# Interest Rate Statistics in Nigeria: Its Sampling Techniques and Computational Procedures

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**Abstract**

Developing nations, like Nigeria, whose financial systems and infrastructural base are not yet fully developed face data rendition challenges which may hamper the representativeness of their interest rate statistics. A critical component of any credible interest rate data compilation framework relates to the sampling procedure. In Nigeria, no work has been done with regards to employing alternatives sampling techniques in the computation of interest rate statistics largely because of the small number of deposit money banks in the country. Leveraging on existing literature and established statistical methods, the study examines two sampling techniques for generating credible and reliable interest rates in Nigeria. The current interest rate compilation framework in the country is presented and alternative sampling procedures were explored with a view to investigating their appropriateness for Nigeria's interest rate computation. The interest rates generated based on the current population-based compilation method is compared with those of the alternative approaches. This paper recommends the use of purposive sampling method that covers Deposit Money Banks (DMBs) which account for about 70.0 per cent of the banking sector total assets as an appropriate alternative.

**Key Words:** Banking sector, Deposit Money Bank, Electronic data submission

## 1.0 Introduction

Interest rate statistics cover a broad range of interest rates that monetary and financial institutions (MFIs) apply to their deposits and loans. It is an important economic price which plays an important role in the determination of savings and investments in the economy (see Colander, 2001 and Ojo, 1993). As the positive relationship between investment and economic development is well established, it therefore becomes expedient for any economy that wishes to grow to pay proper attention to changes in its interest rate. From the regulatory perspective, interest rate is a powerful piece in any central banks' monetary policy toolkit and it represents a crucial financial indicator (see Ogwuma, 1996 and Ojo, 1993). In Nigeria, the Central Bank of Nigeria (CBN) is responsible for compiling interest rate statistics, both on deposits and loans.

Amongst others, reliable interest rates statistics facilitate the analysis of the transmission mechanism of monetary policy, help in assessing the financing conditions of the economy as well as indicate how components of the money stock are remunerated. It is also used for monitoring structural and financial stability of the banking sector. The effective interest rate for Nigeria is computed as the weighted average of all the interest rates across each type of deposit or loan account submitted by Deposit Money Banks within the country. The reporting institutions comprise all the locally incorporated banks which include all foreign owned that are active in banking operations in the country.

In view of the role of interest rate statistics in economic management, compilers strive to ensure the dissemination of timely, credible, unbiased and representative interest rate data. A review of selected countries' experiences shows that Ireland, Croatia and Malta cover the entire population of banks in their compilation procedure, as Nigeria, while Hong

[1] The views expressed are those of the author and do not reflect the views of the Central Bank of Nigeria.

Kong uses a sample of retail banks that account for about 90 per cent of deposit liabilities. In terms of sampling techniques, England and Denmark use stratified samples[2]. It is noteworthy that biased interest rate statistics yield faulty policy prescriptions as well as wrong investment and consumption decisions.

A critical component of any credible interest rate data compilation framework relates to the adoption of a sampling technique that guarantees data representativeness. Over the years, the interest rate compilation practice in Nigeria has been based on data rendition from all the reporting DMBs. However, as the economy gets enlarged and more reporting institutions are brought on board (especially those in the mortgage and microfinance sectors), the need for a reliable sampling procedure becomes imperative. To the knowledge of this study, no work has been done in this regards for Nigeria. This study therefore seeks to bridge the gap.

The objective of this paper is to examine the current methodology for compiling interest rate statistics in Nigeria vis-a-vis possible alternatives and propose a sampling procedure that is capable of generating credible and representative statistics on interest rates in the country. The paper is structured into five sections. Section two reviews the current interest rate compilation procedure in the country while data, sampling techniques and method of analysis employed by the study are explained in section three. Section four presents the results and the paper concludes with some recommendations in section five.

## 2.0 Current Interest Rate Compilation Procedure in Nigeria

As earlier defined, the effective interest rates in Nigeria are a weighted average of actual rates of interest received from borrowers and paid to depositors in various economic sectors. The data are collected from the existing twenty one (21) DMBs through an electronic platform referred to as the electronic Financial Analysis Surveillance System (eFASS), which was introduced in 2006. This was part of the CBN's initiative for ensuring timely and comprehensive compilation of monetary and financial statistics in Nigeria.

