 3							
90%		95%		97.5%		99%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61
Critical Values (0.1-0.01), t-statistic, Case 3							
90%		95%		97.5%		99%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37
F	4.508						
t	-1.633						

Source: Author's computation

The F-test at the 5 percent level and considering the upper critical value (since all the regressors in the model are integrated of order one), the result showed that the F-value is greater than the upper critical value. This means that the Null hypothesis of no cointegration has to be rejected at the 5 percent level. The rejection of the null hypothesis means that there is a level form (long run) relationship among the variables. For this reason, we estimated an error correction representation of the autoregressive distributed lag model. The lag length was selected using the Final Prediction Error (FPE) and the Akaike Information Prediction (AIC) criterions (see appendix B). The error correction estimates of the long-run and short-run coefficients based on the autoregressive distributed lag model are reported in Table 4.11 below.

Table 4.11: ARDL model estimates of the Long-Run and Short-Run Coefficients used in testing the Marshall-Lerner condition

Variables	coefficients	Standard Errors	t-Statistics	P-value
Speed of Adjustment				
Bt	-0.0208	0.0128	-1.63	0.104
Long-Run				
Income	-2.7202	2.3173	-1.17	0.242
Incomex	2.6475	2.1838	1.21	0.227
EXR	0.0080	0.0114	0.70	0.483
Short-Run				
Bt	0.6957	0.0706	9.85	0.000
Income	0.5786	0.6516	0.89	0.376
Incomex	-0.0399	0.0036	-11.01	0.000
EXR	0.0055	0 .0025	2.21	0.029
Constant	-0.1840	0.6809	-0.27	0.787
R^2		0.5237		
Adjusted R-Squared		0.4937		
F-statistics		2.39 (0.0254)		
Durbin-Watson d-statistic (3, 188)		1.931085		
Breusch-Godfrey LM Chi-square Statistics		17.148 (0.0730)		

Source: Author's computation

The speed of adjustment coefficient is negative and lies between the range of 0 and 1 as expected but, is not significant at the 5 percent level. Specifically, the speed of adjustment coefficient is 0.0208. This coefficient means that 2.08 percent of the error in the short run is corrected at every quarter. That is, the variables adjust to equilibrium in the long run with an adjustment speed of 2.08 percent per quarter. The convergence process is indeed slow.

On the other hand, the long run coefficient of relative domestic income is -2.7202 with a t-value of -1.17. This means that domestic income has no significant long run effect on balance of trade. Specifically, an increase in domestic income in the long run reduces the trade balance by 2.72 percent. This could be as a result of the fact that when domestic income increases, the demand for foreign goods also increase. That is, imports increase with an increase in domestic income, therefore worsening the trade balance in the long run. The worsening of the trade balance would also worsen the balance of payments accounts. An entirely opposite result was found in the short run, showing that an increase in domestic income improves the trade balance by 0.58 percent, though not statistically significant at the 5 percent level.

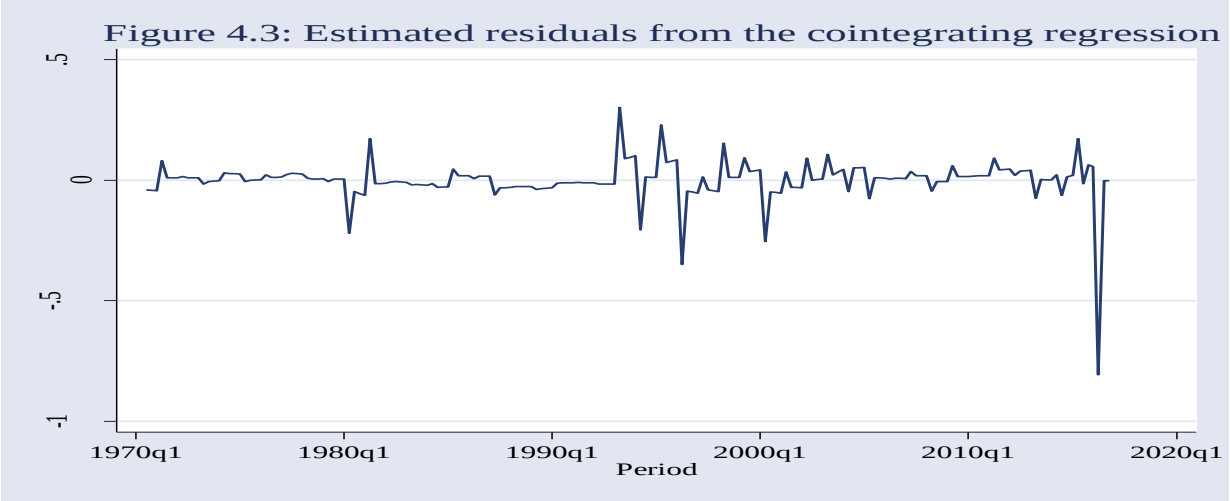
Foreign (US) income in the long run however showed a positive coefficient of 2.65 with a t-value of 1.21. This means that an increase in foreign income improves the trade balance by 2.65 percent. This is because, when foreign income increases, the demand for locally produced good would be induced and the inducement would result to rise in exports of domestic goods which would result to improvement in the trade balance. This therefore, though not statistically significant, could likely improve the balance of payments. This result agrees with the primary reason for currency devaluation by countries seeking for export promotion. This is not the case in the short run. In the short run, the coefficient is negative and significant. This means that an increase in foreign income in the short run negatively affects the trade balance.

The long run coefficient of exchange rate is also positive but insignificant at the 5 percent level. This means that large devaluation would in the long run make domestic products less expensive, which would make the trade balance to improve through the increase in export of domestic goods. A similar result was also found in the short run as regards the exchange rate, except that the short rung coefficient is significant at the 5 percent level.

The result also showed that the balance of trade in the short run as a significant effect on itself. This is confirmed by the coefficient of 0.7 with a significant t-value of 9.85 and probability value of 0.000.

The variables in the model jointly explain 52.37 percent variation in the balance of trade in Nigeria. Also, at the 5 percent level, the variables together significantly affect balance of trade. This is indicated by the F-value of 2.39 with the significant probability value of 0.0254. The Durbin-Watson statistics of approximately is of the opinion that the model is free from autocorrelation. This is also confirmed by the Breusch-Godfrey Chi-square test at the 5 parent level. The residuals of the regression was also observed and plotted Shown in figure 4.3.

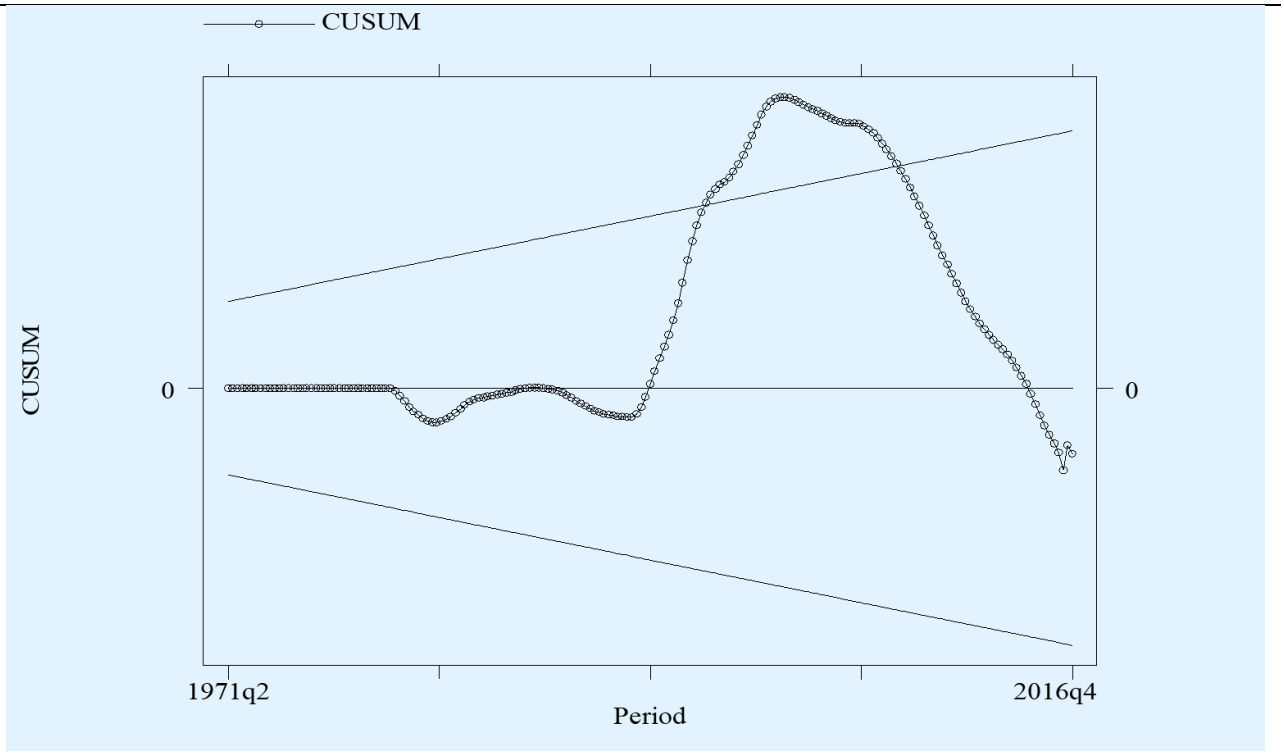
Figure 4.3: Plot of the residuals of the regression

