

# External Reserves Accumulation and the Estimation of the Adequacy Level for Nigeria

Newman C. Oputa and Toyin S. Ogunleye\*

Nigeria's foreign exchange reserves, which was US\$5.4 billion in 1999, rose to an overwhelming level of US\$51.3 billion at end-2007 and further to US\$53.0 billion in 2008, but owing to the crash in the international price of crude oil in 2008 and the aftermath of the global financial crisis, the reserve declined to US\$42.4 billion in 2009. In trying to determine the optimum level, the paper adopted Shcherbakov (2002) model which estimated the level of international reserves adequacy along the line of the drivers of external reserves. We found that there have been shortfalls in the achieved level of reserves over the year, the actual levels of reserves fell below the estimated trigger levels, except in the period 1992 – 2005. However, from 2006 through 2009 external reserves were in excess of actual reserves, especially in 2006 and 2007. The result reveals that the reserves accumulation in recent years was in line with global trend especially in emerging economies and could not be adjudged to be sufficient or in excess of expectations. Government should sustain reserves accumulation during oil boom to guard against any external shock, especially crude oil price shock.

**Keywords:** Foreign Exchange Reserves, Reserves Adequacy and Reserves Accumulation.

**JEL Classification:** F31

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## I. Introduction

In the decade 2000-2009, the accumulation of foreign exchange reserves by developing economies reached its peak, especially in the oil exporting countries and emerging market economies. In 2005, the European Central Bank (ECB) noted that Emerging Market Economies (EMEs), accumulated reserves at an annual rate of US\$250 billion or 3.5 per cent of their annual combined GDP during the period 2000-2005. This was almost five times higher than the levels in the early 1990s and was concentrated in Asia. Countries like China, Korea, India, Malaysia and Taiwan witnessed large surge while Latin America and Central Europe countries recorded modest increase during the period. In the same reasoning, the IMF (2001) noted that the financial crises of the late 1990s and early 2000s have shown that holding and managing adequate external reserves helps a country to prevent and move ahead of external crises especially if propelled by the capital account transactions. Reserves

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accumulation can, therefore, be seen as crisis prevention perception or precautionary motives for holding international reserves, driven by the volatility of capital flows and the vulnerability of global economies to external shocks.

World external reserves rose from US\$ 1.2 trillion in January 1995 to above US\$3.4 trillion in 2005, surging since 2002. As at end-2007, global reserves stood at US\$ 4.1 trillion while Nigeria's stock represented only 1.3 per cent of total stock. Despite this low level, political economist query the need for accumulating foreign reserves in Nigeria amidst decaying infrastructure which brings to the fore the key issue of reserves adequacy, especially in developing economies. In Nigeria, since 1999, foreign exchange reserves have maintained an upward trend, except in 2003. The sharp rise in foreign exchange reserves globally, as well as in Nigeria, was attributable to three main drivers. First, precautionary motive arising from lessons of the financial crisis that occurred in the 1990s which called for huge external reserves to absorb external shocks or attack on the domestic currency. Second, in the Asian economies the surge was boosted by the earnings from the export-led growth, in addition to an increase in crude oil prices for the oil-producing countries. Last, is the macroeconomic development in emerging economies reflected in their excess domestic savings over investment (IMF 2002). Despite this new phenomenon, there have been arguments on why Nigeria should accumulate external reserves.

Reserves accumulation and composition of currency are contemporary issues in reserves management and countries accumulate foreign reserves for different reasons. Prominent among these are, to service foreign liabilities including external debt obligations, finance imports, provide fund for intervention in the foreign exchange market, and cushion the effects of external shocks. Globalization and the continued liberalization of capital account transactions as well as the aftermath of the Asian crisis of the mid-1990s have made most emerging economies to adopt reserve accumulation as a reserve management option. Lessons of experience have shown that recent reserves accumulations are mostly driven by capital account surplus, for example, in China, India, Korea and Taiwan, while in Russia and Nigeria, the build-up reflects the current account surplus. However, the combined estimated current account surplus of oil-producing countries have exceeded that of the Asian economies and have emerged as major net capital exporters in the world economy (ECB, *ibid*). More importantly, the experience of huge capital reversals in the Asian economies in the 1990s precipitated the accumulation of external reserves in emerging economies.

In most cases foreign exchange reserves are held in five currencies namely the US dollar, the euro, the Japanese yen, the British pound, and the Swiss franc. Dollar reserves holdings are by far the largest; accounting for about 70.0 per cent of the total, while euro reserves holdings comes next with a share of 20.0 per cent. The dollar commands a high share in global reserves because of the depth and liquidity in the US market for treasury and agency securities. In Nigeria, over 90.0 per cent of its foreign reserves are denominated in dollar owing mainly to the fact that the country's crude oil receipts and other non-oil exports are invoiced in dollar (Oputa, 2002).

Although Nigeria had sustained the built-up of foreign reserves in recent years, it is pertinent to understand the underlining drivers of current reserves accumulation. The paper will focus on trends in global foreign reserves accumulation and try to estimate the adequacy level for Nigeria using an adjusted form of Shcherbakov (2002) model. The rest of the paper is divided into four parts. Section 2 presents the theoretical framework with the review of literature and empirical measures of reserves adequacy. Section 3 analyzes trends in the recent reserves accumulation in some selected countries and consequences of reserves accumulation. Section 4 presents the estimation and analysis of reserves adequacy in Nigeria. Section 5 concludes the paper.

## **II. Theoretical Framework**

Reserves adequacy is the level of external reserves that ensures sustainable balance of payments and macroeconomic adjustment resulting from external price shocks or reversals in short-term foreign capital flows. The debate on foreign exchange reserves adequacy transcends the use of visible imports or level of import cover in most of the 1950's through the mid-1990's to the recent calls for the incorporation of a broader measure that includes the need to meet major external liabilities such as external indebtedness and other forms of capital flows. A refocus on the issue of reserves adequacy was in the 1990s and early 2000s when depleting foreign exchange reserves associated with the currency crises in some emerging economies became worrisome. The aftermath was the move to accumulate reserves to self-insure against future crises.

## **II.1 Review of Literature**

During the great depression of the 1930's, Keynes advocated the use of external reserves for mitigating external vulnerability or shocks. He called for an international clearing system where the main source of liquidity would be related to the value of trade (import ratio). This was further supported by Triffin (1947) who argued that demand for foreign reserves grew with trade in a linear form and advocated the use of reserves/imports ratio as a measure of reserves adequacy. The International Monetary Fund (1953) discovered that adequacy of international reserves was related to the international credit system, the existing pattern of exchange rate, the appropriateness of monetary and fiscal policies, policy objectives and the stages of development of countries. The study argued that foreign trade is the largest item in the balance of payments and, therefore, the reserves should be compared with a country's trade figure. A major finding was that globally, most countries' annual reserves/imports ratio ranged between 30 to 50 per cent. This informed the minimum of three months of import cover that has been used internationally. This ratio has continued to serve as a preliminary indicator of reserves adequacy since it has become the most acceptable benchmark widely used until the recent rethink in the wake of the 1990's Asian crisis.