The compilation of Nigeria's interest rate statistics is based on a weighted average interest rate of all Nigerian Naira interest bearing deposit liabilities. These include time and term, savings, and demand deposits. On the assets side, the computed lending rate is based on the loans and advances granted to prime and other customers. The following formula illustrates how the weighted average interest and lending rates are calculated:

$$\text{Weighted Average Deposit Rate} = \frac{\sum_{i=1}^{k} r_i Q_i}{\sum_{i=1}^{k} Q_i} \quad (1)$$ and

$$\text{Weighted Average Lending Rate} = \frac{\sum_{i=1}^{k} r_i P_i}{\sum_{i=1}^{k} P_i} \quad (2)$$

Where k is the total number of reported deposit rates or banks reporting, $r_i$ is the average deposit or lending rate of bank i, $Q_i$ is aggregate deposit at $r_i$ by bank i and $P_i$ is aggregate amount lent at $r_i$ by bank i. Data from all existing DMBs are used in the calculation. The compiled interest rate statistics for Nigeria is disseminated monthly on the CBN website (www.cbn.gov.ng) and statistics database of the CBN (http://statistics.cbn.gov.ng/cbn-onlinestats/).

[2] For Ireland (see Central Bank of Ireland 2012), for Hong Kong (See Hong Kong Monetary Authority, 2005), for Croatia (see Usorae et. al. 2011), for England (see Bailey et. al. 2001), for Malta (See Central Bank of Malta, 2008) and for Demark (see Danmarks National Bank)

## 3.0 Data, Sampling Techniques and Method of Analysis

This section presents the analytical framework employed in the study. The study uses monthly interest rates data covering the period 2008 – 2012 and sourced from the Central Bank of Nigeria (CBN). The sampling procedures adopted ensure majority coverage in the market. The interest rates generated based on the population of banks is presented alongside the results of the alternative sampling approaches. The means of the promising alternatives are tested for equality while judgment is passed in favour of the most representative. The best interest rate computation methodology that is a true representation of the financial activities of the deposit money banks in Nigeria is highlighted.

### 3.1 Sampling Techniques

As noted above, the current interest rate compilation procedure in Nigeria entails taking a weighted average of interest rates data submitted by all the DMBs operating within the country. In this regard, computation usually commences a day after the data rendition cutoff date. This implies that Nigeria's interest rate data compilation is based on the population of banks operating within the country. The objective of this paper is to apply alternative sampling procedures to Nigeria's interest rate data, with a view to possibly developing a methodology that may as well yield interest rate statistics in the country that is representative and efficient. Thus, purposive and stratified random sampling techniques were employed.

***i. Purposive Random Sampling:*** This is a non-probability sampling technique. In view of the structure of the Nigerian banking sector, this sampling technique becomes handy as it allows us to sample DMBs that are believed to be crucial in the determination of interest rate statistics in the country. As noted earlier, there are 21 DMBs operating in the country. Based on this sampling procedure, the study selects DMBs that control 70.0 per cent of the total loans and advances made to the economy. For robustness of analysis, an alternative purposive sampling involving DMBs that are responsible for 80.0 per cent of total loans and advances was also used. Roughly speaking, this procedure selected between 8 and 13 banks of the entire DMBs population in the country. The results of the two alternative purposive sampling techniques are compared.

***ii. Stratified Random Sampling:*** this sampling strategy involves stratifying the elements of the population into homogenous subgroups before sampling. This requires that the strata should be mutually exclusive and collectively exhaustive. This implies that every element in the population should be assigned into only one stratum and no element should be excluded. Following the stratification, either simple random sampling or systematic sampling is applied on each stratum. This sampling procedure has the advantage of reducing variance, especially when estimating population statistics from a known population. For the purpose of this study, the population of DMBs in Nigeria is stratified into three homogenous strata containing seven DMBs each using the total assets size. These are categorized as big, medium and small banks. Within each stratum, three banks are selected systematically.

The variables used in the study are average prime lending rate (PrimeAll), average maximum lending rate (MaxilendAll) and average consolidated deposit rate (ConsdepAll) for the entire population of banks. Others include average prime lending rate (Prime70), average maximum lending rate (Maxilend70), average consolidated deposit rate (Consdep70) of banks selected based on purposive sampling technique and controlling 70% of loans/deposits. Also analyzed are average prime lending rate (Prime80), average maximum lending rate (Maxilend80) and average consolidated deposit rate (Consdep80) of banks selected based on purposive sampling technique and controlling 80% of loans/deposits. For the stratified sampling technique, the variables are average prime

lending rate (PrimeStr), average maximum lending rate (MaxilendStr), and average consolidated deposit rate (ConsdepStr).

### 3.2 Method of Analysis

In this study, both descriptive and inferential statistics techniques were employed. The descriptive mean, median and trend analysis while the inferential involved the Pearson product correlation analysis and the t-test for difference between means.