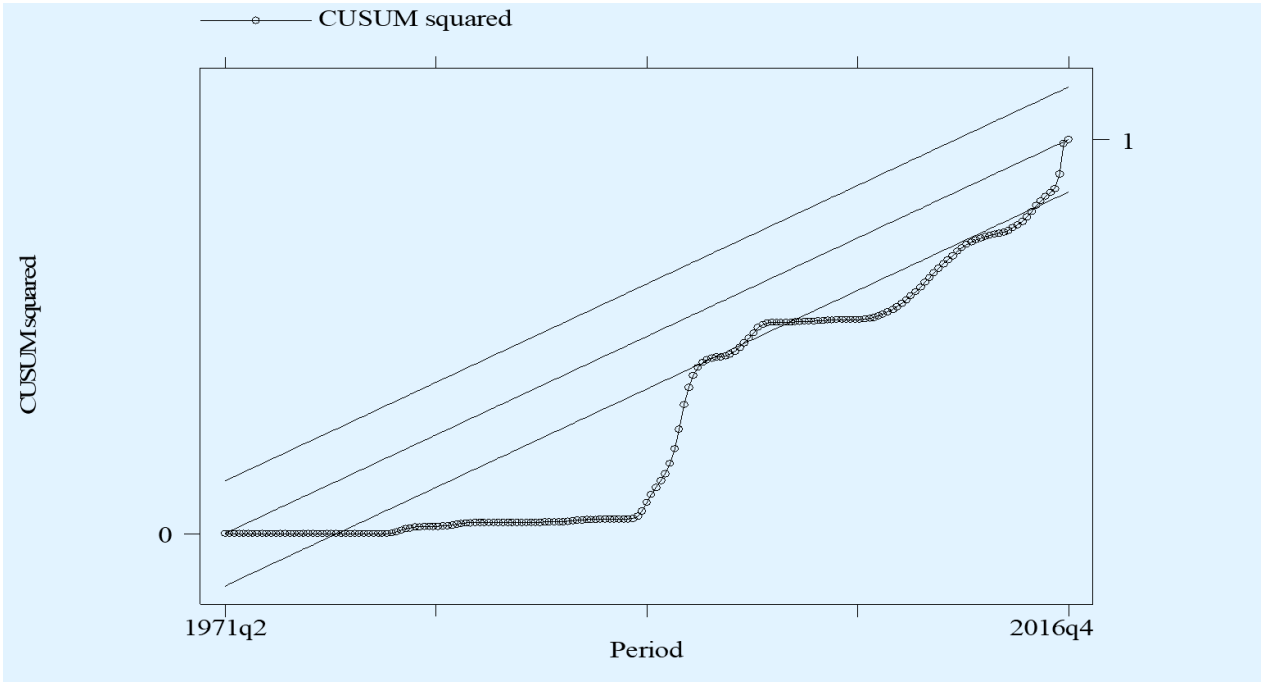


Source: Author's computation

This is to check further, the randomness and predictability of the model (whether the residuals are consistent with random error). The residuals have to fall in a symmetrical pattern and should have a constant spread throughout the range for the model to be considered correct on average for all fitted values. Also, the recursive residuals (CUSUM) was used both to test for non-linearity and to test for structural change. The CUSUM test is a plot of the sum of the recursive residuals. If the sum goes outside a critical bound, then, it means that there is a structural break at the point at which the sum goes outside the bound. The CUSUM-OF-SQUARES test is similar to the CUSUM test. It plots the cumulative sum of squared recursive residuals, as a fraction of the squared residuals summed over all observations. The plot for the residual is shown in Figure 4.3, while the CUSUM and the CUSUM-OF-SQUARES plots are shown in Figure 4.4.

Figure 4.4: Graphs of the stability of the coefficient (CUSUM and the CUSUM-OF-SQUARES) tests





Source: Authors Plot

As shown in Figure 4.3, the residuals have a symmetrical and a random pattern that constantly spread throughout around the 0 horizontal axis, therefore, indicating a good fit.

That is, the model is appropriate for the data. Thus, further use of the coefficients of the regression for tests such as the test for the Marshall-Lerner condition would not be misleading. The CUSUM and the CUSUM-OF-SQUARES graphs, as shown in Figure 4.4 on the other hand, suggests that parameter constancy may have broken down around mid 1990s. The coefficients of this regression are used in testing the Marshall-Lerner condition.

To ascertain the existence (non-existence) of the Marshall-Lerner condition, the long run coefficients of the relative (US) incomes were used. Table 4.12 below reports the condition to be fulfilled in order for it to hold, the test result and the decision taken based on the outcome of the test.

Table 4.12: Marshall-Lerner condition to be fulfilled and test of the condition

Marshall-Lerner Condition to be Fulfilled	**Test of the condition**	**Decision**
The coefficients of the relative (US) income have to be statistically significant and positive.	Only the coefficient of foreign (US) income is positive and, none of foreign and domestic incomes is statistically significant.	Marshall-Lerner condition does not hold
$(\varphi^{x} + \varphi - 1) > 0$	-1.0727 < 0	Marshall-Lerner condition does not hold
$(\varphi^{x} + \varphi) > 1$	$\|0.0727 < 1\|$	Marshall-Lerner condition does not hold

[1]where φ^{x} and φ are the coefficients of the foreign and domestic incomes (in US Dollar)

[2]$\varphi^{x} = 2.6475$ and $\varphi = -2.7202$

[3]$(\varphi^{x} + \varphi - 1) = [2.6475 + (-2.7202) - 1] = 2.6475 - 2.7202 - 1 = -1.0727$

[4]$(\varphi^{x} + \varphi) = [2.6475 + (-2.7202)] = 2.6475 - 2.7202 = -0.0727$

Source: Author's Computation

The Marshall-Lerner condition states that exchange rate depreciation improves balance of trade in the long run, if the sum of the elasticities of demand for exports and imports (in absolute sense) is greater than one. The Marshall-Lerner condition to be fulfilled is stated in three different ways in Table 4.12 and tested respectively based on the condition to be

fulfilled. The result showed that only the coefficient of foreign (US) income was positive and, none of foreign and domestic incomes was statistically significant. This therefore, violates the condition that the coefficients of the relative (US) income have to be statistically significant and positive. Also, the result of the sum of the coefficients of demand for exports and imports minus one is negative (less than one). This as well did not fulfilled the condition that the sum of the coefficients of demand for exports and imports minus 1 have to be greater than 0. In addition, the sum of the coefficients of demand for exports and imports (in absolute sense) is less than 1. This again did not fulfill the condition that the sum of the coefficients of demand for exports and imports (in absolute sense) have to be greater than 1.

None of the conditions stated in Table 4.12 was fulfilled. This is therefore, a clear indication that the Marshall-Lerner condition is not satisfied. Thus, the null hypothesis that the Marshall-Lerner condition does not hold for Nigeria is accepted. This means that exchange rate depreciation as a result of devaluation did not improve balance of trade and, hence, balance of payments in the long run in Nigeria.

CHAPTER FIVE

SUMMARY OF FINDINGS AND CONCLUSION

5.1 Introduction

As the economic interdependence of countries around the world increases, it becomes necessary to have an understanding of the nature and significance of the foreign exchanges. The sub-accounts of the balance of payments provide a detailed record of a country's international economic transactions and are central to the understanding of a country's integration with the rest of the world. The monetary approach to balance of payments posits that a currency depreciation would lead to improved balance of payments position and that an appreciation of a domestic currency over foreign currency on the other hand will deteriorate the balance of payments. Countries all over the world, therefore, allow their exchange rate policy to undergo substantial transformations from time to time with the intention to improving their balance of payments accounts. This study is grounded on the fact that while the monetarists' view could holds in some countries, other countries may not experience improvement of their balance of payments accounts at any given period after depreciation of the currency. Exchange rate volatility is not a regular, consistent and predictable event. The Ordinary Least Square technique was employed using the conditional variance obtained from an AR-EGARCH model as measure of exchange rate volatility. Whereas, the autoregressive distributed lag model was used to estimate the long run coefficients used in testing the validity of the condition that devaluation would improve the trade balance and, thus, the balance of payments in the long run. In this chapter, summary of the findings are presented and the economic policy relevance of the findings are discussed. Also in this chapter, conclusion is drawn from the findings and policy recommendations are proffered alongside areas suggested for further studies.

5.2 Summary of the Findings

The major findings of this study are summarized below:

i. In relation to objective one, real exchange rate volatility was found to had a positive effect on the current account balance of balance of payments in Nigeria. Though, the effect was not statistically significant at the 5 percent level. Similarly, national income and balance of trade were found to had a positive and significant effect on the current account balance. On the other hand, the domestic price level and money supply had

negative effect on the current account balance of balance of payments. The price level was not significant but money supply was significant at the 5 percent level.

ii. The findings with respect to the second objective showed a positive and insignificant coefficient for the relationship between real exchange rate volatility and the capital account balance of balance of payments. This means that real exchange rate volatility also positively and insignificantly affected the capital account balance of balance of payments. In addition, interest rate and money supply had negative effect on the capital account balance. Though, the effect of money supply was not significant, but the effect of interest rate on the other hand, was statistically significant at the 5 percent level. Whereas, domestic credit showed positive and significant effect on the capital account balance of balance of payments also at the 5 percent level.

iii. For objective three, we found that real exchange rate volatility had negative and insignificant effect on the financial account balance of balance of payments. It was also found that the price level and money supply positively affected the financial account balance. The effect of the price level was statistically insignificant, while the effect of money supply was statistically significant at the 5 percent level. It was also found that FDI had negative and significant effect on the financial account balance of balance of payments at the 5 percent level.

iv. In relation to objective four, it was found that the Marshall-Lerner condition does not hold for Nigeria. The condition was not satisfied in any of three conditions that were expected to be fulfilled. It was also found that the convergence process of the balance of trade, relative (US) incomes and exchange rate was very slow. Also, in the long run, foreign income and exchange rate were positive while domestic income was negative. None of the variables was significant at the 5 percent level. But in the short run, domestic income was found to be positive and insignificant, while foreign income was negative and significant at the 5 parent level. Exchange rate was found to be positive even in the short run, although, unlike the long run, it was significant at the 5 percent level.

5.3 Economic Policy Relevance of the Findings

The positive effect of real exchange rate volatility on the current and capital account balances respectively, implies that when there is large devaluation of Nigerian naira, the domestic products could become less expensive relative to foreign goods and services and, therefore, there will be a shift of global demand away from foreign products towards domestic ones. This means that large devaluation of the currency makes exports to increase and reduce imports. This will lead to an overall improvement in the trade balance and thus a reduction in the net trade, which in turns improves the current and capital account balances of balance of payments. This supports the claim that a floating exchange rate may work as a domestic economic stabilizer to mitigate external disequilibria. This is also in line with the interpretation of J-curve effects, which presupposes that a real depreciation of domestic currency will lead to positive changes in balance of payments accounts due to an increase in export and a decrease in import, simultaneously. The negative effect of real exchange rate volatility on the financial account balance of balance of payments on the other hand means that real exchange rate volatility resulting from currency devaluation policy discourages inflow of foreign direct investment (FDI), portfolio investment (PI), and official reserve transactions and, therefore, worsen the financial account balance of balance of payments. The insignificant exchange rate volatility coefficients for the current, capital and financial account balances, however, means that currency devaluation does not make meaningful difference in the country's balance of payments accounts. No significant changes could take place on the balance of payments accounts by devaluing (or depreciating) the local currency.

The negative effect of money supply on the current and capital account balances respectively means that when the money supply in the economy becomes too much (excess), there would be an increase in expenditure and a shift of demand away from domestic demand towards global demand for foreign products. Therefore, there would be an increase in the demand for foreign currency and to be supplied from the foreign exchange reserves. This, in agreement with the monetary theory of balance of payments, would worsen the trade balance and, therefore, the current and capital accounts balances would be worsened. The effect of money supply on the current account balance was significant, therefore indicating that money supply plays a significant role in determining the current account balance. But the effect of money supply on the capital account balance was not significant, pointing out that money supply may not play a very significant role in the capital account balance determination. The positive effect of money supply on the financial account balance on the other hand implies that if

money supply is not in excess, then there would be an improvement in the financial account balance of balance of payments. This is because, demand for domestic product would increase and, therefore, foreign direct investment (FDI), and portfolio investment (PI) would be attracted. Money supply plays a significant role in determining the improvement of the capital account balance of balance of payments in Nigeria.