Heller (1966) adopted a radical approach and analyzed the adequate level of reserves in term of rational optimizing decision. He argued that optimum reserves occur where marginal utility of holding reserves equals marginal cost. He identified the precautionary motive of holding reserves as stemming from the ability to smoothen consumption and production in case of balance of payments deficit. This he noted, would lead to a more reliable and consistent index of reserves adequacy than simple reserves/imports ratio. Consequently, Heller supported the provision for other external payments variability.

Heller and Klan (1978) identified the type of exchange rate regime as a critical factor that influences the level of reserves adequacy. In their study, they noted that for industrial countries their reserves requirements trend downwards, while for most developing countries the level seems to be on the increase. Inference from this showed that countries like Nigeria should maintain much higher reserves level than the acceptable level of three month import cover. Lizondo and Mathieson (1987) also found that the debt crisis of the 1980's produced similar structural breaks in the demand for reserves after the collapse of the Bretton Woods System. Their findings showed that major components of external variability serve as critical factors in determining reserves adequacy for developing countries which was in line with Heller's position.

Greenspan (1999) observed that it is necessary to take into account the increased capital inflows for emerging market economies, and to relate the size of reserves to a country's short term external debt. This ratio according to him appears to be the most relevant single indicator of reserve adequacy for countries that borrow in international financial market. Bussiere and Christain (1999) found that higher liquidity could significantly decrease countries' vulnerability to external shocks in the face of weak domestic fundamentals. Their findings suggest full coverage of total short-term external debt as a practical rule for reserves adequacy for individual countries.

The IMF (2002) deriving from the currency crisis of the late 1990's argued that three months of imports of goods and services as an indicator of reserves adequacy was inadequate. The study in addition to recognizing the size and structure of external debt and export bills, positioned the ratio of reserves to base money or other monetary aggregates as major indicator of reserves adequacy. The Fund noted that lower levels of reserves have the potential of creating the risk of capital flight and lower investors' confidence on the economy. Similarly, Aizenman and Marion (2004) focused on the magnitude and speed of the reversal of capital flows throughout the 1997–98 crisis and observed that accumulating international reserves could be viewed as a precautionary adjustment process, reflecting the desire for self-insurance against exposure to future shocks.

Aizenman and Lee (2005) tested empirically the significance of precautionary and mercantilist motives in accounting for the hoarding of international reserves by developing countries. The empirical results were in line with the precautionary demand nexus. They found that the effects of financial crisis were localized, and had increased reserves hoarding in most countries. However, to obtain an optimum level of external reserves will require a detailed model and more information that include an assessment of the probability and output costs of shocks, as well as the opportunity cost of holding external reserves. In their view, exposure of developing countries to external shocks and reversals of hot money as well as growing trade openness are accountable for the observed increase in international reserves/GDP ratios by developing markets.

In the literature, we found no specific empirical work that focused on optimal reserves for Nigeria, except for the analytical usage of the months of import cover in various publications of the Central Bank of Nigeria. The most current and related work by the Drummond and Dhasmana (2008), considered the 'foreign reserves adequacy in sub-Saharan Africa' where it also mentioned that the

'literature on optimal reserves so far has not paid attention to the particular shocks facing low-income countries'. The authors used a 'two-good endowment economy model' for countries facing terms-of-trade and aid shocks to derive the optimal level of reserves. Their result confirmed that optimal level of reserves in these countries depended on the size of trade and aid shocks, their probability and output cost.

## **II.2 Analytical Methodology**

There are various approaches in the estimation of reserves benchmark level as noted in Triffin (1947), IMF (1953 and 2002), Heller (1966) among others. These models assume that optimal reserves should be that which could finance the gap between demand and supply of foreign currency, smoothing external payments imbalances and prevent exchange rate crisis. The basic models of external reserves adequacy are discussed in this section.

### **II.2.1 The Traditional Model**

This consists of three variants designated along the line of thoughts of the proponents namely Kaminsky (1999), Pablo (1999) and Greenspan (1999) which are mix of both the balance of payments and monetary (balance sheet) approaches.

Basically this model relates reserves to the total months of import cover of any country. Consequently, the IMF (1953) and Triffin (1947) suggest that reserves adequacy required a minimum average yearly reserves to import ratio of 30-35 per cent. This has remained the benchmark ratio and it represented the trade-related approach to balance of payments and reserves needs

$$RA = R_s/M \quad (1)$$

where

RA=Reserves adequacy

R<sub>s</sub>=Reserve stock

M= Imports

The limitation of this measure was proved by the Asian experience which was characterized by capital reversal that could not be backed by the available reserve, resulting in a bail-out by the IMF to avert the contagion effects which moved towards a total destabilization of the international financial system. Empirically, massive capital outflows have been associated with short-term debt outstanding rather than trade financing. Therefore, it has been suggested that

the size of the reserves of emerging market economies should be related to their short-term external debt outstanding.

Pablo (1999) and Greenspan (1999) advocated for a new minimum reserves stock benchmark using short-term emerging market debts as well as the current account deficit as measure of reserves adequacy. The short-term debt outstanding should be of maturity less than one year.

$$RA = R_s/M + Dt \quad (2)$$

where  $Dt$  =short term debt

Kaminsky (1999) employed the monetary aggregates and measured reserves adequacy as the ratio of broad money ( $M2$ ) to the stock of reserves. They considered this as an accurate predictor of crises. De Beaufort Wijnholds and Kapteyn (2001) also revealed the monetarist approach to reserves adequacy by linking reserves to broad money. Increased money stock was expected in an import-dependent economy to translate to increased imports which would drain the reserves. For them the ratio of the money stock to reserves could be a guide to the measurement of reserves adequacy in any country. Unlike the traditional model, adequate threshold was not established in this model.

$$RA = R_s/M2 \quad (3)$$

where  $M2$  =aggregate money stock

### II.2.2 The Buffer Stock Model

The buffer stock model posits that the authorities select the stock of reserves by establishing the trade-off between the macroeconomic costs of future depletion of reserves and the current accumulation. This precautionary optimal reserves management is based on the minimization of the total cost of financing and adjusting to external shocks. The proponents included Heller (1966), Hamada and Ueda (1977) and Frenkel and Jovanovic (1981).

Specifically, the Frenkel and Jovanovic (1981) stochastic model adopted a rigorous quantitative approach in deriving the optimal reserves based on the outcomes of restocking financial transactions. Their optimizing equation was presented as:

$$R_t = -\mu dt + \sigma dW_t \quad (4)$$

where  $R_t$  represents external reserves,  $W_t$  is a Wiener process with a mean of zero and variance  $t$ . At any given time the distribution of the reserves holdings is expected to be.

$$R_t = R_0 - \mu t + \sigma W_t \quad (5)$$

where  $R_0$  is the optimal initial stock of reserves,  $\mu$  is a drift parameter and  $\sigma$  is the standard deviation of the Wiener reserves increment.

In their exposition, optimal reserves management like the management of most financial assets involves the selection of the cost minimizing stocks with a lower band, set here at zero. Since reserves holdings follow a stochastic process, the authorities are assumed to select the initial level of reserves  $R_0$  that minimizes total expected costs. Costs here have two interrelated dimension which are influenced by opportunity cost of reserves holdings and the adjustment cost of reserve restocking within the lower band. Thus, optimal reserves level will drift between  $\mu$  and zero.

