

## Impact of Foreign Exchange Volatility on Imports: A Case of Nigerian Foreign Exchange Market (1987-2008)

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**Abstract** This study uses time series data obtained from the Central Bank of Nigeria statistical bulletin to examine the impact of Foreign Exchange rate volatility on the changes of SITC imports value in Nigeria under the three foreign exchange market regime. The parametric test shows that no significant relationship exist between exchange rate shocks of Naira and US dollar on the changes of imports value under autonomous foreign exchange market, the period under this regime witnessed the introduction of parallel market which ensure stability and at the same time create distortion in the Foreign exchange market. Moderately positive and highly negative significant relationship were found to exist between exchange rate volatility and changes in SITC imports value under second-tier Foreign Exchange Market (SFEM) and Inter-Bank Foreign Exchange Market (IFEM) respectively. It is recommended that the foreign exchange rate should be allowed to fluctuate but such must equally be controlled to exist within a defined range of rate.

**Key words** Foreign exchange rate; Imports; Second-tier Foreign Exchange Market (SFEM); Inter-Bank Foreign Exchange Market (IFEM); Autonomous Foreign Exchange Market (AFEM)

### 1 Introduction

The fundamental objectives of exchange rate policy in Nigeria are to preserve the value of the domestic currency, maintain a favorable external reserve position and ensure external balance without compromising the need for internal balance and the overall goal of macro-economic stability. In an attempt to achieve optimal level of foreign exchange efficiency, several policy guidelines and requirements were introduced to manage the nation foreign exchange market. Remarkable among the prominent policies emerged in 1986 upward when Nigeria shift to market oriented economy with view to promote productive sector and enhance the facilitation of foreign direct investment (FDI) influx into the country.

Prior to the introduction of Structural Adjustment Program (SAP) in 1986, Naira (Nigerian Currency) enjoyed appreciable value against US dollar a factor that creates opportunity for rapid economic growth and stability. With introduction of new economic program, the country began to suffer unstable exchange rate that cause a high degree of uncertainty in the Nigeria business environment. Domestic investors face enormous risk as no one, no matter how intelligent could predict the likelihood of the foreign exchange market performance. The situation must equally have an effect on importation level of the country. Nigeria as a developing country striving to develop its industrial base needs to harness its foreign exchange market to enable domestic investors import relevant machineries, equipments and raw materials for the industrial consumption.

Considerable size of literature discussed extensively about the effect of exchange rate volatility in relation to imports value, and how overvalued exchange rate affect developmental projects. According to Ekanem (2002) overvalued exchange rate can frustrate development efforts of import dependent economies to a large extent because critical imports needed for infrastructure and other development projects become more expensive. In reality, trade is determined by individual country's ability to export and the ability and desire to import. Huizinga (1997) reports that developing countries frequently maintain an overvalued nominal exchange rate resulting in real exchange rate misalignment. To finance import demand at the overvalued exchange rate, countries have to raise the level of income taxation or they have to resort to monetary finance. Mallic and Marques (2008) assert that changes in exchange rate can lead to a rise in import prices and thus spur overall inflation. Furthermore, the response of local-currency prices of imported products to changes in exchange rate may not be one-for-one, as has been in the case of many advanced markets. Interestingly, the study by Baek and Koo (2009) established that both the bilateral exchange rates and income in the United States and its trading partners are found to have significant impacts on U.S. agricultural exports and imports.

The present paper thus fills a gap in the literature; first, by investigating the effect of foreign exchange volatility on the value of imports for Nigeria as an enlarging market economy during 1987-

2008. Secondly, comparing the relative impact of the three foreign exchange regimes namely; SFEM, AFEM and IFEM on the imports value. Briefly, the remaining parts of the paper is structured as follows; section 2 deals with evolution of the foreign exchange market in Nigeria, section 3 presents methodology and model specification for the study while section 4 contains data presentation and analysis, section 5 concludes.

## 2 Evolution of the Foreign Exchange Markets in Nigeria

The evolution of the foreign exchange market in Nigeria could be traced to the establishment of the Central Bank of Nigeria (CBN) in 1958 and subsequent enactment of the Exchange Control Act of 1962. Prior to this period, foreign exchange earned by the private sector used to be held in balances abroad by commercial banks, which acted as agents for local exporters. Similarly, during the period agricultural exports contributed the bulk of foreign exchange receipts. The fact that the Nigerian pound was tied to the British pound sterling at par, with easy convertibility, delayed the development of an active foreign exchange market. With introduction of Naira as an official currency of Nigeria, the exchange process commenced.