The negative and insignificant effect of the price level on the current account balance of balance of payments implies that high prices could worsen the current account balance. But that it plays an unimportant role in determining the current account balance of balance of payments especially in the short run. However, it would be wise to take precaution against high and sustainable (long time) price increase. This is because, as pointed out by the balance of payments theory of exchange rate, change in the value of money (in essence, a currency's price depreciation or appreciation) may likely directly affects the volume of a country's imports and exports and, consequently, a likely fluctuation in the exchange rates can worsen the balance of payments. On the other hand, the positive and significant effect of the price level on the financial account balance indicates that the high prices improves the financial account balance and it is a significant determinant of the financial account balance even in the short run.

The finding that real GDP has positive and significant effect on the current account balance of balance of payment showed that national income contributes significantly to the improvement of the current account balance of balance of payments. An increase in national income results to high real demand for money which would be met by inflow of money from abroad, hence the trade balance will improve. This in turns, improves the balance of payments, especially the current account balance.

The international trade balance is also a significant determinant of the current account balance. The positive and significant coefficient of the international trade balance means that an increase in net trade (trade surplus) significantly improves the current account balance of balance of payments. In other words, a favourable flow of trade between nations adds to the current account balance of balance of payments.

Since the interest rate effect on the capital account balance is negative and significant, it means that real interest rate increase worsen the trade balance. This could suggest that capital flows are sensitive to short term interest rate changes in Nigeria.

The findings as regards the effect of domestic credit on the capital account balance of balance of payments points out that domestic credit directly affect the capital account balance. Supply and demand for domestic credit leads to high productivity and induce the capital account balance of balance of payments. Creating domestic credit at a rate faster than the rate of change of demand for domestic credit would bring about a deterioration of the capital account balance.

The negative and significant effect of FDI posits that FDI worsen the financial account balance of balance of payments. This is however, contrary to a priory expectation. This could be attributed to the point that FDI in Nigeria is not a substitute for imports of goods or services from where the FDI is coming from, it has not improved the financial account of Nigeria's balance of payment. The multinational enterprises does not use a foreign subsidiary to export goods and services to other countries. FDI policies have not been organized in such a way that FDI a substitute for imports of goods or services.

The findings of non-existence of the Marshall-Lerner condition in Nigeria implies that an increase in import expenditure will be greater than the increase in export revenue which will worsen the balance of trade resulting in a deterioration in the current account and hence the balance of payments, assuming export revenue is equal to import expenditure initially. This finding suggest that the support for the Marshall-Lerner condition is much weaker in Nigeria than commonly thought. This therefore, makes an important contribution to thinking regarding the potential benefits of devaluation. But, for the fact that cointegration was found except that the convergence process of the balance of trade, relative (US) incomes and exchange rate was very slow, could mean the possibility of achieving the Marshall-Lerner condition in Nigeria if appropriate policies are put in place alongside devaluation policy and not just devaluation policy alone as a major policy tool of focus. There is possibility of the Marshall-Lerner condition to hold in the long run if greater emphases are placed on other policies that would support devaluation or depreciation to boost export and discourage imports.

5.4 Conclusion

The effect of real exchange rate volatility on balance of payments, especially with respect to the various components of balance of payments has been studied and discussed by eminent researchers all over the world (though, analysis with respect to the specific components of balance of payments is very scanty in Nigeria) and has also been presented in text books. The

analysis have also based on different theoretical frameworks including the monetary approach. A proper investigation has revealed that the effect of real exchange rate volatility on balance of payments vary across counties. For some countries, the effect was negative while for others the effect was positive. Some studies in most cases have provided ambiguous results - indicating negative and positive depending on the source of volatility. This study has shown that, the real exchange rate volatility effect is positive on the current and capital accounts, but is negative on the financial accounts. The real exchange rate volatility coefficients was not statistically significant in any of the current, capital and financial accounts models, therefore, exchange rate volatility does not play a significant role on the balance of payments accounts in Nigeria. Currency devaluation does not significantly determine the balance of payments position of Nigeria. Other multitude factors such as national income, money supply, and domestic credit could explain the balance of payments position besides real exchange rate volatility (currency devaluation).

The Marshall-Lerner condition does not hold in Nigeria. This means devolution or depreciation is not a better policy option to discourage importation of foreign goods. This policy tool may not be very effective because of the high value Nigerians place on foreign (made in abroad) goods. The perception that "foreign goods are quality goods - more than local goods" is so high in such a way that people are ready to pay more (regardless of the price) to get foreign goods. Until this perception is redirected, it would be very difficult for currency devaluation as a policy tool to be very effective in Nigeria. Policymakers who hope to improve the country's competitive position have to consider that this policy is indeed less effective than might be supposed. There is therefore, the need for implementation of more effective economic policies.

5.5 Policy Recommendations

The following policy recommendations are proffered:

i. The monetary authority should not see currency devaluation (or depreciation) as a major policy option to maintain the exchange rate volatility at a rate that allows adjustment of the balance of payments.
ii. Ban on some of the goods that have high degree of importation such as foreign rice could go a long way to reduce importation expenditure, boost local production in

quantity and quality and could be an appropriate complement to devaluation (or depreciation), which could increase export expenditure in the long run.

iii. Adequate attention should be given to factors that stimulate exchange rate fluctuations such as high domestic price and budget deficit. Therefore, policy makers has to consider using inflation and money supply targeting as a policy strategy.

iv. Considering the current high foreign exchange rate situation, the economy needs an effective exchange rate policy in order to overcome the unfavorable effect of declining foreign reserves. Thus, an encouraging exchange rate has to be offered for foreign transactions and transfers to attract inflow of foreign capital such as FDI and portfolio investments.

v. Also, trade agreements with neighboring countries in the West African region would be helpful in increasing foreign earnings, especially in the short run.

5.6 Areas for Further Studies

i. Further studies focusing on the channels through which exchange rate volatility affects economic performance would be useful.

ii. It would also be relevant that further studies identify the source of exchange rate volatility as the economy has undergone several transformations over the years including the advent of oil.

iii. Further studies can be done in case of examining other countries including small or large, developing or developed economies in form of comparative studies.

iv. Further studies on the effect of real exchange rate volatility on balance of payments can also be carried out, using measures of exchange rate volatility that is different from the measure used in this study.

5.7 Contribution to Knowledge

This study has informed us that real exchange rate volatility has positive effect on the current and capital accounts and negative effect on the financial account. The findings in this study also has added to the stock of knowledge regarding currency devaluation in Nigeria by revealing that exchange rate volatility plays no significant role in balance of payments determination. This study in addition, brings to our notice that other multitude factors such as national income, money supply, and domestic credit could explain the balance of payments position besides real exchange rate volatility (currency devaluation). In addition, this study

has revealed to us that the Marshall-Lerner condition does not hold in Nigeria. This is because of perception and value placed on foreign goods and has informed us of possible complementary polices that could lead to reduction in importation of made in abroad goods. This finding suggest that the support for the Marshall-Lerner condition is much weaker in Nigeria than commonly thought. This therefore, makes an important contribution to thinking regarding the potential benefits of devaluation, and to economic theory in general.

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APPENDIX A

DATA USED FOR THE STUDY

Table A1: Quarterly Series of the Variables used for the Study

YEAR	CAB	KAB	FAB	EXR	EXR_V	BOT	DC	FDI	INT	MS	RGDP	PRICEL	income	Incomex	BT
1970Q1	-50.5	49.2	-	19.87	1406.705	129.2	1120.3	128.6	7.0	978.2	1028.0214	.22463095	9.0e+10	4.8e+12	1.01858
1970Q2	-95.225	110.25	-	40.135	1406.705	129.2	1115.025	132.15	7.0	994.1	1071.6278	.2264632	9.4e+10	4.8e+12	1.01906
1970Q3	-139.95	171.3	-	60.4	7341.258	129.2	1109.75	135.7	7.0	1010	1035.1569	.2261739	9.7e+10	4.9e+12	1.01954
1970Q4	-184.675	232.35	-	80.665	3129.377	129.2	1104.475	139.25	7.0	1025.9	1084.1939	.2261739	1.0e+11	4.9e+12	1.02002
1971Q1	-229.4	293.4	-	100.93	2264.754	129.2	1099.2	142.8	7.0	1041.8	1168.5277	.22665606	1.0e+11	4.9e+12	1.0205
1971Q2	-252.725	287.35	-	100.94	886.6661	150.525	1133.15	181.55	7.0	1085.075	1195.6318	.2273311	1.0e+11	5.0e+12	1.02041
1971Q3	-276.05	281.3	-	100.95	432.8246	171.85	1167.1	220.3	7.0	1128.35	1152.9044	.23118846	1.1e+11	5.1e+12	1.02032
1971Q4	-299.375	275.25	-	100.96	200.4417	193.175	1201.05	259.05	7.0	1171.625	1198.4361	.23224923	1.1e+11	5.1e+12	1.02023
1972Q1	-322.7	269.2	-	100.97	113.3351	214.5	1235	297.8	7.0	1214.9	1214.197	.25651411	1.1e+11	5.2e+12	1.02014
1972Q2	-228.85	238.1	-	99.29	63.11228	271.9	1255.475	269.925	7.0	1291.8	1239.469	.25844279	1.1e+11	5.3e+12	1.02013
1972Q3	-135	207	-	97.61	41.96568	329.3	1275.95	242.05	7.0	1368.7	1185.0305	.24108469	1.1e+11	5.3e+12	1.02012
1972Q4	-41.15	175.9	-	95.93	19.59495	386.7	1296.425	214.175	7.0	1445.6	1254.1035	.23915601	1.1e+11	5.4e+12	1.02011
1973Q1	52.7	144.8	-	94.25	16.77355	444.1	1316.9	186.3	7.0	1522.5	1319.8203	.25265675	1.1e+11	5.5e+12	1.0201
1973Q2	803.9	107.125	-	95.8825	18.07222	596.475	910.1	185.125	7.0	1729.95	1344.9291	.27001485	1.2e+11	5.5e+12	1.02067
1973Q3	1555.1	69.45	-	97.515	32.79214	748.85	503.3	183.95	7.0	1937.4	1275.3585	.26230014	1.2e+11	5.5e+12	1.02125
1973Q4	2306.3	31.775	-	99.1475	17.89249	901.225	96.5	182.775	7.0	2144.85	1369.8921	.28351559	1.2e+11	5.5e+12	1.02183