As a product of a stochastic process, this model is faced with the problem of exact predictability because the random factors could be unforeseen macroeconomic shocks and financial assets volatility, which are difficult to estimate. The technicality of the model poses a major limitation to its wide usage.

### **II.2.3 Integrated Model (Reserves Drainer Approach)**

A more adaptable model by Shcherbakov (2002) based on the Russian experience examined the totality of foreign exchange outflows as major "drainers" of external reserves. He identified three basic variables that should be considered in measuring reserves adequacy namely import bills, short-term debt payments and money base. Shcherbakov opined that once these variables are matched by available external reserves, then external shocks would be cushioned in any economy. The equation for optimal reserves level was given as.

$$RA = I + D + M \quad (6)$$

where:

RA = Reserves adequacy in year  $t$

I = Value of imports in year  $t$

D = Debt service payments in year  $t$

M = Base money in year  $t$

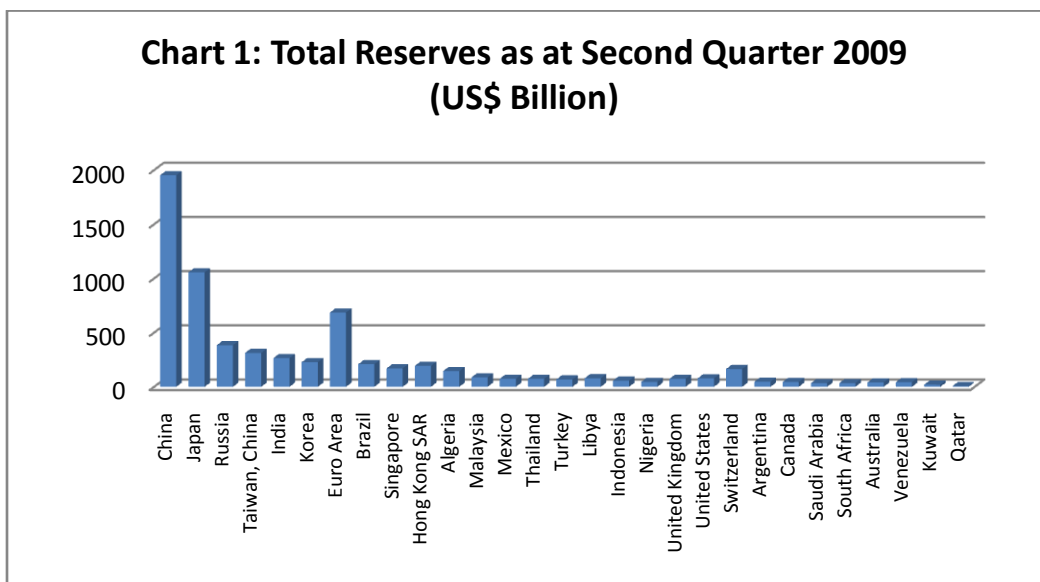


The advantages of this model over the previous ones included its simplistic nature and, therefore, ease of adoptability, and its comprehensiveness, as it did not only measure trade financing but combined short-term debts and the monetary base. After a review of the various models for estimating reserves adequacy, Shcherbakov's simplistic procedure was adopted in estimating Nigeria's data because of its broad base and the recognition of shocks.

### III. Trends in External Reserves Accumulation

#### III.1 Global Perspective

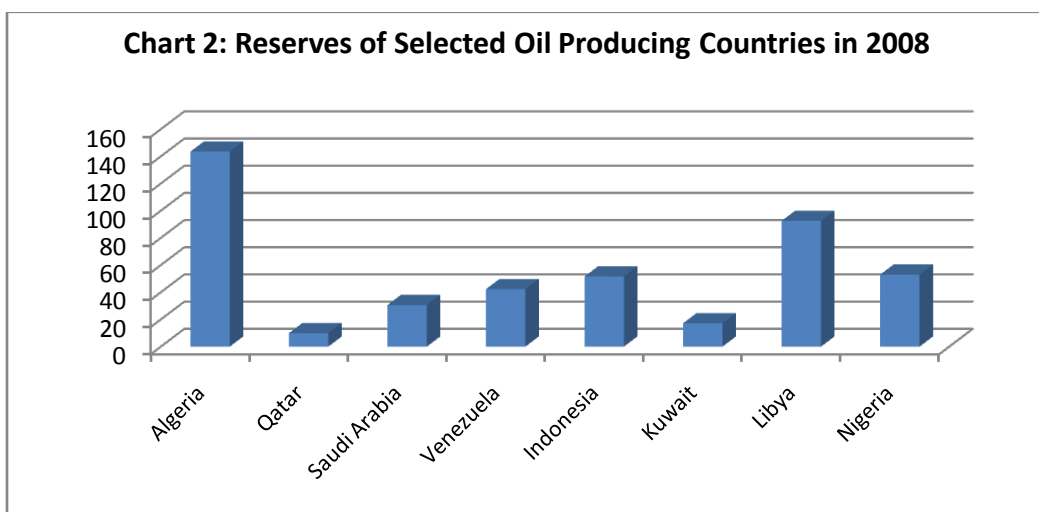
Global external reserves have increased significantly since the 1990s with most emerging market economies accumulating external assets as a precautionary measure against the increased capital flows into their economies. China, Japan and Euro area ranked first, second and third, respectively, in the stock of reserves as at end-June 2009 (Table 4). The accumulation of reserves was clearly visible from 2000. For instance, the stock of China's external reserves was US\$28.6 billion in 1990, it increased to US\$154.7 billion in 1999 and skyrocketed to US\$1.95 trillion by June 2009. Similar trend was experienced for Japan and Russia with the stock of external reserves growing from US\$277.7 billion in 1999 to US\$1.06 trillion in 2009, while for the Euro area, the stock grew from US\$203.2 million in 2007 to US\$685.4 million by end-June 2009. Analysis for selected emerging market economies and the oil producing countries revealed that growth in reserves in 2007 were above a 100 per cent for all the countries, ranging from 106.8 per cent for Venezuela to 2404.6 per cent for Algeria (Table 5 and Chart 1).



Source: Authors, based on analysis of data from IMF

### III.2 Oil Producing Countries

An analysis of reserves accumulation by some selected countries revealed an upward trend for most oil-producing countries for the period 1999 through 2002, except for Venezuela, which recorded a decline in the stock of foreign exchange reserves. The increase in foreign reserves ranged from 4.1 per cent for Brazil to a high of 450.0 and 423.8 per cent for Algeria and Russia, respectively. The stock of foreign exchange reserves in Nigeria for 1999-2002 increased by 42.6 per cent. In the period 2002 through 2007 when oil prices soared, the upward trend in reserves accumulation was sustained with Nigeria's reserves growing by 267.5 per cent while Kuwait, an oil-producing country, recorded a negative growth of 3.3 per cent. In this period other oil producing countries such as Russia, Qatar, Venezuela, Libya and Algeria recorded increases of 253.9, 181.3, 181.2, 176.2 and 123.8 per cent, respectively (Table 6). Consequently, the reserves accumulation is not peculiar to Nigeria but has become a global phenomenon.