However, the increased exports of crude oil, in the early 1970s, following the sharp rise in its prices enhanced official foreign exchange receipts. The foreign exchange market experienced a boom during this period and the management of foreign exchange resources became necessary to ensure that shortages did not arise. However, it was until 1982 that comprehensive exchange controls were applied as a result of foreign exchange crisis that set in that year. The increasing demand for foreign exchange at a time when the supply was shrinking encouraged the development of a flourishing parallel market for foreign exchange.

Before 1986, importers and exporters of non-oil commodities in Nigeria were required to get appropriate licenses from the federal ministry of Commerce before they could participate in the foreign exchange market. Generally, import procedures followed the international standard of opening of letters of credit (L/Cs) and subsequent confirmation by correspondent banks abroad. The use of form 'M' was introduced in 1979 when the comprehensive import supervision scheme (CISS) was put in place to guard against sharp import practices. The authorization of foreign exchange disbursement was a shared responsibility between the federal ministry of finance and the CBN. The federal ministry of finance had responsibility for public sector applications, while the CBN allocated foreign exchange in respect of private sector applications.

The exchange control system was unable to evolve an appropriate mechanism for foreign exchange allocation in consonance with the goal of internal balance. This led to the introduction of the second-tier foreign exchange market (SFEM) in September, 1986. Under SFEM, the determination of the Naira exchange rate and allocation of foreign exchange were based on market forces. To enlarge the scope of the foreign exchange market, bureau de change was introduced in 1989 for dealing in privately sourced foreign exchange. Additionally, the federal ministry of finance had its allocative powers transferred to the CBN.

As a result of volatility in rates, further reforms were introduced in the foreign exchange market in 1994. These included the formal pegging of the Naira exchange rate, the centralization of foreign exchange in the CBN, the restriction of bureau de change to buy foreign exchange as agents of the CBN, the reaffirmation of the illegality of the parallel market and the discontinuation of open accounts and bills for collection as means of payments sectors.

The foreign exchange market was liberalized in 1995 with the introduction of an autonomous foreign exchange market (AFEM) for the sale of foreign exchange to end-users by the CBN through selected authorized dealers at market determined exchange rate. In addition, bureau de change were once more accorded the status of authorized buyers and sellers of foreign exchange. The foreign exchange market was further liberalized in October 1999 with the introduction of an inter-bank foreign exchange market (IFEM).

The core objective of this paper is to evaluate the impact of foreign exchange volatility on imports under the three distinguished foreign exchange regimes. Using US dollar exchange rate to Naira, which officially applied as pegging rate, the following hypothesis were formulated:

H<sub>1</sub> – The changes in value of SITC imports in Nigeria has no significant correlations with the changes in foreign exchange rate under second-tier foreign exchange market regime.

H<sub>2</sub> – The changes in value of SITC imports in Nigeria has no significant correlation with the changes in foreign exchange rate of Naira per US dollar under autonomous foreign exchange market

regime.

H<sub>3</sub> – The changes in value of SITC imports in Nigeria has no significant correlation with the changes in foreign exchange rate of Naira per US dollar under inter-bank foreign exchange market regime.

### 3 Methodology and Models Specification

In this study, annually time series data were extensively utilized to investigate the relative contribution of exchange rate volatility into changes in unit values of imports. The assumption proposed is that whenever there is exchange rate appreciation cost of imports escalates thereby inducing inflation. In articulating the total value of imports, aggregate values of SITC imports (i.e. standard international trade classification) comprising of machinery, manufactured goods, chemicals, miscellaneous manufactured goods and miscellaneous transactions were sourced and computed from Central Bank of Nigeria (CBN) statistical bulletins. Equally too, data pertaining official exchange rate for the period of 1987-2008 were simultaneously obtained from the same source. The 22 years data-covering period is purposely conceived to concisely reflect period within which the foreign exchange market was liberalized by shifting from tight control regime to market-oriented regime. This led to the implementation of the three main reforms. Firstly, the introduction of second tier – foreign exchange market (SFEM) from 1986-1994. Secondly, replacing SFEM by introducing Autonomous Foreign Exchange Market from 1995-1999 a development that create parallel market where dual exchange rate policy was implemented. Thirdly, AFEM was abrogated and inter-bank foreign exchange market (IFEM) was introduced in 1999 to further achieve full scale market liberalization.