1974Q1	3057.5	-5.9	-	100.78	14.44734	1053.6	-310.3	181.6	7.0	2352.3	4164.6305	.28544427	1.3e+11	5.5e+12	1.0224
1974Q2	2303.775	30.85	-	100.68	6.726051	1804.575	71.75	199.45	6.75	2824.525	3952.3033	.30280237	1.2e+11	5.5e+12	1.02213
1974Q3	1550.05	67.6	-	100.58	12.04148	2555.55	453.8	217.3	6.5	3296.75	3749.1759	.30473105	1.2e+11	5.5e+12	1.02185
1974Q4	796.325	104.35	-	100.48	8.779063	3306.525	835.85	235.15	6.25	3768.975	4053.576	.31051708	1.2e+11	5.5e+12	1.02157
1975Q1	42.6	141.1	-	100.38	10.11514	4057.5	1217.9	253	6.0	4241.2	7225.8942	.36452005	1.2e+11	5.5e+12	1.0213
1975Q2	-32.65	93.175	-	102.2275	8.418114	3344.125	1740.9	242.875	6.0	4657.175	6752.8887	.41080831	1.2e+11	5.5e+12	1.02148
1975Q3	-107.9	45.25	-	104.075	8.432055	2630.75	2263.9	232.75	6.0	5073.15	6458.5284	.42430905	1.2e+11	5.6e+12	1.02166
1975Q4	-183.15	-2.675	-	105.9225	23.85594	1917.375	2786.9	222.625	6.0	5489.125	6734.7287	.4455245	1.3e+11	5.7e+12	1.02184
1976Q1	-258.4	-50.6	-	107.77	72.88998	1204	3309.9	212.5	6.0	5905.1	7766.3604	.46673996	1.3e+11	5.7e+12	1.02202
1976Q2	-355.675	-.35	-	106.465	97.0246	1303.65	3772.975	220.75	6.0	6403.525	7219.9313	.48216938	1.3e+11	5.8e+12	1.02209
1976Q3	-452.95	49.9	-	105.16	126.1966	1403.3	4236.05	229	6.0	6901.95	6897.2204	.49374144	1.3e+11	5.9e+12	1.02217
1976Q4	-550.225	100.15	-	103.855	100.434	1502.95	4699.125	237.25	6.0	7400.375	7262.9978	.49952747	1.4e+11	5.9e+12	1.02224
1977Q1	-647.5	150.4	-	102.55	87.09399	1602.6	5162.2	245.5	6.0	7898.8	8371.9252	.53038631	1.4e+11	6.0e+12	1.02231
1977Q2	-1082.35	390.775	-	102.17	64.00738	1336.2	5626	217.725	6.25	7920.45	7798.5477	.59210399	1.4e+11	6.1e+12	1.02172
1977Q3	-1517.2	631.15	-	101.79	47.19432	1069.8	6089.8	189.95	6.5	7942.1	7455.7832	.61331945	1.3e+11	6.2e+12	1.02114
1977Q4	-1952.05	871.525	-	101.41	37.29755	803.4	6553.6	162.175	6.75	7963.75	7894.0839	.65575035	1.3e+11	6.3e+12	1.02055
1978Q1	-2386.9	1111.9	-	101.03	29.27616	537	7017.4	134.4	7.0	7985.4	7642.0246	.6345349	1.3e+11	6.3e+12	1.01997
1978Q2	-1537.8	1037.225	-	100.3275	23.49462	-134.075	7454.35	146.875	7.125	8545.2	7252.4088	.68275184	1.3e+11	6.4e+12	1.02013
1978Q3	-688.7	962.55	-	99.625	18.49927	-805.15	7891.3	159.35	7.25	9105	6879.6734	.68468051	1.3e+11	6.4e+12	1.0203
1978Q4	160.4	887.875	-	98.9225	12.86288	-1476.225	8328.25	171.825	7.375	9664.8	7438.2432	.69625258	1.4e+11	6.5e+12	1.02047
1979Q1	1009.5	813.2	-	98.22	8.396803	-2147.3	8765.2	184.3	7.5	10224.6	7829.8374	.72325406	1.4e+11	6.5e+12	1.02064

1979Q2	1345.95	634.25	-	100.235	4.62468	-337.7	9330.3	239.25	7.5	11443.45	7414.7538	.75989894	1.4e+11	6.5e+12	1.02087
1979Q3	1682.4	455.3	-	102.25	4.291252	1471.9	9895.4	294.2	7.5	12662.3	7009.8174	.7541129	1.4e+11	6.5e+12	1.02109
1979Q4	2018.85	276.35	-	104.265	5.694822	3281.5	10460.5	349.15	7.5	13881.15	7693.5814	.7541129	1.4e+11	6.5e+12	1.02132
1980Q1	2355.3	97.4	-	106.28	30.74838	5091.1	11025.6	404.1	7.5	15100	8059.838	.76375629	1.4e+11	6.5e+12	1.02155
1980Q2	766.875	305.425	-	107.30792	118.3274	3817.8709	12320.05	386.75	7.5625	15365.425	7808.8289	.77725703	1.4e+11	6.6e+12	.766159
1980Q3	-821.55	513.45	-	108.33583	100.0514	2544.6419	13614.5	369.4	7.625	15630.85	7380.3795	.85440414	1.3e+11	6.6e+12	.510773
1980Q4	-2409.975	721.475	-	109.36375	120.2973	1271.4128	14908.95	352.05	7.6875	15896.275	8297.7136	.87561959	1.3e+11	6.7e+12	.255386
1981Q1	-3998.4	929.5	-	110.39167	140.3229	-1.8163	16203.4	334.7	7.75	16161.7	53020.573	.93733727	1.2e+11	6.7e+12	1.6e-09
1981Q2	-4218.675	1564.85	-	110.25833	167.709	-2.00325	17720.55	323.525	8.375	16644.675	50928.049	.98941156	1.2e+11	6.7e+12	1.5e-09
1981Q3	-4438.95	2200.2	-	110.125	197.1223	-2.1902	19237.7	312.35	9.0	17127.65	49429.927	1.0260564	1.2e+11	6.6e+12	1.4e-09
1981Q4	-4659.225	2835.55	-	109.99167	195.3794	-2.37715	20754.85	301.175	9.625	17610.625	51843.511	1.0279851	1.2e+11	6.6e+12	1.3e-09
1982Q1	-4879.5	3470.9	-	109.85833	196.134	-2.5641	22272	290	10.25	18093.6	50900.683	1.0395572	1.2e+11	6.6e+12	1.2e-09
1982Q2	-4444.1	3287.1	-	109.85417	192.5965	-2.273375	23875.975	283.575	10.1875	18789.975	49573.692	1.058844	1.2e+11	6.6e+12	1.2e-09
1982Q3	-4008.7	3103.3	-	109.85	189.5284	-1.98265	25479.95	277.15	10.125	19486.35	48192.882	1.076202	1.2e+11	6.7e+12	1.1e-09
1982Q4	-3573.3	2919.5	-	109.84583	188.8198	-1.691925	27083.925	270.725	10.0625	20182.725	51017.993	1.0993462	1.2e+11	6.8e+12	1.1e-09
1983Q1	-3137.9	2735.7	-	109.84167	188.2017	-1.4012	28687.9	264.3	10	20879.1	47931.743	1.1861367	1.2e+11	6.9e+12	1.1e-09
1983Q2	8671.575	2094.75	-	110.68125	187.9832	-.573475	29521.075	288.325	10.625	21501.825	46102.198	1.2825705	1.2e+11	7.0e+12	1.1e-09
1983Q3	20481.05	1453.8	-	111.52083	187.7802	.25425	30354.25	312.35	11.25	22124.55	44889.458	1.3944338	1.2e+11	7.1e+12	1.1e-09
1983Q4	32290.525	812.85	-	112.36042	209.0562	1.081975	31187.425	336.375	11.875	22747.275	46674.741	1.5255839	1.2e+11	7.2e+12	1.2e-09
1984Q1	44100	171.9	-	113.2	232.7731	1.9097	32020.6	360.4	12.5	23370	47793.811	1.6297325	1.1e+11	7.4e+12	1.2e-09
1984Q2	33628.85	-509.825	-	109.875	259.9727	2.596825	32631.1	378.825	11.6875	24096.9	45541.373	1.8920326	1.2e+11	7.5e+12	1.3e-09

1984Q3	23157.7	-1191.55	-	106.55	288.5522	3.28395	33241.6	397.25	10.875	24823.8	44396.038	2.015468	1.2e+11	7.5e+12	1.4e-09
1984Q4	12686.55	-1873.275	-	103.225	202.3814	3.971075	33852.1	415.675	10.0625	25550.7	45831.728	1.8708172	1.2e+11	7.6e+12	1.4e-09
1985Q1	2215.4	-2555	-	99.9	147.8506	4.6582	34462.6	434.1	9.25	26277.6	51640.484	1.955679	1.2e+11	7.7e+12	1.5e-09
1985Q2	911.775	-2391.475	-	87.897917	84.06622	4.2279	35309.575	419.525	9.5625	26555.65	49927.811	1.9633937	1.2e+11	7.8e+12	1.4e-09
1985Q3	-391.85	-2227.95	-	75.895833	43.38367	3.7976	36156.55	404.95	9.875	26833.7	48956.046	1.9151768	1.2e+11	7.8e+12	1.3e-09
1985Q4	-1695.475	-2064.425	-	63.89375	149.6811	3.3673	37003.525	390.375	10.1875	27111.75	50511.929	1.890104	1.2e+11	7.9e+12	1.2e-09
1986Q1	-2999.1	-1900.9	-	51.891667	3122.501	2.937	37850.5	375.8	10.5	27389.8	52749.648	1.8881753	1.1e+11	8.0e+12	1.1e-09
1986Q2	-2323.15	-5611.5	-	42.597917	3412.659	5.327475	39422.875	895.05	12.25	28959.2	51200.266	2.021254	1.1e+11	8.0e+12	1.7e-09
1986Q3	-1647.2	-9322.1	-	33.304167	1995.639	7.71795	40995.25	1414.3	14	30528.6	50341.794	2.1620475	1.1e+11	8.1e+12	2.4e-09
1986Q4	-971.25	-13032.7	-	24.010417	2616.357	10.108425	42567.625	1933.55	15.75	32098	51679.732	2.1485467	1.0e+11	8.2e+12	3.0e-09
1987Q1	-295.3	-16743.3	-	14.716667	3634.239	12.4989	44140	2452.8	17.5	33667.4	52504.768	2.1620475	1.0e+11	8.2e+12	3.6e-09
1987Q2	-462.9	-17169.3	-	14.279167	4571.126	11.81095	46808.275	2269.15	17.25	36612.275	50848.198	2.2025497	1.0e+11	8.3e+12	3.6e-09
1987Q3	-630.5	-17595.3	-	13.841667	5470.574	11.123	49476.55	2085.5	17	39557.15	49928.813	2.3009123	1.1e+11	8.4e+12	3.6e-09
1987Q4	-798.1	-18021.3	-	13.404167	5315.945	10.43505	52144.825	1901.85	16.75	42502.025	51524.761	2.3568439	1.1e+11	8.5e+12	3.6e-09
1988Q1	-965.7	-18447.3	-	12.966667	5295.793	9.7471	54813.1	1718.2	16.5	45446.9	56069.649	3.0935987	1.1e+11	8.6e+12	3.6e-09
1988Q2	1946.75	-21390.95	-	11.94375	5352.708	14.088075	50360.875	4758	19.075	45848.925	54619.018	3.5757681	1.1e+11	8.7e+12	4.3e-09
1988Q3	4859.2	-24334.6	-	10.920833	5404.857	18.42905	45908.65	7797.8	21.65	46250.95	53669.113	3.8129954	1.1e+11	8.7e+12	5.0e-09
1988Q4	7771.65	-27278.25	-	9.8979167	5522.02	22.770025	41456.425	10837.6	24.225	46652.975	55517.85	3.7994947	1.1e+11	8.8e+12	5.7e-09
1989Q1	10684.1	-30221.9	-	8.875	5641.102	27.111	37004.2	13877.4	26.8	47055	60668.747	4.8486952	1.2e+11	8.9e+12	6.4e-09
1989Q2	19195.875	-34977.75	-	8.5854167	5756.607	36.3753	42305.475	11579.55	26.475	52456.875	58849.271	5.7339582	1.2e+11	8.9e+12	7.8e-09
1989Q3	27707.65	-39733.6	-	8.2958333	5873.064	45.6396	47606.75	9281.7	26.15	57858.75	57697.301	5.5275897	1.2e+11	9.0e+12	9.2e-09