**Source:** Authors, based on analysis of data from IMF

#### III.3.1 ASEAN Plus Three

The experience of the 1997-98 Asian financial crisis provided a driving force for the ten Association of South East Asian Nations (ASEAN) countries together with China, Japan and Korea known collectively as ASEAN Plus Three (APT) to engage in regional cooperation. They agreed to pool currency reserves via a network of bilateral currency swaps and repurchase agreements to provide liquidity support to assist currency crisis and avert future financial crises. They were of the opinion that the arrangement would strengthen financial integration without sacrificing monetary independence in the respective member countries. A member country

in crisis can draw on “tiers of liquidity” as defense lines, utilizing owned reserves placed with the regional pool and other members’ reserves with the pool.

### **III.3.2 India**

In 1993 India adopted the market-based system of exchange rates when the current account recorded a surplus. As a result of measures initiated to liberalize capital inflows, India's foreign exchange reserves increased from US\$6 billion at end-March 1991 to over US\$155 billion by mid-2006 to US\$276 billion at end-December 2008. India's foreign exchange reserves were among the highest in the world after China and Japan. The accumulation of foreign exchange reserves could be explained mainly by three factors: the size of the economy, its vulnerability to the current and capital accounts shocks and exchange rate flexibility. The increasing financial integration in global markets and the pace of movement of capital were considerations for reserves accumulation in defense of any financial crisis caused by reversals in capital flows. These have become important factors for accumulating foreign exchange reserves in most emerging economies.

### **III.4 Consequences of Reserves Accumulation**

Reserves accumulation like most economic policy measures has its costs and risks as well as benefits. The benefits and reasons for reserves accumulation have been treated, but the adverse consequences include market risks, the cost for monetary stability and financial risk.

#### **III.4.1 Market risk**

High reserves holdings might increase market risk notably currency and interest rate risks, resulting in potential capital losses on the balance sheet of the monetary authority. When a particular foreign currency dominates reserves holdings of a country, a depreciation of such currency could lead to sizable capital losses. A good example is Nigeria's reserves holdings; with substantial portion denominated in the US dollar, persistent depreciation of the US dollar would have a serious implication on the value of the stock of Nigeria's reserves holdings. Also a low or zero interest rate on investment as adopted in the wake of the global financial melt-down of 2008 will surely affect the rate of returns on investment on reserve assets of countries currently accumulating external reserves. This will certainly lower the income profile of most independent central banks which could affect the operations of these banks. For instance, income earned by Nigeria on external reserves declined by 8.3 per cent from US\$ 2.04 billion in 2007 to US\$1.87 billion at end-2008.

### **III.4.2 Monetary Stability**

Reserves accumulation could result in a delicate balancing between exchange rate stability and further accumulation when the huge reserves are used to defend the currency as well as the continued pressure to ease monetary conditions. If inappropriate easing of monetary conditions is adopted, the resultant effect will be inflation and other macroeconomic bubbles, which will make it difficult for central banks to manage the money market. These would impinge on macroeconomic stability and on the achievement of set targets in the monetary programmes.

### **III.4.3 Financial Markets Risk**

The sterilization of accumulated external reserves in most developing countries with less developed market-based policy instruments is injurious to internal financial stability especially to the financial market. When central banks, in order to control credit expansion, issue huge bills for sterilization, they often resort to increasing reserve requirements and use of non-market instruments like credit rationing. These have their costs and may lead to inefficient capital allocations especially if non-market instruments are deployed. Credit and interest rates become administered and the credit crunches have fiscal costs which are transferred to the banking sector and eventually to the bank customers' stockholders.

Despite the downside risks of holding external reserves the associated benefits include the ability of offering the central bank's enough intervention funds for the foreign exchange market as well as serving as security against external shocks. It could also be used as collateral for external borrowing.

## **IV. Estimation and Analysis of Reserves Adequacy for Nigeria**

Estimating optimum level of reserves adequacy has undergone different approaches since the aftermath of the Asian financial crisis. Some of the earlier approaches adopted to measure reserves adequacy by most developing countries include reserves to imports, to measures of external debt and to money aggregates, but most countries seem to favour reserves to imports ratio which make three months of import cover deemed appropriate (Triffin 1947; Kaminsky 1999). However, frequent and unpredictable macroeconomic adjustments induced by external shocks and short-term capital reversal have rendered individual use of these measurements less appropriate (Shcherbakov, 2002).

A more versatile approach of reserve adequacy was proposed by Greespan (1999); he used stochastic tests to identify the vulnerability of balance of

payments, nevertheless, the approach suffer a major set-back because it is difficult to apply to the existing data. Shcherbakov (2002) observes that appropriate level of reserves must cover balance of payments vulnerability, i.e. current account transactions (imports), external debt structure and the risks of residents' capital flight in a less developed financial market and uncertain macroeconomic environment.

We estimated optimum level of reserves adequacy for Nigeria using a combination of reserves adequacy measurements identified by Shcherbakov (2002) which estimated the level of international reserves adequacy using the major outflows which he termed the "drainers" of reserves. However, minor adjustments were made to make the model adoptable in the Nigerian context. The approach enjoy major advantages over the previous ones for two main compelling reasons, its simplistic nature thus the ease of adaptability for Nigeria and the model is very comprehensive as it did not only measure trade financing but combined short-term debt and the money base reserves adequacy.

#### **IV.1 The Adjusted Model for Nigeria**

##### **IV.1.1 Determinants of Reserve Accumulation in Nigeria**

External reserves are foreign currency assets that are available to the monetary authority for intervention purposes in order to stabilize the value of the domestic currency. Trends in external reserves accumulation in Nigeria have been influenced by a number of factors which include the movement in crude oil prices, import bills and debt service payments. During the period 1992-2003, reserves accumulation averaged US\$6.12 billion and was driven by the relatively lower crude oil prices at the international market, huge debt servicing profile and high import bills. All these, drastically reduced the ability of the monetary authority to build-up external reserves. For instance, the average price of crude oil for this period was US\$18.48 per barrel, import bills averaged US\$9.87 billion while debt service payments averaged US\$1.75 billion (Table 1).

**Table 1: Nigerian Debt Service Payments, Imports and Crude oil Prices**

Years	Crude Oil Price (US\$ Billion)	Debt Service (US\$ Billion)	Imports (US\$ Billion)
1992	19.04	2.39	7.2
1993	16.79	1.77	7.51
1994	15.95	1.84	7.44
1995	17.2	1.62	9.32
1996	20.37	1.88	6.92
1997	19.27	1.64	10.36
1998	13.07	1.27	9.99
1999	17.98	1.72	9.31
2000	28.23	1.72	9.65
2001	24.33	2.13	12.13
2002	24.95	1.17	12.5
2003	28.89	1.81	16.08
2004	37.76	1.75	14.88
2005	53.35	7.57	21.19
2006	64.27	6.73	22.63
2007	71.13	1.02	30.44
2008	97.04	0.44	36.89
2009	61.78	0.43	28.76