On the basis of these three fundamental reforms implemented in the Nigerian Foreign Exchange market, the below stated three models were derived from standard linear regression equation to conceptualize the relationship between exchange rate fluctuations and level of imports under each period of the reform regime. Using computed values of changes in exchange rate and changes in imports values, the research applies statistical software SPSS 17.0 to conduct the regression analysis and draw inferences from the time series data obtained over the three regime periods.

$$IV_s = a + bER_s + \mu \tag{1}$$

$$IV_A = a + bER_A + \mu \dots \tag{2}$$

$$IV_I = a + bER_I + \mu \tag{3}$$

Where:

IV<sub>s</sub> = Imports Value under second-tier foreign exchange market SFEM

ER<sub>s</sub> = Exchange rate under second-tier foreign exchange market SFEM

IV<sub>A</sub> = Imports value under autonomous foreign exchange market AFEM

ER<sub>A</sub> = Exchange rate under autonomous foreign exchange market AFEM

IV<sub>I</sub> = Imports value under inter-bank foreign exchange market IFEM

ER<sub>I</sub> = Exchange rate under inter-bank foreign exchange market IFEM

a & b = Predictors (Estimators)

μ = Stochastic error-term

### 4 Data Presentation and Analysis

Table 1, 2 and 3 below clearly present the data computed from CBN statistical bulletin from 1987-2008 explaining the changes in imports value that occurred as a result of the changes in foreign exchange rate per US dollar. Even though the value of imports kept on rising, it still fluctuates. The zero value of foreign exchange indicates stability while negative sign stands for fluctuation. From 1987 to 2008 the exchange rate of Naira (N) to US dollar (\$) appreciate from N4.0179 to N118.5669 indicating 2,850% overwhelming increase of the exchange rate, while the total value of imports skyrocket from N17.8617 billion in 1987 to N5,921.5 billion in 2008 indicating 33,350% phenomenal increase of imports value into Nigeria.

Figure 1 below depicts exchange rate volatility over the twenty-two year period. The chart illustrates all time highest positive exchange rate change of N70.7 and the all time highest negative change of N-7.3. This trend clearly shows a high degree of variability of exchange rate, which equally denotes high degree of volatility. In nutshell, it can be deduced that shift from control regime to market oriented regime of exchange rate pave way for high volatility of the foreign exchange market in Nigeria.

**Table 1 Imports Value and Foreign Exchange Rate Changes under SFEM**

Year	Official Exchange Rate (N=US\$1.00)	Change in Exchange Rate(Naira)	Value of Total SITC Imports (N Billion)	Change in Imports (N Billion)
1987	4.0179	1.997	17.8617	11.878
1988	4.5367	0.518	21.4457	3.584
1989	7.3916	2.859	30.8602	9.414
1990	8.0378	0.642	45.7179	14.858
1991	9.9095	1.872	87.0202	41.302
1992	17.2984	7.389	145.9114	58.891
1993	22.0511	4.753	166.1004	20.189
1994	21.8861	-0.165	162.7888	-3.311

Source :Computed from Central Bank of Nigerian Statistical Bulletin (2005)

**Table 2 Imports Value and Forex Exchange Rate Changes under AFEM**

Year	Official Exchange Rate (N=US\$ 1.00)	Change in Exchange Rate (Naira)	Value of Total SITC Imports (N B)	Change in Imports (N Billion)
1995	21.8861	0	755.1277	592.339
1996	21.8861	0	562.6266	-192.501
1997	21.8861	0	845.7166	283.090
1998	21.8861	0	837.4189	-8.298
1999	92.6934	70.867	862.5157	25.097

Source: Computed from Central Bank of Nigeria Statistical Bulletin (2009)

**Table 3 Imports Value Change and Forex Exchange Rate Change under IFEM**

Year	Official Exchange Rate (N-US\$ 1.00)	Change in Exchange Rate (Naira)	Value of Total SITC Imports(N Billion)	Change in Imports (N Billion)
2000	102.1052	9.412	985.0224	122.506
2001	111.9433	9.838	1,371.4091	386.387
2002	120.9702	9.027	1,457.0914	85.682
2003	129.3565	8.386	1,507.4228	50.332
2004	133.5004	4.144	1,638.3537	130.931
2005	131.6619	-1.839	2,496.4237	858.070
2006	128.8516	-2.810	3,412.1764	915.752
2007	125.8331	-3.019	4,381.9300	969.754
2008	118.5669	-7.267	5,921,4497	1,539.520

Source: Computed from Central Bank of Nigeria Statistical Bulletin (2009)

In order to make empirical analysis in this study, the concept of parametric statistics were used. It involves the computations of f-ratio and t-ratio to examine the fitness of the models. Statistically, a t-ratio of greater than 2 is perceived to be significant at 5% level. Similarly, a calculated f-ratio of greater than 1 signifies the model ability to predict the outcome variable. R<sup>2</sup> statistics explain the extent at which the dependent variable relates or associates with dependent variables. Lastly, the Durbin Watson statistics (DW) tells about whether the assumption of independent errors is tenable. In other words it explains whether the autocorrelation problem exist or not in a given model.