1989Q4	36219.425	-44489.45	-	8.00625	5900.214	54.9039	52908.025	6983.85	25.825	63260.625	59514.26	5.4967309	1.3e+11	9.0e+12	1.1e-08
1990Q1	44731.2	-49245.3	-	7.7166667	5927.996	64.1682	58209.3	4686	25.5	68662.5	69200.289	5.5372331	1.3e+11	9.1e+12	1.2e-08
1990Q2	36712.25	-43804.7	-	7.3729167	5961.707	56.13795	64083.225	5243.525	24.1275	73371.825	66533.388	5.7571024	1.3e+11	9.1e+12	1.2e-08
1990Q3	28693.3	-38364.1	-	7.0291667	5995.473	48.1077	69957.15	5801.05	22.755	78081.15	64939.293	5.6818839	1.3e+11	9.1e+12	1.3e-08
1990Q4	20674.35	-32923.5	-	6.6854167	6035.629	40.07745	75831.075	6358.575	21.3825	82790.475	66877.021	5.6953847	1.3e+11	9.1e+12	1.3e-08
1991Q1	12655.4	-27482.9	-	6.3416667	6075.913	32.0472	81705	6916.1	20.01	87499.8	67998.718	5.9210399	1.3e+11	9.1e+12	1.3e-08
1991Q2	19347.25	-55301.075	-	5.6916667	6115.903	39.650525	104046.51	8802.85	22.4575	97896.219	66054.4	6.4861425	1.3e+11	9.1e+12	1.5e-08
1991Q3	26039.1	-83119.25	-	5.0416667	6156.007	47.25385	126388.01	10689.6	24.905	108292.64	64540.752	6.5864337	1.3e+11	9.2e+12	1.7e-08
1991Q4	32730.95	-110937.43	-	4.3916667	6234.664	54.857175	148729.52	12576.35	27.3525	118689.06	66785.27	7.003028	1.3e+11	9.3e+12	1.9e-08
1992Q1	39422.8	-138755.6	-	3.7416667	6313.922	62.4605	171071.02	14463.1	29.8	129085.47	69743.379	7.8458601	1.3e+11	9.4e+12	2.2e-08
1992Q2	24694.925	-109001.93	-	3.5479167	6390.834	60.13055	198477.67	18262.4	26.93	146433.91	67535.091	9.6298868	1.3e+11	9.4e+12	2.2e-08
1992Q3	9967.05	-79248.25	-	3.3541667	6468.14	57.8006	225884.31	22061.7	24.06	163782.34	66036.979	10.200775	1.3e+11	9.5e+12	2.2e-08
1992Q4	-4760.825	-49494.575	-	3.1604167	6487.367	55.47065	253290.96	25861	21.19	181130.77	68050.07	10.420645	1.3e+11	9.6e+12	2.2e-08
1993Q1	-19488.7	-19740.9	-	2.9666667	6506.834	53.1407	280697.6	29660.3	18.32	198479.2	70732.915	12.227815	1.3e+11	9.6e+12	2.2e-08
1993Q2	-14629.601	-7130.975	-	2.9645833	6530.315	50.673125	320301.65	27802.55	18.99	215595.62	68389.462	15.055257	1.3e+11	9.7e+12	.316452
1993Q3	-9770.5022	5478.95	-	2.9625	6553.821	48.20555	359905.7	25944.8	19.66	232712.04	66940.942	16.152674	1.3e+11	9.8e+12	.632904
1993Q4	-4911.4032	18088.875	-	2.9604167	6552.525	45.737975	399509.76	24087.05	20.33	249828.47	68769.971	16.804567	1.3e+11	9.9e+12	.949355
1994Q1	-52.3043	30698.8	-19.446	2.9583333	6551.271	43.2704	439113.81	22229.3	21	266944.89	70737.613	18.428514	1.3e+11	1.0e+13	1.26581
1994Q2	-85.749425	31680.95	-24.05485	2.4041667	6551.62	81.336225	447925.7	35657.125	20.795	279899.53	68588.245	21.313815	1.3e+11	1.0e+13	1.26409
1994Q3	-119.19455	32663.1	-28.6637	1.85	6551.966	119.40205	456737.59	49084.95	20.59	292854.18	67189.626	25.873209	1.3e+11	1.0e+13	1.26237
1994Q4	-152.63968	33645.25	-33.27255	1.2958333	6623.118	157.46787	465549.49	62512.775	20.385	305808.82	68935.077	29.703562	1.3e+11	1.0e+13	1.26066

1995Q1	-186.0848	34627.4	-37.8814	.74166667	6695.039	195.5337	474361.38	75940.6	20.18	318763.47	72413.778	33.410063	1.3e+11	1.0e+13	1.25894
1995Q2	-45.5576	34520.6	-134.27673	8.0984952	6762.099	333.37948	448540.79	84778.175	20.06875	331655.98	70122.806	40.404355	1.4e+11	1.0e+13	1.52609
1995Q3	94.9696	34413.8	-230.67205	15.455324	6829.414	471.22525	422720.21	93615.75	19.9575	344548.5	68697.003	43.95273	1.4e+11	1.0e+13	1.79325
1995Q4	235.4968	34307	-327.06738	22.812152	5925.868	609.07102	396899.62	102453.33	19.84625	357441.01	70173.813	45.028023	1.4e+11	1.1e+13	2.0604
1996Q1	376.024	34200.2	-423.4627	30.168981	5149.302	746.9168	371079.04	111290.9	19.735	370333.53	75716.111	47.410505	1.4e+11	1.1e+13	2.32755
1996Q2	347.84193	31133.205	-382.89897	29.835474	4399.818	659.17413	369776.94	111081.35	18.186875	385182.98	73219.328	52.058876	1.4e+11	1.1e+13	2.11271
1996Q3	319.65985	28066.21	-342.33525	29.501968	3709.369	571.43145	368474.84	110871.8	16.63875	400032.43	71703.838	54.350258	1.4e+11	1.1e+13	1.89787
1996Q4	291.47778	24999.215	-301.77153	29.168461	3689.168	483.68877	367172.74	110662.25	15.090625	414881.88	73106.103	51.47346	1.4e+11	1.1e+13	1.68302
1997Q1	263.2957	21932.22	-261.2078	28.834955	3712.402	395.9461	365870.64	110452.7	13.5425	429731.33	77805.314	53.927444	1.4e+11	1.1e+13	1.46818
1997Q2	114.61435	16777.515	-167.05451	28.706484	3745.3	275.56908	402525.56	103026.77	14.73	453707.95	75334.219	58.121678	1.5e+11	1.1e+13	1.32559
1997Q3	-34.067	11622.81	-72.90121	28.578014	3777.011	155.19205	439180.47	95600.85	15.9175	477684.57	73778.591	57.897188	1.5e+11	1.1e+13	1.183
1997Q4	-182.74835	6468.105	21.252085	28.449544	3788.413	34.815025	475835.39	88174.925	17.105	501661.18	75104.356	56.730616	1.5e+11	1.2e+13	1.04041
1998Q1	-331.4297	1313.4	115.40538	28.321074	3799.919	-85.562	512490.3	80749	18.2925	525637.8	80217.771	57.67904	1.5e+11	1.2e+13	.897826
1998Q2	-236.98822	1289.772	-5.45585	39.717148	3812.104	17.442025	542370.24	83759.875	19.049375	569161.78	77564.145	61.808319	1.5e+11	1.2e+13	1.01799
1998Q3	-142.54674	1266.144	-126.31708	51.113223	3824.303	120.44605	572250.18	86770.75	19.80625	612685.75	75983.54	61.935823	1.5e+11	1.2e+13	1.13816
1998Q4	-48.105266	1242.516	-247.17831	62.509298	2857.638	223.45008	602130.13	89781.625	20.563125	656209.73	77124.593	63.488891	1.5e+11	1.2e+13	1.25832
1999Q1	46.336212	1218.888	-368.03954	73.905372	2137.313	326.4541	632010.07	92792.5	21.32	699733.7	80059.442	65.492686	1.5e+11	1.2e+13	1.37849
1999Q2	213.00814	1745.156	-374.44973	74.731583	1433.931	485.0158	592010.48	98582.425	20.485	783820.17	77992.062	66.924358	1.5e+11	1.2e+13	1.5277
1999Q3	379.68007	2271.424	-380.85992	75.557793	892.379	643.5775	552010.88	104372.35	19.65	867906.63	76474.8	63.32049	1.5e+11	1.2e+13	1.6769
1999Q4	546.352	2797.692	-387.27011	76.384003	735.0279	802.13921	512011.29	110162.27	18.815	951993.09	77657.176	63.630856	1.6e+11	1.3e+13	1.8261
2000Q1	713.02392	3323.96	-393.6803	77.210214	609.2058	960.70091	472011.7	115952.2	17.98	1036079.5	84673.631	64.558137	1.6e+11	1.3e+13	1.97531