**Source:** Authors, based on analysis of data from Central Bank of Nigeria

**Table 2: Nigerian Foreign Exchange Flows and Reserves Level**

Years	Inflow (US\$ Billion)	Outflow (US\$ Billion)	Net flow (US\$ Billion)	Actual Reserves (US\$ Billion)
1992	8.45	10.19	-3.35	1.55
1993	7.51	7.42	0.33	3.05
1994	6.07	6.34	0.21	9.01
1995	9.52	21.36	-11.99	1.84
1996	13.05	18.37	5.42	3.4
1997	14.98	11.23	3.48	7.22
1998	10.16	11.6	-2.19	7.11
1999	10	10.88	1.51	5.44
2000	18.07	12.9	3.93	9.39
2001	19.34	15.69	0.98	10.27
2002	15.01	13.76	3.35	7.68
2003	23.38	17.9	0.73	7.47
2004	35.4	15.85	9.63	16.96
2005	51.24	24.84	10.77	28.28
2006	58.72	24.72	12.41	42.3
2007	74.05	26.04	11.2	51.33
2008	106.8	47.17	2.28	53
2009	67.26	36.51	-10.75	42.38

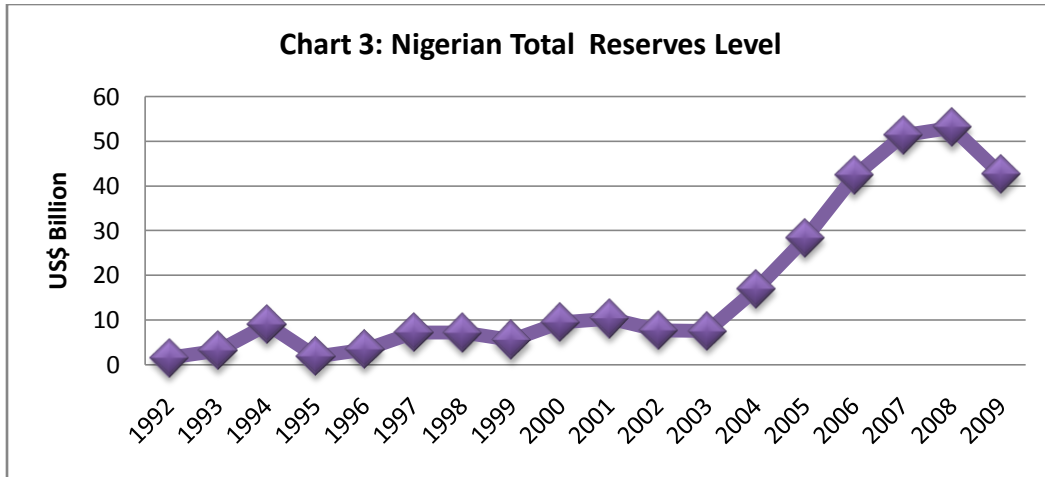
**Source:** Authors, based on analysis of data from Central Bank of Nigeria

**Table 3: Nigerian Actual Reserves, Reserves Adequacy and Reserves Gaps**

Years	Actual Reserves (US\$ Billion)	Estimated Reserves (US\$ Billion)	Reserves Gaps (US\$ Billion)
1992	1.55	9.6	-8.04
1993	3.05	19.74	-18.31
1994	9.01	22.01	-13
1995	1.84	23.65	-22.04
1996	3.4	9.7	-6.3
1997	7.22	12.16	-4.94
1998	7.11	36.43	-29.33
1999	5.44	11.03	-5.59
2000	9.39	18.42	-9.04
2001	10.27	19.74	-9.47
2002	7.68	19.08	-11.4
2003	7.47	18.84	-11.37
2004	16.96	25.99	-9.03
2005	28.28	28.76	-0.48
2006	42.3	33.25	9.05
2007	51.33	35.95	15.37
2008	53	50.38	2.62
2009	42.5	41.78	0.69

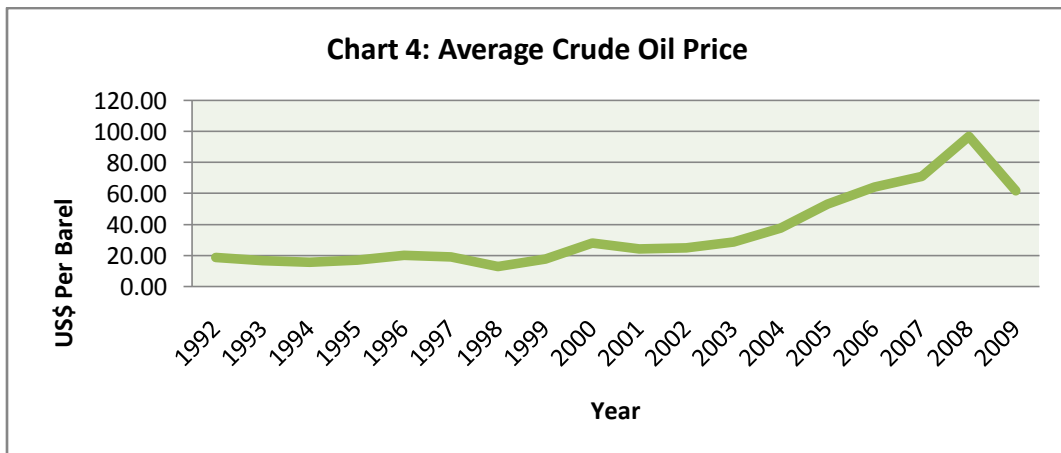
**Source:** Authors, based on analysis of data from Central Bank of Nigeria





Source: Authors, based on analysis of data from Central Bank of Nigeria

In 2004 through mid-2008, reserves accumulation rose consistently from US\$16.96 billion in 2004 to US\$28.28 billion, US\$42.30 billion, US\$51.33 billion, and US\$53.00 billion in 2005, 2006, 2007 and 2008, respectively. The significant accretion to reserves during these periods was mainly driven by high crude oil prices that reached the peak of US\$147.1 per barrel in July 2008. Other complementary factors include decrease in the foreign debt stock due to debt forgiveness and prudent macroeconomic management that moderated import bills and reduced capital outflows during the periods (Table 2 & 3).



Source: Authors, based on analysis of data from World Bank

The upward tempo in reserves accumulation was not sustained in the later part of 2008, due to the second-round effects of the global financial and economic

crises. External reserves trended downward from US\$53.00 billion in 2008 to US\$42.38 billion in 2009. The reversal was also due to the drastic fall in crude oil prices at the international market and huge capital outflows from the domestic stock market by foreign portfolio investors.

In Nigeria, the appropriate level of reserves requires identification of major drainers of reserves or most vulnerable items in the balance of payments. The Nigerian economy is susceptible to high variations of exports prices due to the frequent changes in crude oil prices at the international market. Also, debt service repayments constituted significant portion of reserves drainer prior to the debt forgiveness of 2007. Annual debt servicing varied from US\$1.5 billion to US\$ 2.0 billion which constituted below 70.0 per cent of the scheduled debt servicing profile with the reminder capitalized annually. In addition, debt servicing constituted 10.5 per cent of total outflows during 2000 – 2009. Imports, through the funding at the foreign exchange market, have remained a major source of outflows or 'drainer' of reserves. Funding of imports through the CBN constituted 87.2 per cent of foreign exchange outflows in 2000 – 2009. With these considerations, we deem it appropriate to include imports bills and short-term debt repayments in modeling reserves adequacy in Nigeria.