Table 4 presents linear regression equation  $IV_s = a + bER_s + \mu$  which defines the relationship between changes in foreign exchange rate and changes of imports value under second tier Foreign exchange regime. The moderate R<sup>2</sup> values of 0.62 indicates moderately significant relationship and means that 62% of the variations in the value of SITC imports is accounted by the changes in the exchange rate while the remaining 38% variations unable to be explained by the model are captured by the stochastic error term.

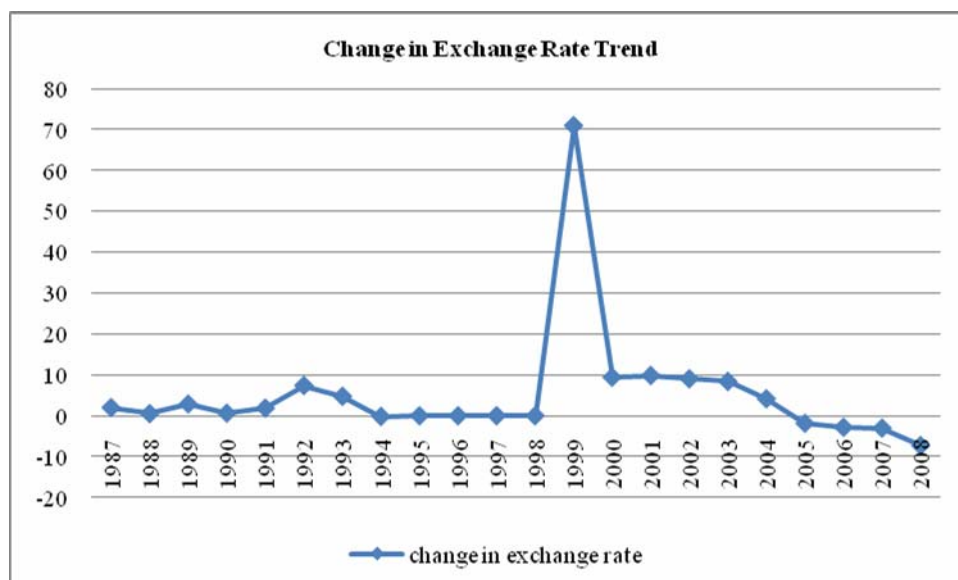


Figure 1 Change in Exchange Rate Trend (Naira Per US dollar)

Table 4 Model 1.  $IV_s = a + bER_s + \mu$

Model	Unstandardized coefficient		t-value	Significance
	B	Standard Error		
Constant	4.034	7.012	0.575	0.586
ER <sub>SFEM</sub>	6.130	1.979	3.097	0.021

Dependent variable:  $IV_{SFEM}$ ,  $R^2 = 0.62$ ,  $R^2$  adjusted = 0.55, F-Value = 9.59, DW = 1.39

Furthermore, the computed value of f-ratio and t-ratio of 9.59 and 3.097 are greater than critical values of f-ratio and t-ratio at 5% significance level, which stood at 5.59 and 1.895 respectively. In addition, the observed Durbin Watson (DW) is greater than and closer to 2 which means the model has no autocorrelation problem and therefore conclude that the above result is not biased. Base on these parametric statistics analysis the null hypothesis can be rejected and accept the alternative hypothesis that under second tier foreign exchange regime between 1987-1994, the exchange rate volatility had significant impact on changes to SITC imports in Nigeria. The positive **b** value of 6.130 indicates positive relationship; it means that every increase in the exchange rate per US dollar is associated with the increase of the value of SITC imports.