2000Q2	595.49328	10402.045	-348.06303	78.233696	555.8074	847.96906	566256.97	120072.58	18.058125	1106026.9	82213.646	70.853166	1.6e+11	1.3e+13	1.82532
2000Q3	477.96263	17480.13	-302.44577	79.257178	509.1589	735.23721	660502.25	124192.95	18.13625	1175974.3	80550.247	73.143415	1.6e+11	1.3e+13	1.67532
2000Q4	360.43198	24558.215	-256.82851	80.28066	468.38	622.50537	754747.52	128313.33	18.214375	1245921.7	81741.217	72.874492	1.6e+11	1.3e+13	1.52533
2001Q1	242.90133	31636.3	-211.21125	81.304142	429.7354	509.77352	848992.8	132433.7	18.2925	1315869.1	91399.415	76.30726	1.6e+11	1.3e+13	1.37534
2001Q2	152.91667	25363.963	-269.34791	83.215915	393.1624	440.20073	969094.92	155631.48	19.931875	1386775.5	89281.018	82.230669	1.7e+11	1.3e+13	1.31976
2001Q3	62.932015	19091.625	-327.48457	85.127688	358.1192	370.62793	1089197	178829.25	21.57125	1457681.9	87717.265	87.125568	1.7e+11	1.3e+13	1.26418
2001Q4	-27.052642	12819.288	-385.62123	87.039462	302.4654	301.05514	1209299.2	202027.02	23.210625	1528588.2	88596.563	84.895031	1.7e+11	1.3e+13	1.2086
2002Q1	-117.0373	6546.951	-443.75788	88.951235	252.3124	231.48235	1329401.3	225224.8	24.85	1599494.6	107423.08	89.6	1.7e+11	1.3e+13	1.15303
2002Q2	88.362034	5565.5	-547.44851	91.871361	202.5289	425.52454	1448035.3	233515.75	23.815	1695918.9	108976.89	92.3	1.8e+11	1.3e+13	1.23587
2002Q3	293.76137	4584.049	-651.13913	94.791488	158.3293	619.56673	1566669.3	241806.7	22.78	1792343.2	108668.59	95.8	1.8e+11	1.3e+13	1.31871
2002Q4	499.1607	3602.5979	-754.82975	97.711614	106.0167	813.60893	1685303.3	250097.65	21.745	1888767.5	108134.95	95.2	1.8e+11	1.3e+13	1.40155
2003Q1	704.56003	2621.1469	-858.52037	100.63174	65.64101	1007.6511	1803937.3	258388.6	20.71	1985191.8	118970.26	94.8	1.9e+11	1.3e+13	1.48439
2003Q2	1042.5016	3146.2352	-873.62417	102.24044	33.11985	1409.6724	1857996.3	255847.6	20.3275	2054790.8	119880.69	105.2	2.0e+11	1.4e+13	1.69239
2003Q3	1380.4432	3671.3234	-888.72797	103.84914	27.06753	1811.6937	1912055.3	253306.6	19.945	2124389.9	119733.88	113.4	2.2e+11	1.4e+13	1.90039
2003Q4	1718.3847	4196.4117	-903.83177	105.45783	28.55807	2213.715	1966114.3	250765.6	19.5625	2193988.9	118948.15	117.9	2.4e+11	1.4e+13	2.10839
2004Q1	2056.3263	4721.5	-918.93557	107.06653	46.03197	2615.7363	2020173.3	248224.6	19.18	2263587.9	114617.63	116.1	2.5e+11	1.4e+13	2.3164
2004Q2	10848.508	5373.125	-7271.3732	106.94573	78.2476	3073.2218	2093476.9	349716.74	18.8725	2401402.4	123702.92	120	2.5e+11	1.4e+13	2.38411
2004Q3	19640.691	6024.75	-13623.811	106.82493	113.3087	3530.7074	2166780.5	451208.88	18.565	2539217	142373.62	123.8	2.6e+11	1.4e+13	2.45183
2004Q4	28432.873	6676.375	-19976.248	106.70414	106.9097	3988.1929	2240084.1	552701.01	18.2575	2677031.5	146881.88	129.7	2.6e+11	1.4e+13	2.51954
2005Q1	37225.055	7328	-26328.686	106.58334	110.2227	4445.6785	2313387.7	654193.15	17.95	2814846.1	120048.92	135	2.6e+11	1.4e+13	2.58726
2005Q2	37129.911	8158.5	-27294.009	106.19367	106.7213	4388.2992	1913592.2	646775.05	17.7775	3118110	128755.46	142.3	2.7e+11	1.5e+13	2.52952

2005Q3	37034.768	8989	-28259.332	105.804	105.2528	4330.9199	1513796.7	639356.94	17.605	3421373.9	153933.59	153.9	2.7e+11	1.5e+13	2.47179
2005Q4	36939.624	9819.5	-29224.655	105.41434	97.81706	4273.5406	1114001.2	631938.83	17.4325	3724637.8	159193.42	144.7	2.8e+11	1.5e+13	2.41406
2006Q1	36844.48	10650	-30189.979	105.02467	91.19788	4216.1613	714205.74	624520.73	17.26	4027901.7	128579.79	151.3	2.8e+11	1.5e+13	2.35632
2006Q2	34603.493	2326.93	-25981.947	105.3711	83.4737	4261.5724	1207713.4	658235.66	17.179375	4302776.4	135438.63	154.4	2.9e+11	1.5e+13	2.29829
2006Q3	32362.505	4624.06	-21773.915	105.71754	76.21006	4306.9835	1701221.1	691950.58	17.09875	4577651.2	162498.77	163.5	2.9e+11	1.5e+13	2.24026
2006Q4	30121.517	4121.19	-17565.883	106.06397	79.39763	4352.3946	2194728.8	725665.51	17.018125	4852525.9	169304.43	157.1	3.0e+11	1.5e+13	2.18223
2007Q1	27880.529	8318.32	-13357.851	106.4104	83.37436	4397.8057	2688236.5	759380.43	16.9375	5127400.7	135774.74	159.2	3.0e+11	1.5e+13	2.1242
2007Q2	28245.222	7118.99	-12124.562	99.815299	89.94801	4496.9826	2017415.3	812421.27	16.486983	5847601.5	142790.46	164.3	3.1e+11	1.5e+13	2.05745
2007Q3	28609.915	7819.66	-10891.274	93.2202	96.93485	4596.1594	1346594.2	865462.11	16.036466	6567802.3	173067.48	170.2	3.1e+11	1.5e+13	1.9907
2007Q4	28974.608	5620.33	-9657.9861	86.6251	28.92985	4695.3363	675773.01	918502.95	15.585948	7288003.1	182618.59	167.4	3.2e+11	1.5e+13	1.92395
2008Q1	29339.301	6721	-8424.698	80.03	63.43294	4794.5132	4951.8603	971543.79	15.135431	8008203.9	142071.4	171.6	3.2e+11	1.5e+13	1.85721
2008Q2	25509.755	6920.795	-3156.6477	84.03	323.8021	4377.3008	5679.5556	1047111.8	16.099282	8358931	150862.2	184.1	3.3e+11	1.5e+13	1.78548
2008Q3	21680.21	6820.59	2111.4027	88.03	740.2773	3960.0884	6407.2509	1122679.8	17.063132	8709658.1	183678.82	192.4	3.3e+11	1.5e+13	1.71376
2008Q4	17850.664	7120.385	7379.453	92.03	269.964	3542.876	7134.9461	1198247.8	18.026983	9060385.2	195590.14	192.6	3.4e+11	1.5e+13	1.64203
2009Q1	14021.119	6980.18	12647.503	96.03	283.2943	3125.6636	7862.6414	1273815.8	18.990833	9411112.2	148470.58	196.2	3.4e+11	1.5e+13	1.57031
2009Q2	-94000.988	6820.0688	10000.02	96.2425	120.9274	3306.123	8021.6426	1181794.5	18.63953	9817069.4	161748.41	204.7	3.5e+11	1.5e+13	1.54555
2009Q3	-202023.1	8119.9575	7352.5366	96.455	85.33147	3486.5824	8180.6439	1089773.3	18.288227	10223027	196670.54	212.4	3.6e+11	1.5e+13	1.52079
2009Q4	-310045.2	7219.8462	4705.0533	96.6675	45.35595	3667.0419	8339.6452	997752.03	17.936923	10628984	210146.92	215.6	3.6e+11	1.5e+13	1.49604
2010Q1	-418067.31	7719.735	2057.57	96.88	34.66135	3847.5013	8498.6464	905730.77	17.58562	11034941	213111.4	220.19499	3.7e+11	1.5e+13	1.47128
2010Q2	-426444.08	7758.1869	181.00492	97.95348	22.12911	3945.8266	9662.2021	1019375.1	17.194543	11319328	164792.33	104.89575	3.7e+11	1.5e+13	1.44988
2010Q3	-434820.85	7416.6388	-1695.5602	99.02696	17.79676	4044.1518	10825.758	1133019.3	16.803466	11603716	179425.07	108.76	3.8e+11	1.5e+13	1.42848

2010Q4	-443197.62	7457.0906	-3572.1252	100.10044	9.585608	4142.4771	11989.313	1246663.6	16.412389	11888103	217038.09	112.4	3.8e+11	1.5e+13	1.40707
2011Q1	-451574.39	6913.5425	-5448.6903	101.17392	6.369294	4240.8024	13152.869	1360307.9	16.021313	12172490	232295.71	114.2	3.9e+11	1.5e+13	1.38567
2011Q2	-460690.57	6994.73	-7205.632	100.61567	7.027627	4523.7941	13039.203	1298608.6	16.213562	12603215	174358.04	118.3	3.9e+11	1.5e+13	1.42678
2011Q3	-469806.74	6894.9175	-8962.5736	100.05741	12.21897	4806.7859	12925.537	1236909.3	16.405812	13033940	190828.65	119.9	4.0e+11	1.5e+13	1.4679
2011Q4	-478922.91	6817.105	-10719.515	99.499156	8.507221	5089.7776	12811.871	1175209.9	16.598061	13464664	232308.35	124	4.0e+11	1.5e+13	1.50901
2012Q1	-488039.09	6618.2925	-12476.457	98.940902	7.829069	5372.7694	12698.205	1113510.6	16.790311	13895389	249949.23	126	4.0e+11	1.6e+13	1.55012
2012Q2	-495357.24	7919.0494	-7420.1344	98.37156	4.608604	5485.2243	13157.455	836535.07	16.773441	14211614	185318.2	132.6	4.1e+11	1.6e+13	1.5668
2012Q3	-502675.4	7219.8062	-2363.812	97.802219	3.071315	5597.6791	13616.705	559559.55	16.756571	14527839	203224.7	135.3	4.1e+11	1.6e+13	1.58348
2012Q4	-509993.55	8120.5631	2692.5104	97.232878	2.561935	5710.134	14075.955	282584.03	16.739702	14844065	246600.53	138	4.2e+11	1.6e+13	1.60016
2013Q1	-517311.71	8521.32	7748.8329	96.663537	3.246028	5822.5889	14535.205	5608.5	16.722832	15160290	267650.55	141.1	4.3e+11	1.6e+13	1.61684
2013Q2	-518943.63	8220.485	9093.8502	96.389334	5.309534	4972.3698	15619.587	816030.51	16.679222	15790347	197419.33	144.02485	4.3e+11	1.6e+13	1.52008
2013Q3	-520575.55	8919.65	10438.868	96.11513	9.002647	4122.1508	16703.97	1626452.5	16.635611	16420405	19931.016	146.64741	4.4e+11	1.6e+13	1.42331
2013Q4	-522207.46	8518.815	11783.885	95.840927	11.00247	3271.9317	17788.352	2436874.5	16.592001	17050462	20464.396	148.92247	4.5e+11	1.6e+13	1.32655
2014Q1	-523839.38	8217.98	13128.902	95.566724	13.63685	2421.7127	18872.734	3247296.5	16.548391	17680520	21401.52	152.28557	4.5e+11	1.6e+13	1.22979
2014Q2	-428339.09	8418.0581	-12496.457	89.940902	16.13782	5452.7694	12192.205	3463510.6	16.710311	17343214	20169.778	155.23484	4.6e+11	1.6e+13	1.12199
2014Q3	-4123357.2	8618.1362	-6920.4438	97.45756	18.91737	5.445e+12	13227.455	536535.07	16.125441	17013939	21734.83	158.62362	4.6e+11	1.6e+13	1.01419
2014Q4	-502375.4	8818.2144	-6353.12	99.221936	178.3647	5537.7915	132216.7	529559.55	16.319571	17156664	22933.144	161.30794	4.6e+11	1.6e+13	.906385
2015Q1	-523839.38	8217.98	-6210.4354	95.566724	10.25631	2421.7127	18872.734	3247296.5	16.548391	17680520	24205.863	164.43537	4.6e+11	1.7e+13	.798583
2015Q2	-428339.09	8418.0581	-6466.717	89.940902	46.08989	5452.7694	12192.205	3463510.6	16.710311	17343214	24114.83	166.62741	4.6e+11	1.7e+13	.846304
2015Q3	-4123357.2	8618.1362	-65896.157	97.45756	18.28562	5.445e+12	13227.455	536535.07	16.125441	17013939	23873.121	158.87247	4.6e+11	1.7e+13	.894026
2015Q4	-502375.4	8818.2144	-6118.1497	99.221936	106.7432	5537.7915	132216.7	529559.55	16.319571	17156664	23895.452	161.45557	4.6e+11	1.6e+13	.941748