The economy is also exposed to unpredictable capital flows, high volatility of the domestic currency and frequent macroeconomic adjustments which often cause some level of uncertainty in domestic economy and external imbalance. This condition may exacerbate capital flight. Shcherbakov (2002, pp.3) noted that '*additional uncertainty induced by any balance of payments problem may trigger off another balance of payments problems*'. In Nigeria a sudden fall in commodity exports prices such as crude oil prices may trigger or create uncertainty about the economic conditions which in turn may induce capital flight from the domestic economy.

Shcherbakov defined capital flight as part of base money that would be exchanged for foreign assets if resident lose their confidence in the domestic economy due to currency and macroeconomic uncertainty. Basically, two measurements methods were suggested which include, first, comparing the ratio of M2 to GDP in the crisis and the reporting periods. Second, identifying the most liquid part of the base money, that household could exchange for foreign currency, due to macroeconomic and currency uncertainty in the domestic economy. These measures of base money reserves adequacy point to the fact that residents do exchange their domestic assets for foreign assets due to uncertainty in the domestic economy which could be termed capital flight.

Englama, et al. (2007) termed capital flight as a situation where residents exchange their domestic assets for foreign assets due to wrong fundamentals and uncertainty in the domestic economy to avoid extremely high losses. Consequently, we considered capital flight as a key variable in the estimate of appropriate level of reserves for Nigeria. A supportive reason for adopting the estimated capital flight in the model is that the money-base measure if represented by the net foreign assets (NFA) might be misleading since for the monetary authority these assets have already been captured in the reserve assets and cannot be assumed to be drainers or sources of outflows.

#### **IV.1.2 Model Specification and Sources of Data**

The choice of variables for the estimation was, therefore, based on the foregoing deductions from the drivers of reserves accumulation. The study integrated the three measures of reserves adequacy, namely, debt, imports and part of base money or capital flight to model the appropriate reserves adequacy for Nigeria. It used annual data for the period 1993 to 2008. All the data required were obtained from the various issues of the CBN Statistical Bulletin and Annual Reports and extracts from Englama, et al. (2007). The model equation is as presented below:

$$RA = I + D + M \quad (7)$$

where:

RA = Integral measure of reserves adequacy in year t

I = Import-based measure of reserves adequacy in year t

D = Debt-based measure of reserves adequacy in year t

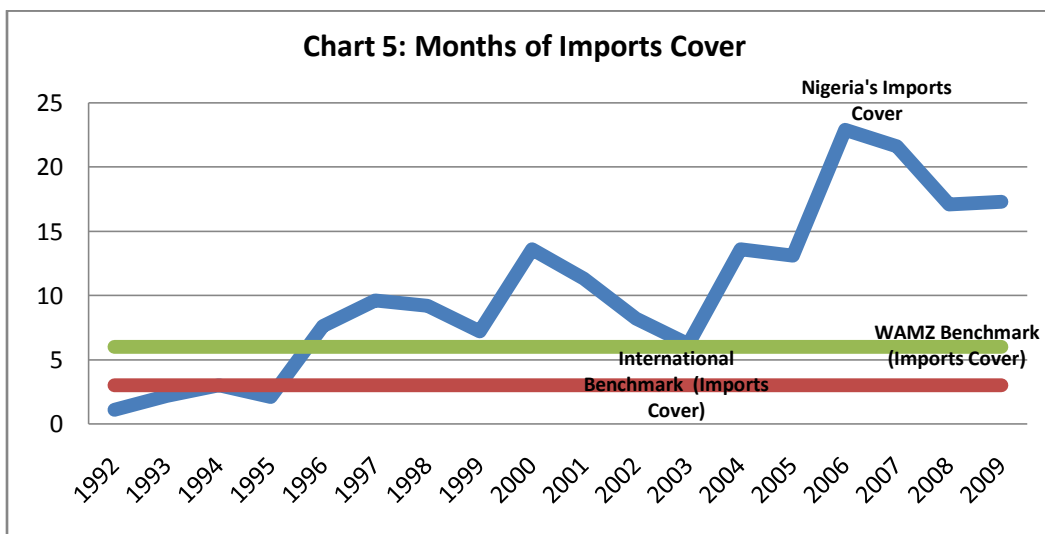
M= Money-based measure of reserves adequacy in year t

The (I), which represents import-based measurement of reserves adequacy for year t was derived from the CBN statistical bulletin using the import value for each year. Also, debt-based measurement of reserves adequacy (D) covered all debt service repayments for a particular year, the values of which were obtained from the CBN annual report for various issues. In the third component of reserves adequacy measure, money-based measurement, we simply leveraged on the study conducted by Englama, et al. (2007) which had estimates for capital flight for Nigeria from 1971 to 2006. The capital flight model was also updated to generate the estimates for the periods 2007 to 2009. The estimates of capital flight from 1992 to 2009 were used to represent the measure of base money reserves adequacy for these periods in this study. The estimate of capital flight was taken for each year, but for the periods when there were inward capital reversals, we assume zero capital flight in such periods.

## IV.2 Analysis of Results

### IV.2.1 International Benchmark of Three Months Import Cover

The analysis of reserves adequacy using the international benchmark of three-months of import cover revealed that the levels of external reserves were far in excess for most of the period except for 1992, 1993 and 1995. This judgment may be misleading if considered along the line of models of the 1990's. Similarly, if the West African Monetary Zone (WAMZ) convergence benchmark of six months is applied, the level of external reserves for Nigeria could be adjudged to be adequate except for 1992, 1993 and 1995, which would also be misleading if all external payments were considered (Table 7).

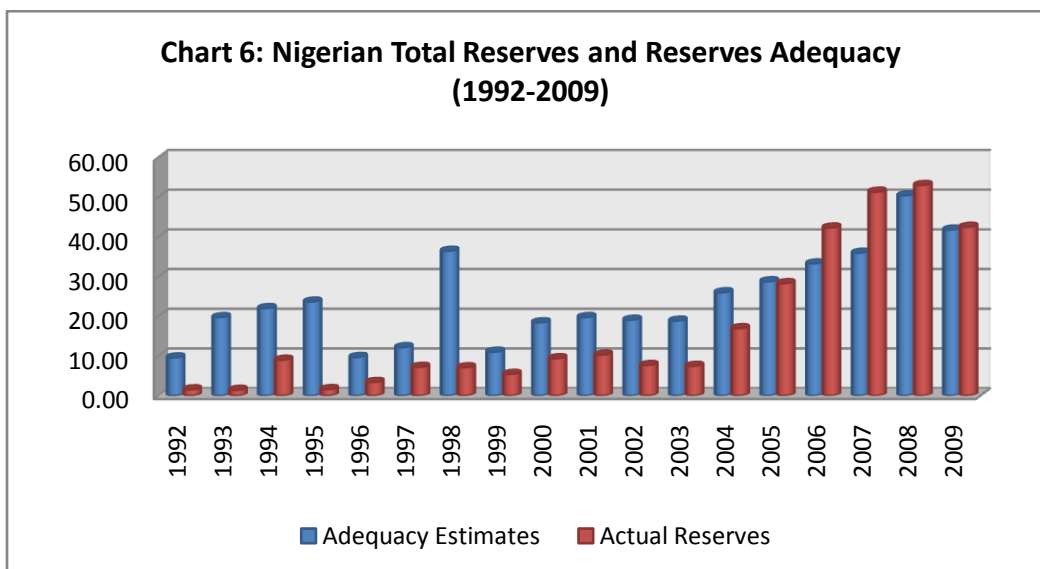


**Source:** Authors, based on analysis of data from Central Bank of Nigeria

Applying this measure, reserves in most of the year were adequate. However, considering the vulnerability of Nigeria's foreign exchange inflows to the vagaries of external shocks especially from the volatility of crude oil price shock, other external liabilities and the level of uncertainties associated with the domestic economy these measures of three or six months of imports cover as noted in the current literature, will underestimate reserves adequacy for Nigeria. Consequently, we intend to establish especially within the context of the events that followed the global financial crisis and the commodity price shocks of 2007/2009 that more level of reserves are required to withstand negative global commodity price shocks.