## 4.0 Results

### *4.1 Descriptive Statistics*

The average benchmark prime lending rate (PrimeAll) during the study period was 16.90 per cent while the benchmark maximum lending rate (MaxilendAll) was 22.01 per cent. However, based on the two sampling procedures adopted, the average prime lending rate for Prime70, Prime80 and PrimeStr were 17.30, 16.60 and 17.87 per cent, respectively. The average maximum lending rate for Maxilend70, Maxilend80 and MaxilendStr were 21.99, 21.23 and 22.30 per cent, respectively. The average benchmark consolidated deposit rate (ConsdepAll) during the study period was 6.50 while the Consdep70, Consdep80 and ConsdepStr were 6.45, 6.20 and 7.20 per cent, respectively. The time series plots of the computed rates for prime, maximum and consolidated rates are presented in Figures 1 to 3 below.

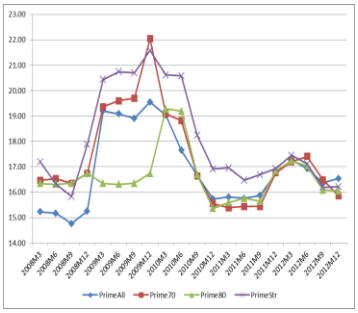

Fig 1: Prime Lending Rates

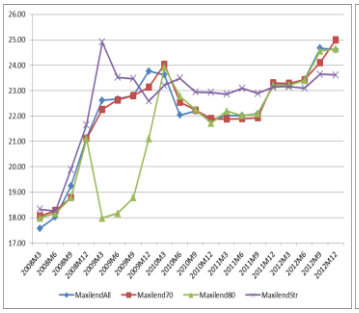

Fig 2: Maximum Lending Rates

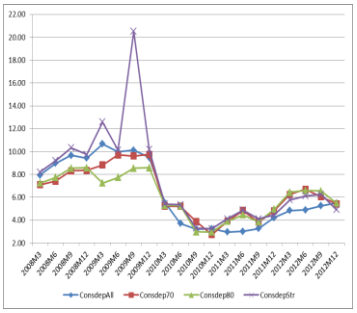

Fig 3: Consolidated Deposit Rates

### *4.2 Pearson Correlation*

The results of the Pearson Correlation coefficient are presented in Table 1. Analysis for the prime lending rate shows that PrimStr had the highest correlation (91.8 per cent) with the benchmark rate (PrimeAll). This was followed by Prime70 with a correlation coefficient of 88.3 per cent. The implication of this is that movements in the prime lending rate based on the stratified sampling procedure closely mimics that of the population (PrimeAll).

**Table 1: Correlation Matrix**

| | Prime All | Maxil endAll | Consd epAll | Prime 70 | Maxil end70 | Cons dep70 | Prim e80 | Maxil end80 | Consd ep80 | Prim eStr | Maxil endStr | Consd epStr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PrimeAll | 1 | | | | | | | | | | | |
| MaxilendAll | .558 | 1 | | | | | | | | | | |
| ConsdepAll | .321 | -.301 | 1 | | | | | | | | | |
| Prime70 | .883 | .238 | .619 | 1 | | | | | | | | |
| Maxilend70 | .582 | .949 | -.316 | .270 | 1 | | | | | | | |
| Consdep70 | .436 | -.141 | .940 | .703 | -.130 | 1 | | | | | | |
| Prime80 | .475 | .173 | .083 | .491 | .230 | .139 | 1 | | | | | |
| Maxilend80 | -.020 | .692 | -.731 | -.313 | .694 | -.608 | .244 | 1 | | | | |
| Consdep80 | .241 | -.233 | .909 | .554 | -.229 | .943 | .178 | -.517 | 1 | | | |
| PrimeStr | .918 | .346 | .342 | .873 | .375 | .407 | .531 | -.166 | .215 | 1 | | |
| MaxilendStr | .574 | .916 | -.356 | .228 | .894 | -.219 | .114 | .586 | -.342 | .434 | 1 | |
| ConsdepStr | .341 | -.208 | .900 | .599 | -.237 | .877 | .025 | -.680 | .839 | .376 | -.221 | 1 |

Analysis for the maximum lending rate shows that Maxilend70 and MaxilendStr had correlation of 94.9 and 91.6 per cent, respectively with the benchmark rate (MaxilendAll). For the consolidated deposit rate, the Consdep70, Consdep80 and ConsdepStr had correlation of 94.0, 90.9 and 90.0 per cent, respectively with ConsdepAll. These movements imply that both maximum lending rate and consolidate deposit rate based on the DMBs controlling about 70 per cent of the market closely mimics that of the population.

### *4.3 Tests for Difference between Means*

Analysis for the prime lending rate shows that the null hypothesis of equality between the means of the benchmark rate and those of the Prime70 and PrimeStr were rejected at the 5 per cent significance level. However, there was no evidence to reject the null for Prime80, implying that the average prime lending rate for the Prime80 was not significantly different from the population mean (i.e. the benchmark).