Sources: CBN Statistical Bulletin, Various Issues

Where:

YEAR = period of the study

CAB = current account balance of balance of payment

EXR = exchange rate

RGDP = real gross domestic product as a measure of national income

PRICEL = price level

MS = money supply

BOT = balance of trade

EXR_V = σ_{exr}^2 = conditional variance of exchange as a measure of exchange rate volatility

KAB = capital account balance of balance of payments

INT = interest rate

DC = domestic credit

FAB = financial account balance

FDI = foreign direct investment

incomex = foreign (US) income

income = domestic income (in US Dollar)

BT = ratio of nominal exports to nominal imports

Note: All the variables are measured in million

APPENDIX B

DESCRIPTIVE STATISTICS OUTPUTS

Variable	Obs	Mean	Std. Dev.	Min	Max
BOT	188	5.79e+10	5.60e+11	-2147.3	5.45e+12
CAB	188	-108754.7	451691.3	-4123357	44731.2
DC	188	343045.1	600045.9	-310.3	2688236
EXR	188	74.66373	38.77016	.7416667	113.2
FDI	188	367690.5	798934.4	128.6	5367297
INT	188	15.12637	5.941113	6	29.8
KAB	188	-584.0993	23097.66	-138755.6	34627.4
MS	188	3232825	5543293	978.2	1.79e+07

Variable	Obs	Mean	Std. Dev.	Min	Max
RGDP	188	71764.7	62369	1028.021	267650.6
PRICEL	188	57.77823	66.97768	.224631	220.195

Variable	Obs	Mean	Std. Dev.	Min	Max
income	188	25.8774	.4892247	25.22836	26.8758
incomex	188	29.74608	2.170353	.6258047	30.57428
bt	188	1.008664	.7342579	1.07e-09	2.587257

Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
BOT	188	0.0000	0.0000	.	0.0000
CAB	188	0.0000	0.0000	.	0.0000
DC	188	0.0000	0.0000	62.79	0.0000
EXR	188	0.0000	0.0000	30.26	0.0000
FDI	188	0.0000	0.0000	.	0.0000
INT	188	0.6572	0.0000	19.90	0.0000
KAB	188	0.0000	0.0000	.	0.0000
MS	188	0.0000	0.0118	41.73	0.0000

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Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
RGDP	188	0.0000	0.1868	21.64	0.0000
PRICEL	188	0.0001	0.0000	27.80	0.0000

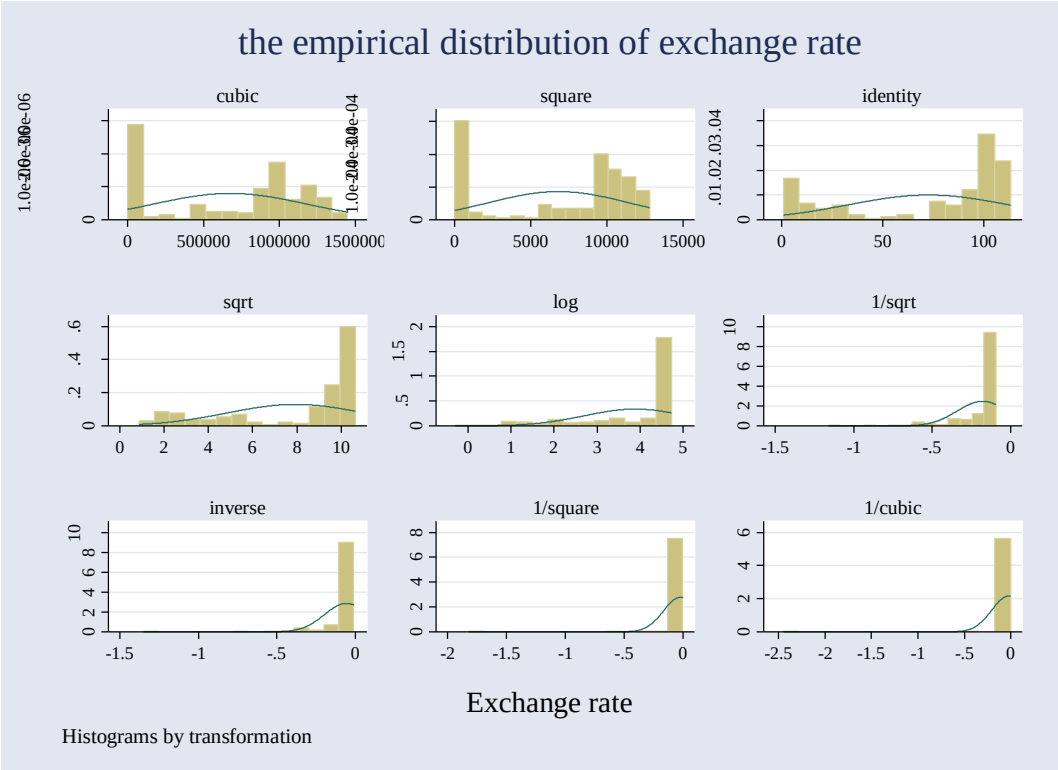
Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
income	188	0.0000	0.0058	22.95	0.0000
incomex	188	0.0000	0.0000	.	0.0000
bt	188	0.9014	0.0001	12.85	0.0016

APPENDIX C

AR-EGARCH AND COINTEGRATION TEST OUTPUTS

AR-EGARCH Results



Selection-order criteria
Sample: 1970q3 - 2015q4 Number of obs = 182

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-927.019				1572.05	10.198	10.2051	10.2156
1	-533.822	786.39	1	0.000	21.1212	5.88815	5.90243	5.92336
2	-453.789	160.07*	1	0.000	8.86208*	5.01966*	5.04106*	5.07247*

Endogenous: EXR
Exogenous: _cons

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Source	SS	df	MS	Number of obs =	183
				F(0, 182) =	0.00
Model	0	0	.	Prob > F =	.
Residual	3791.57776	182	20.8328449	R-squared =	0.0000
				Adj R-squared =	0.0000
Total	3791.57776	182	20.8328449	Root MSE =	4.5643

D.EXR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_cons	.4358576	.3374028	1.29	0.198	-.2298666	1.101582

LM test for autoregressive conditional heteroskedasticity (ARCH)

lags(*p*)	chi2	df	Prob > chi2
2	102.427	2	0.0000

H0: no ARCH effects *vs.* H1: ARCH(*p*) disturbance

ARCH family regression

Sample: 1970q1 - 2015q4 Number of obs = 184
Distribution: Gaussian Wald chi2(.) = .
Log likelihood = -774.2474 Prob > chi2 = .

EXR	Coef.	OPG Std. Err.	z	P>|z|	[95% Conf.	Interval]
EXR						
_cons	98.85281	.4091206	241.62	0.000	98.05095	99.65467
ARCH						
earch						
L2.	.1198967	.2601597	0.46	0.645	-.3900069	.6298003
earch_a						
L2.	1.774772	.4291059	4.14	0.000	.9337394	2.615804
egarch						
L2.	.8762446	.0507275	17.27	0.000	.7768205	.9756687
_cons	.5737481	.2689316	2.13	0.033	.0466518	1.100844

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Cointegration and ECM Result Output

Johansen tests for cointegration

Trend: none Number of obs = 186
Sample: 1970q3 - 2016q4 Lags = 2

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	49	-14384.677	.	362.2439	109.99
1	62	-14282.893	0.66528	158.6765	82.49
2	73	-14228.747	0.44134	50.3849*	59.46
3	82	-14214.401	0.14295	21.6918	39.89
4	89	-14207.031	0.07618	6.9532	24.31
5	94	-14204.762	0.02410	2.4149	12.53
6	97	-14203.555	0.01289	0.0010	3.84
7	98	-14203.555	0.00001		

Johansen tests for cointegration

Trend: none — Number of obs = 186
Sample: 1970q3 - 2016q4 — Lags = 2

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	36	-8781.6646	.	111.8537	82.49
1	47	-8760.6401	0.20234	69.8047	59.46
2	56	-8744.1359	0.16261	36.7962*	39.89
3	63	-8730.3101	0.13814	9.1446	24.31
4	68	-8727.1715	0.03319	2.8673	12.53
5	71	-8725.7936	0.01471	0.1115	3.84
6	72	-8725.7378	0.00060		

Johansen tests for cointegration

Trend: none — Number of obs = 86
Sample: 1994q3 - 2015q4 — Lags = 2

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	36	-4346.1809	.	91.5720	82.49
1	47	-4323.8403	0.40521	46.8907*	59.46
2	56	-4314.3734	0.19761	27.9570	39.89
3	63	-4308.126	0.13523	15.4621	24.31
4	68	-4302.4633	0.12339	4.1367	12.53
5	71	-4300.6325	0.04168	0.4752	3.84
6	72	-4300.3949	0.00551		

Source	SS	df	MS	Number of obs = 187
				F(7, 179) =21879.19
Model	5.3536e+13	7	7.6480e+12	Prob > F = 0.0000
Residual	6.2571e+10	179	349556679	R-squared = 0.9988
				Adj R-squared = 0.9988
Total	5.3599e+13	186	2.8816e+11	Root MSE = 18696

D.CAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EXR						
D1.	-579.4534	306.379	-1.89	0.060	-1184.033	25.12594
RGDP						
D1.	-.1663784	.0734207	-2.27	0.025	-.3112599	-.021497
PRICEL						
D1.	97.53519	167.0603	0.58	0.560	-232.1257	427.1961
MS						
D1.	-.0396224	.007366	-5.38	0.000	-.0541576	-.0250871
BOT						
D1.	-6.73e-07	1.78e-09	-378.44	0.000	-6.76e-07	-6.69e-07
EXR_V						
D1.	-.1059862	2.170505	-0.05	0.961	-4.389055	4.177083
ECM1						
L1.	-.0317324	.0347029	-0.91	0.362	-.1002117	.036747
_cons	1172.501	1551.5	0.76	0.451	-1889.082	4234.084