### IV.2.2 Findings from the Estimated External Reserves Using the Integrated Model

Analysis of the estimated reserves adequacy level revealed that there have been shortfalls despite the assumed high levels of accumulations since 2005. In the period 1992-2005, the estimated reserves adequacy using the integrated model revealed that the actual reserves with the CBN were inadequate to meet all the country's external obligations. However, from 2006 through 2009 external reserves were in excess of actual reserves especially in 2006 and 2007. The actual reserves were in excess of the estimated external reserves to the tune of US\$9.1 billion, US\$15.4 billion, US\$2.6 billion and US\$0.7 billion in 2006, 2007, 2008, and 2009, respectively (Table 3 and Chart 6). The development was due to the sustained increase in inflows both from oil and autonomous sources which helped total reserves level to exceed the estimated trigger level or adequacy level. The rate of reserves accumulation dropped drastically in 2008 as a result of the lower crude oil prices, huge import bills, repatriation of dividend by foreign direct investment enterprises as well as capital reversal by foreign portfolio investors occasioned by the global financial and economic crises.

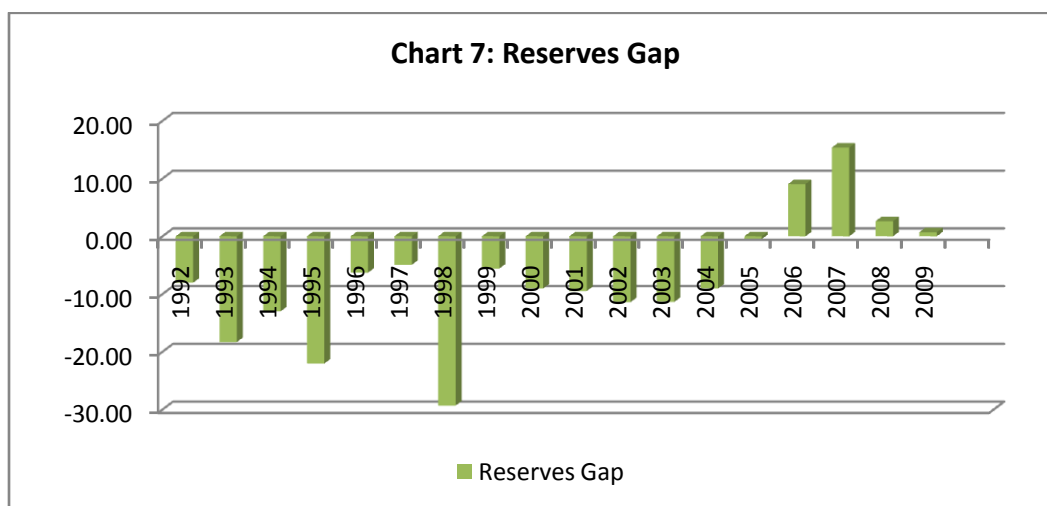


**Source:** Authors, based on analysis of data from Central Bank of Nigeria

### IV.2.3 Analysis of External Reserves Gap

The gap analysis, measures the difference between the actual external reserves with the central bank and the model estimated reserves adequacy level. In the period 1992 – 2004, a negative gap position was recorded showing that the actual reserves levels were below the trigger points which represented the economy's adequacy levels. Huge differences were recorded in 1993, 1996 and

1998. An earlier study by Englama, et al. (2007) showed that these periods were commonly associated with huge capital flights. For instance, their estimated capital flight during 1993, 1994, 1995 and 1998 were US\$10.5 billion, US\$12.7 billion, US\$12.7 billion and US\$25.2 billion, respectively. The huge capital flight especially between 1993 and 1995 was attributed to the policy slippage to a control regime in 1994 which sent wrong signals to investors, as well as to the political uncertainty caused by the annulment of the June 12, 1993 elections (Table 3 and Chart 7).



**Note:** Reserves gap is the difference between actual reserve and estimated reserve adequacy

**Source:** Authors, based on analysis of data from Central Bank of Nigeria

However, from 2005 the trend revealed positive gap outcomes with a peak in 2007, thereafter; it started declining due to the low rate of reserves accumulation. During this period, the actual external reserve was greater than the estimated adequacy level.

### IV.3 Inference from Current Global Meltdown

In Nigeria, the initial pass-through of the global financial crisis was via commodity prices. The collapse in commodity prices, especially crude oil prices from an all-time high of over US\$147.1 per barrel in July 2008 to an average of US\$59.98 per barrel in the last quarter of 2008, reduced export earnings and government's revenue. The foreign exchange market witnessed severe demand pressures occasioned by the divestment and repatriation of capital and dividend by foreign portfolio investors.

The increased outflows in the last quarter of 2008, coupled with reduced inflows, resulted in de-accumulation of external reserves, aggravated capital flight, which

in turn eroded the confidence in the foreign exchange market, thereby, causing panic foreign exchange purchases and increased demand pressures. If the fall in commodity prices persist especially the price of oil at the international market without adequate diversification of the economy from oil, the demand pressures in the foreign exchange market might be sustained which could drastically drawdown the foreign reserves in 2010 and beyond. This would adversely affect the comfortable reserve adequacy level achieved during 2006 through 2008.

#### **V. Concluding Remarks**

The study has attempted to model the optimum level of reserves adequacy for Nigeria using annual data from 1992-2009. The result from the adjusted model shows that the actual reserves with the CBN were inadequate to meet all the country's external obligations especially from 1992 to 2005. The result further indicates that for four consecutive years, 2006 – 2009, actual reserves were in excess of the trigger level due to the surge in inflow from crude oil revenue that started since 2003. Further analysis of the results also show that the period of high negative reserves gaps were associated with the periods of high capital flight induced by the unfriendly investments environment and political instability. The study recommends sustenance of reserves accumulation, as it is in line with the global trends. In addition, accumulation of reserves could be further enhanced by curtailing factors that precipitate massive outflows.