Table 5 Model 2.  $IV_A = a + bER_A + \mu$

Model	Unstandardized coefficient		t-value	Significance
	B	Standard Error		
Constant	168.658	171.84	0.981	0.399
ER <sub>AFEM</sub>	-2.027	5.427	-0.374	0.734

Dependent variable:  $IV_{AFEM}$ ,  $R^2 = 0.044$ ,  $R^2$  adjusted = -0.274, F-value = 0.140, DW = 2.705

Table 5 presents model 2 equation  $IV_A = a + bER_A + \mu$  denoting the relationship between changes in the foreign exchange rate and changes of imports values under Autonomous Foreign Exchange allocation arrangements. The low  $R^2$  value of 0.044 indicates weak relationship meaning changes in exchange rate accounted for only 4% variations in SITC imports during the period. Other parametric statistics tests show low values. The computed value of f-ratio and t-ratio of 0.140 and -0.374 are less than the critical values at 5% significance level figured at 5.32 and 1.860 respectively. This implies the acceptance of null hypothesis that the changes in value of SITC imports in Nigeria had no significant correlations with changes in foreign exchange rate under autonomous foreign exchange market regime. Between 1995-1999, the foreign exchange rate was highly stabilized. The volatility of the market was checkmated through introducing parallel market in which dual exchange rate was used. Even though stability had been achieved during the period but high level of distortion exist which led to negative manipulation of the market by the top government officials. The parallel market was later abolished with the advent of civilian government in 1999 in which new reforms were introduced. The 2.705 value of

Durbin-Watson which is closer to 2 further discloses non existence of autocorrelation in the model making the above result unbiased.

**Table 6 Model 3.  $IV_i = a + bER_i + \mu$**

Model	Unstandardized coefficient		T-values	Significance
	B	Standard Error		
Constant	774.677	76.157	10.172	.000
ER <sub>IFEM</sub>	-73.947	11.049	-6.692	.000

Dependent Variable:  $IV_{IFEM}$ ,  $R^2 = 0.865$ ,  $R^2$  adjusted = 0.846, F-Value = 44.789 DW 1.413

The result of model 3 equation  $IV_i = a + bER_i + \mu$  is presented in table 6 above. The model describes the relationship between changes in the imports value and the changes in foreign exchange rate under inter-bank foreign exchange market allocation arrangement. The high  $R^2$  value of 0.865 obtained indicates high significant relationship. It signifies that changes in exchange rate of Naira to US dollar constitutes 86.5% variations in changes in total value of SITC imports into Nigeria. Both f-ratio and t-ratio observed reveal high values of 44.789 and -6.692 which are relatively higher than the critical values of 5.32 and 1.860 at 5% significance level respectively. The result of these parametric tests categorically imply the rejection of null hypothesis and therefore conclude that under inter-bank foreign exchange market allocation arrangement (IFEM) the volatility of exchange rate of Naira to US dollars has significant impact on changes in the value of SITC imports into Nigeria. The negative b value -73.947 indicates inverse relationship which means increase in exchange rate changes is associated with decrease in changes in SITC imports into Nigeria.

However, it is important to note that between 2000-2008 the foreign exchange market experienced high degree of volatility in which the changes in the exchange rate per dollar fluctuates from high of +9.412 to less of -7.267 indicating the greater range of variability. Interestingly, the market even though highly unstable offer suitable opportunity for substantial imports. Similarly, within the period, Nigeria has operated several variants of the auction system such as Dutch Auction System, Wholesale Dutch Auction System and Retail Dutch Auction System all aim towards determining the efficient exchange rate of Naira to US dollars and achieving stable foreign exchange market. The observed Durbin-Watson value of 1.413 is closer to 2 signifying lack of autocorrelation problem in the model which means the assumption of independent errors has almost certainly been met.

## 5 Conclusion

The study is designed to investigate the impact of foreign exchange volatility on imports in Nigeria. Three models were formulated to test the relationship between Naira exchange rate fluctuations per US dollar on the total value of imports under three foreign exchange markets namely; second-tier Foreign Exchange Market (SFEM), Autonomous Foreign Exchange Market (AFEM) and Inter-bank Foreign Exchange Market (IFEM). The regression results of the three models show that moderate relationship exist between exchange rate volatility and value of imports under second-tier foreign exchange regime (SFEM), while weak relationship signifying non-impact exist between exchange rate volatility and changes in value of imports under Autonomous Foreign Exchange Market (AFEM). The result of the study further confirms strong and inverse relationship between the exchange rate shocks and changes in value of imports under Inter-bank foreign exchange market (IFEM) indicating significant impact and robustness of exchange rate on imports. The result of the study has two important implications for the relevant government policies. Inter-Bank Foreign Exchange Market proves to be more efficient in relation to imports but the high rate of volatility must be reduced to install sanity and confidence in the market. Secondly, a flexible range must be set within which the exchange rate can fluctuate and fixed rate must be avoided to enable the participants in the foreign exchange market engage in profitable transactions. Further study could be done to examine the effect of inflation; the rising value of imports may not necessarily reflect high quantity of goods and machineries imported due to inflation hence requires further research.

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