Source	SS	df	MS	Number of obs =	187
				F(6, 180) =	19.75
Model	3.2557e+09	6	542617296	Prob > F =	0.0000
Residual	4.9463e+09	180	27479534.4	R-squared =	0.3969
				Adj R-squared =	0.3768
Total	8.2020e+09	186	44096881.5	Root MSE =	5242.1

D.KAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
INT						
D1.	-4479.058	426.0321	-10.51	0.000	-5319.718	-3638.398
EXR						
D1.	4.333592	86.85939	0.05	0.960	-167.06	175.7272
DC						
D1.	.0024282	.0029682	0.82	0.414	-.0034287	.0082852
MS						
D1.	-.0005235	.0021156	-0.25	0.805	-.004698	.003651
EXR_V						
D1.	.1806487	.6114939	0.30	0.768	-1.02597	1.387267
ECM2						
L1.	-.0305033	.0204234	-1.49	0.137	-.0708034	.0097968
_cons	331.929	436.8035	0.76	0.448	-529.9851	1193.843

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Source	SS	df	MS	Number of obs =	87
				F(6, 80) =	28.80
Model	5.6806e+09	6	946760061	Prob > F =	0.0000
Residual	2.6297e+09	80	32870997.2	R-squared =	0.6836
				Adj R-squared =	0.6598
Total	8.3102e+09	86	96630699.3	Root MSE =	5733.3

D.FAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EXR						
D1.	742.0677	205.425	3.61	0.001	333.2591	1150.876
FDI						
D1.	-.0080878	.001015	-7.97	0.000	-.0101076	-.0060679
MS						
D1.	.0214814	.0029307	7.33	0.000	.015649	.0273138
pricel						
D1.	5.298097	47.10042	0.11	0.911	-88.43473	99.03093
exr_v						
D1.	-2.063837	2.827334	-0.73	0.468	-7.69041	3.562737
ECM3						
L1.	-.3486626	.0684182	-5.10	0.000	-.4848191	-.212506
_cons	-4951.764	963.5018	-5.14	0.000	-6869.194	-3034.334

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Variance Inflation Factors of the Variables in Equations (3.10), (3.12) and (3.14)

Variable	VIF	1/VIF
EXR_V	10.75	0.093038
EXR	10.29	0.097191
PRICEL	4.79	0.208582
MS	3.10	0.322453
RGDP	2.18	0.459665
BOT	1.14	0.880515
Mean VIF	5.37	

Variable	VIF	1/VIF
EXR	11.49	0.087034
EXR_V	10.81	0.092540
INT	3.53	0.283106
MS	1.97	0.507215
DC	1.95	0.513016
Mean VIF	5.95	

Variable	VIF	1/VIF
EXR	18.81	0.053159
exr_v	17.58	0.056875
pricel	3.31	0.301727
MS	2.59	0.386271
FDI	1.84	0.542435
Mean VIF	8.83	

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APPENDIX D

OUTPUTS OF THE MODEL WITH EXCHANGE RATE VOLATILITY (WITHOUT THE EXCHANGE RATE VARIABLE)

Source	SS	df	MS	Number of obs = 187
				F(5, 181) =30297.99
Model	5.3535e+13	5	1.0707e+13	Prob > F = 0.0000
Residual	6.3963e+10	181	353387944	R-squared = 0.8988
				Adj R-squared = 0.8388
Total	5.3599e+13	186	2.8816e+11	Root MSE = 18799

D.CAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EXR_V D1.	.1205037	2.16483	0.06	0.956	-4.151046	4.392053
RGDP D1.	.1629233	.0737543	2.21	0.028	-.308452	.5173945
PRICEL D1.	-37.70945	156.0534	- 0.24	0.809	-270.2085	- 345.6274
MS D1.	-.0391534	.0073276	_5.34	0.000	-.0536119	-.024695
BOT D1.	6.73e-07	1.76e-09	383.58	0.000	-6.77e-07	6.79e-07
_cons	947.7856	1544.816	0.61	0.540	-2100.378	3995.95

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Durbin-Watson d-statistic(6, 187) = 1.054052

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
1	0.035	1	0.8513

H0: no serial correlation

Ramsey RESET test using powers of the fitted values of CAB
Ho: model has no omitted variables
F(3, 183) = 2.59
Prob > F = 0.0545

Source	SS	df	MS	Number of obs =	187
				F(4, 182) =	29.02
Model	3.1938e+09	4	798458874	Prob > F =	0.0000
Residual	5.0082e+09	182	27517497.1	R-squared =	0.6894
				Adj R-squared =	0.6360
Total	8.2020e+09	186	44096881.5	Root MSE =	5245.7

D.KAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EXR_V						
D1.	.2971014	.6046249	0.49	0.624	-.8958743	1.490077
INT						
D1.	-4550.598	422.3943	-10.77	0.000	-5384.018	-3717.179
DC						
D1.	.0020488	.000759	2.70	0.0 4	-.0037087	.0078062
MS						
D1.	-.0006141	.0021136	-0.29	0.772	-.0047844	.0035562
_cons	346.3531	434.5545	0.80	0.426	-511.0596	1203.766

Durbin-Watson d-statistic(5, 187) = .6096333

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
1	1.442	1	0.2299

H0: no serial correlation

Source	SS	df	MS	Number of obs =	87
				F(4, 82) =	23.50
Model	4.4387e+09	4	1.1097e+09	Prob > F =	0.0000
Residual	3.8716e+09	82	47214113.5	R-squared =	0.5341
				Adj R-squared =	0.5114
Total	8.3102e+09	86	96630699.3	Root MSE =	6871.3

D.FAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
FDI						
D1.	-.0089969	.001177	-7.64	0.000	-.0113383	-.0066555
MS						
D1.	.0193927	.0032832	5.91	0.000	.0128613	.0259241
pricel						
D1.	15.47769	56.40103	0.27	0.784	-96.72193	127.6773
exr_v						
D1.	-2.027205	3.193553	-0.63	0.527	-8.380199	4.325789
_cons	-3625.207	1061.568	-3.41	0.001	-5737.005	-1513.409

Durbin-Watson d-statistic(5, 87) = 1.027663

Breusch-Godfrey LM test for autocorrelation

lags(*p*)	chi2	df	Prob > chi2
1	0.290	1	0.5905

H0: no serial correlation

Ramsey RESET test using powers of the fitted values of FAB
Ho: model has no omitted variables
F(3, 80) = 0.08
Prob > F = 0.9692

OUTPUT OF THE ARDL MODEL USED IN TESTING THE MARSHALL-LERNER CONDITION

```
ARDL regression
Model: ec

Sample: 1970q3 - 2016q4
Number of obs  = 186
Log likelihood = 192.2133
R-squared      = .52377266
Adj R-squared  = .49366634
Root MSE       = .08901079
```

D.bt	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
bt						
L1.	-.0208234	.0127531	-1.63	0.104	-.045994	.0043472
LR						
income						
L1.	-2.720202	2.317396	-1.17	0.242	-7.294026	1.853623
incomex						
L1.	2.647517	2.18376	1.21	0.227	-1.662551	6.957584
EXR						
L1.	.0080362	.0114354	0.70	0.483	-.0145338	.0306062
SR						
bt						
LD.	.6957194	.0706083	9.85	0.000	.5563603	.8350785
income						
D1.	.5786229	.6516471	0.89	0.376	-.7075275	1.864773
LD.	.0781345	.6634832	0.12	0.906	-1.231377	1.387646
incomex						
D1.	-.0399157	.0036256	-11.01	0.000	-.0470714	-.0327599
LD.	-.0870115	.0430411	-2.02	0.045	-.1719614	-.0020617
EXR						
D1.	.0055306	.0025055	2.21	0.029	.0005856	.0104757
LD.	-.0035971	.0023848	-1.51	0.133	-.0083039	.0011097
_cons	-.1840379	.6809373	-0.27	0.787	-1.527998	1.159922

Pesaran/Shin/Smith (2001) ARDL Bounds Test

H0: no levels relationship F = 4.508
t = -1.633

Critical Values (0.1-0.01), **F-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61

accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), **t-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_3	-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37

accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

k: # of non-deterministic regressors in long-run relationship
Critical values from Pesaran/Shin/Smith (2001)

Durbin-Watson d-statistic(3, 188) = 1.9863216

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	17 .148	1	0.0730

H0: no serial correlation

Test of the Marshall-Lerner Condition

$\varphi^x = 2.6475$ and $\varphi = -2.7202$

$^3(\varphi^x + \varphi - 1) = [2.6475 + (-2.7202) - 1] = 2.6475 - 2.7202 - 1 = -1.0727$

$^4(\varphi^x + \varphi) = [2.6475 + (-2.7202)] = 2.6475 - 2.7202 = -0.0727$

$(\varphi^x + \varphi - 1) > 0$ -1.0727 < 0

$(\varphi^x + \varphi) > 1$ $|0.0727 < 1|$

APPENDEX E

OUTPUTS OF THE BALANCE OF PAYMENT MODELS WITH EXCHANGE RATE INCLUDED

Source	SS	df	MS	Number of obs =	187
				F(6, 180) =	25548.84
Model	5.3536e+13	6	8.9226e+12	Prob > F =	0.0000
Residual	6.2863e+10	180	349238450	R-squared =	0.9988
				Adj R-squared =	0.9988
Total	5.3599e+13	186	2.8816e+11	Root MSE =	18688

D.CAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EXR						
D1.	-537.4151	302.7722	-1.77	0.078	-1134.854	60.02429
RGDP						
D1.	-.1635204	.0733207	-2.23	0.027	-.3081991	-.0188416
PRICEL						
D1.	41.0421	155.1459	0.26	0.792	-265.0966	347.1808
MS						
D1.	-.0403728	.0073168	-5.52	0.000	-.0548105	-.0259352
BOT						
D1.	-6.73e-07	1.75e-09	-384.69	0.000	-6.77e-07	-6.70e-07
EXR_V						
D1.	-.261707	2.162829	-0.12	0.904	-4.529467	4.006053
_cons	1274.975	1546.743	0.82	0.411	-1777.105	4327.055

Source	SS	df	MS	Number of obs =	87
				F(5, 81) =	22.45
Model	4.8269e+09	5	965381916	Prob > F =	0.0000
Residual	3.4833e+09	81	43004081	R-squared =	0.5808
				Adj R-squared =	0.5550
Total	8.3102e+09	86	96630699.3	Root MSE =	6557.7

D.FAB	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EXR						
D1.	705.5455	234.8211	3.00	0.004	238.3251	1172.766
FDI						
D1.	-.0081166	.0011609	-6.99	0.000	-.0104264	-.0058068
MS						
D1.	.0228503	.0033381	6.85	0.000	.0162086	.029492
pricel						
D1.	15.15303	53.82783	0.28	0.779	-91.94746	122.2535
exr_v						
D1.	.654301	3.175824	0.21	0.837	-5.664593	6.973195
_cons	-4928.124	1102.036	-4.47	0.000	-7120.83	-2735.417

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