**Table 4: Selected Country Total Reserves Accumulation**

<b>Country</b>	<b>Reserves 2007 (US\$ Billion)</b>	<b>Ranking 2007</b>	<b>Reserves 2008 (US\$ Billion)</b>	<b>Ranking 2008</b>	<b>Reserves 2ND QTR 2009</b>	<b>Ranking 2ND QTR 2009</b>
China	1528.3	1 <sup>st</sup>	1968	1 <sup>st</sup>	1953	1 <sup>st</sup>
Japan	948.4	2 <sup>nd</sup>	1011	2 <sup>nd</sup>	1056.7	2 <sup>nd</sup>
Russia	464	3 <sup>rd</sup>	427	3 <sup>rd</sup>	384	4 <sup>th</sup>
Taiwan, China	270.3	4 <sup>th</sup>	296.4	4 <sup>th</sup>	312.6	5 <sup>th</sup>
India	266.6	5 <sup>th</sup>	256.4	5 <sup>th</sup>	264.6	6 <sup>th</sup>
Korea	261.8	6 <sup>th</sup>	201.2	6 <sup>th</sup>	226.9	7 <sup>th</sup>
Euro Area	203.2	7 <sup>th</sup>	563.4	7 <sup>th</sup>	685.4	3 <sup>rd</sup>
Brazil	179.4	8 <sup>th</sup>	193.8	8 <sup>th</sup>	208.7	8 <sup>th</sup>
Singapore	162.5	9 <sup>th</sup>	174.2	10 <sup>th</sup>	170.1	10 <sup>th</sup>
Hong Kong SAR	152.7	10 <sup>th</sup>	182.5	9 <sup>th</sup>	193.4	9 <sup>th</sup>
Algeria	110.2	11 <sup>th</sup>	143.5	11 <sup>th</sup>	145.4	12 <sup>th</sup>
Malaysia	100.6	12 <sup>th</sup>	91.2	15 <sup>th</sup>	87.1	14 <sup>th</sup>
Mexico	86.3	13 <sup>th</sup>	95.3	13 <sup>th</sup>	74.1	17 <sup>th</sup>
Thailand	85.1	14 <sup>th</sup>	111	12 <sup>th</sup>	73.9	13 <sup>th</sup>
Turkey	73.4	15 <sup>th</sup>	73.7	18 <sup>th</sup>	67.7	19 <sup>th</sup>
Libya	79.4	16 <sup>th</sup>	92.5	14 <sup>th</sup>	79	15 <sup>th</sup>
Indonesia	54.7	17 <sup>th</sup>	51.6	21 <sup>st</sup>	56.6	20 <sup>th</sup>
Nigeria	51.3	18 <sup>th</sup>	53	19 <sup>th</sup>	45	22 <sup>nd</sup>
United Kingdom	49	19 <sup>th</sup>	53	29 <sup>th</sup>	73.9	18 <sup>th</sup>
United States	45.8	20 <sup>th</sup>	77.7	16 <sup>th</sup>	78.6	16 <sup>th</sup>
Switzerland	44.5	21 <sup>st</sup>	74.1	17 <sup>th</sup>	164	11 <sup>th</sup>
Argentina	44.2	22 <sup>nd</sup>	46.4	22 <sup>nd</sup>	46.4	21 <sup>st</sup>
Canada	41	23 <sup>rd</sup>	43.9	23 <sup>rd</sup>	44.9	23 <sup>rd</sup>
Saudi Arabia	32.3	24 <sup>th</sup>	30.6	27 <sup>th</sup>	34	26 <sup>th</sup>
South Africa	29.6	25 <sup>th</sup>	34.1	25 <sup>th</sup>	34	27 <sup>th</sup>
Australia	24.8	26 <sup>th</sup>	32.9	26 <sup>th</sup>	40.9	25 <sup>th</sup>
Venezuela	24.2	27 <sup>th</sup>	42.3	24 <sup>th</sup>	42.6	24 <sup>th</sup>
Kuwait	16.7	28 <sup>th</sup>	17.2	28 <sup>th</sup>	19.6	28 <sup>th</sup>
Qatar	9.4	29 <sup>th</sup>	9.9	29 <sup>th</sup>	6.4	29 <sup>th</sup>

Source: International Financial Statistics



**Table 5: Foreign Exchange Reserves of Selected Countries (End-Period)**

	1990	1999	2007	% Change (1990 & 1999)	% Change (1999 & 2007)
China	28.6	154.7	1528.3	440.9	887.9
Japan	69.5	277.7	948.4	299.7	241.5
Russia	NA	8.5	464	NA	5358.8
Korea	14.5	73.7	261.8	409.7	225.2
India	1.2	32	266.6	2554.9	733.1
Malaysia	9.3	29.7	100.6	218.1	238.7
Singapore	27.5	76.3	162.5	177.1	113
Algeria	0.7	4.4	110.2	510.4	2404.6
Brazil	7.4	34.8	179.4	368.2	415.5
Qatar	0.6	1.2	9.4	118.6	691.7
Saudi Arabia	8.6	15.5	32.3	80.5	108.4
Venezuela	8.3	11.7	24.2	40.9	106.8
Indonesia	7.4	26.2	54.7	256.9	108.8
Kuwait	1.6	4.2	16.7	163	297.6
Libya	5.1	6.2	79.4	22.5	1180.7
Nigeria	3.9	5.5	51.3	41.1	832.7

Source: International Financial Statistics

**Table 6: Total Reserves of some Selected Oil Producing Countries (US\$ Billion)**

Year	Algeria	Qatar	Saudi		Indonesia	Kuwait	Libya	Nigeria
			Arabia	Venezuela				
1990	0.7	0.6	8.6	8.3	7.4	1.6	5.1	3.9
1991	1.5	0.6	9.7	10.4	9.2	3.1	4.9	4.4
1992	1.5	0.6	4.6	9.3	10.2	4.8	5.4	1
1993	1.5	0.6	5.7	8.5	11	3.9	NA	1.4
1994	2.7	0.6	5.9	7.4	11.8	3.2	NA	1.4
1995	2	0.7	7.1	5.7	13.3	3.3	NA	1.4
1996	4.2	0.6	12.8	11.1	17.8	3.2	NA	4.1
1997	8	0.8	13.5	14	16.1	3.1	NA	7.6
1998	6.8	1	12.7	11.6	22.4	3.5	6.2	7.1
1999	4.5	1.2	15.5	11.7	26.2	4.2	6.2	5.5
2000	11.9	1.1	18	12.6	28.3	6.5	11.4	9.9
2001	18	1.2	14.8	8.8	27	9.2	13.7	10.5
2002	23.1	1.4	16.7	8	30.8	8.4	13.2	7.3
2003	32.9	2.8	17.7	15.5	34.7	6.6	18.3	7.1
2004	43.1	3.2	23.3	17.9	34.7	7.3	24.3	17
2005	56.2	4.5	24.1	23.5	32.8	8.4	38.2	27.3
2006	77.2	5.3	26	28.9	40.7	12.2	57.9	42.3
2007	110.2	9.4	32.3	24.2	54.7	16.7	79.4	51.3
2008	143.5	9.9	30.6	42.3	51.6	17.2	92.5	53.0

**Source:** International Financial Statistics

**Table 7: Months of Imports Cover**

Years	Nigeria's Import Cover	International Benchmark (Imports Cover)	WAMZ Benchmark (Import Cover)
1992	1.1	3	6
1993	2.2	3	6
1994	3	3	6
1995	2.1	3	6
1996	7.6	3	6
1997	9.6	3	6
1998	9.2	3	6
1999	7.2	3	6
2000	13.6	3	6
2001	11.3	3	6
2002	8.2	3	6
2003	6.2	3	6
2004	13.6	3	6
2005	13.1	3	6
2006	22.9	3	6
2007	21.6	3	6
2008	17.1	3	6
2009	17.3	3	6

**Source:** Authors, based on analysis of data from Central Bank of Nigeria

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