Analysis for both the maximum lending rate and consolidated deposit rate shows that the null hypothesis of equality between the means of the benchmark rate and those of the 80per cent and Stratifies samples were rejected at the 5 per cent significance level. However, there was no evidence to reject the null for the sample of 70 per cent for both rates, implying that the average maximum lending and consolidated deposit rates for the sample of 70 percent were not significantly different from the population means.

### *4.4 The Inter Banks Money Market*

Figures 4 to 6 presents the monetary policy rate (MPR) against the interbank rate for all the DMBs (IBR-all), interbank rate for the DMBs that controls 80% of the market (IBR-80) and interbank rate for the DMBs that controls 70% of the market (IBR-80) respectively.

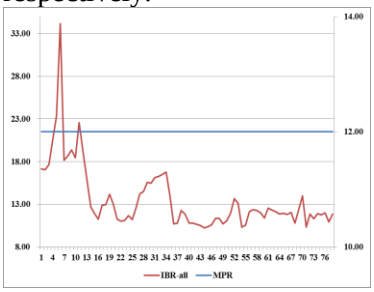


**Fig 4: MPR versus IBR-all**

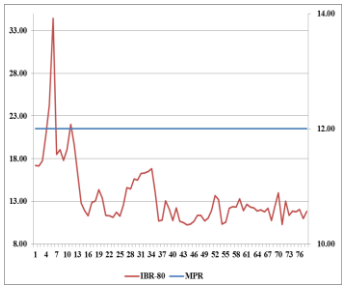


**Fig 5: MPR versus IBR-80**

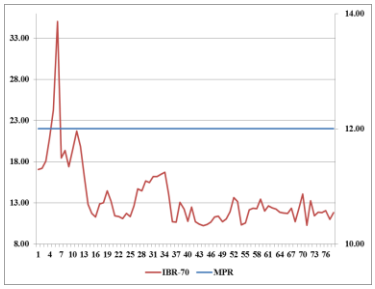


**Fig 6: MPR versus IBR-70**

The generated interbank rates from the two samples; IBR-80 and IBR-70, were good representation of the benchmark interbank rate, IBR-all, as they both have high correlation with the benchmark. This implies that any of them can be used instead of the IBR-all.

### *4.5 Findings*

Table 2 presents the major findings of the study. Based on the correlation analysis, the stratified sampling technique is most appropriate for prime lending rate while 70% of loans sampling technique are best for both maximum lending and consolidated deposit rates. The T-test for differences between means revealed that the 80% of loans sampling technique is most appropriate for prime lending rate, while 70% of loans sampling technique are best for both maximum lending and consolidated deposit rates.

| **Table 2: Summary of Findings** | | |
|---|---|---|
| | Correlation Test Decision | T-test Decision |
| Prime Lending Rate | Stratified Sample | 80% of loans Sample |
| Maximum Lending Rate | 70% of loans Sample | 70% of loans Sample |
| Consolidated Deposit Rate | 70% of loans Sample | 70% of loans Sample |

## 5.0 Conclusion and Recommendation

This paper elucidated the current interest rate compilation procedure in Nigeria, which is based on the population of the reporting DMBs in the country. As a way forward, we consider two alternative sampling strategies that could be used for compiling a representative interest rate statistics in the country. These were the purposive and the stratified sampling methods. The computed interest rate statistics based on the alternative sampling methods are compared with the ones computed based on the entire population of banks (benchmark rates). The results of the correlation coefficient and the t-test for difference between means show that purposive sampling method that covers banks accounting for about 70.0 per cent of the banking sector total assets is adequate for the consolidated deposit rate and the maximum lending rate. However, the stratified sampling procedure was found appropriate for the prime lending rate.

As the Nigerian economy continues to grow and data requirements for the different sectors of the banking sector become increasingly important, proactive steps must be taken for obtaining credible and reliable interest rate statistics in the face of a more diversified and complex banking sector. It is important to note that interest rate data rendition by the other sectors (e.g. mortgage and microfinance) of the banking industry may not be as smooth and prompt as those of the existing DMBs, especially due to infrastructural deficiencies and inadequate trained manpower. Developing nations, like Nigeria, whose financial systems are not yet fully developed and infrastructure is inadequate continues to face data rendition challenges which may hamper the representatives of their interest rate statistics. This challenge may be overcome through the adoption of reliable sampling methods. This paper recommends the use of purposive sampling method that covers banks accounting for about 70.0 per cent of the banking sector total assets as an appropriate alternative for interest rate compilation in Nigeria.

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