

**MATHEMATICAL ANALYSIS/PREDICTIONS
OF INTERNAL GENERATED REVENUE
(IGR) IN SOME STATES IN NIGERIA**

BY

EZAEGU VINCENT IKECHUKWU

PG/M.Sc./2014/68262

**DEPARTMENT OF MATHEMATICS
FACULTY OF PHYSICAL SCINECES
UNIVERSITY OF NIGERIA**

NSUKKA



University of Nigeria
to restore the dignity of man

SUPERVISOR: PROFESSOR G.C.E. MBAH

DECEMBER, 2015.

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**A PROJECT PRESENTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE AWARD OF MASTERS OF SCIENCE
DEGREE (M.Sc.) IN MATHEMATICS.**

**DEPARTMENT OF MATHEMATICS,
UNIVERSITY OF NIGERIA, NSUKKA**

DECEMBER, 2015.

CERTIFICATION PAGE

EZAEGU, VINCENT IKECHUKWU, (PG/M.Sc./2014/68262), A POST GRADUATE STUDENT IN THE DEPARTMENT OF MATHEMATICS, FACULTY OF PHYSICAL SCIENCES, UNIVERSITY OF NIGERIA, NSUKKA, HAS SATISFACTORILY COMPLETED THE REQUIREMENT FOR THE AWARD OF DEGREE OF MASTER OF SCIENCE (M.Sc.) IN MATHEMATICS, BY PRESENTING THIS RESEARCH WORK WHICH IS ORIGINAL AND HAS NOT BEEN SUBMITTED IN PART OR FULL FOR ANY OTHER DIPLOMA OR AWARD OF ANY DEGREE TO THIS UNIVERSITY OR ANY OTHER.

EZAEGU, VINCENT IKECHUKWU
Student

PROF. G.C.E MBAH
Project Supervisor

PROF. M.O. OYESANYA
Head of Department

External Examiner

DEDICATION

I, solemnly, dedicate this work to our Blessed Virgin Mary who has been in her intercession with my guardian angel and the heavens to achieve both the spiritual and physical accomplishment of this work, which seems impossible within a year (and now, ten months).

ACKNOWLEDGMENT

I acknowledge the Trinitarian God, God the Father, Son and the Holy Spirit, in his angels and saints; in particular the Precious Blood of Jesus Christ. Sorry, Lord, for the pierced wound by your side, I say be consoled.

Prof. G.C.E. Mbah shall, indelibly, ever remembered in the bosom of my heart for:

- (1) accepting my transition from Pure to Applied Mathematics
- (2) accepting being my supervisor
- (3) changing my project topic to suit my diversion
- (4) editing, correcting and defense before other lecturers on my proposal
- (5) hastening our graduation without greedy/revenge/jealousy
- (6) considering other students of his and of other supervisors
- (7) helping us to cross the red sea
- (8) revealing some academic tips/secret
- (9) being the hope of the department after God and
- (10) praying for us.

These are the ten(10) commandments Prof. G.C.E. Mbah laid on his students. I, Ezaegu Vincent Ikechukwu, seriously, pray that God, Our Blessed Virgin Mary and his angels and saints should visit him with blessings from God's ten(10) commandments, beatitudes, fruits and gifts of the holy spirit. Amen.

In the same vein, I shall forever remain indebted to Prof. J.C. Amazigo for the opportunity to share in his knowledge the impact now in us; our set 2014/2015 is the last set of his contract to UNN; he lectured like a father, two courses indeed, may him be blessed. To Prof. M.O. Oyesanya, our H.O.D., who lectured on elasticity, I appreciate. I will not forget, Prof. F.I. Ochor, formally Njoku, who lectured on O.D.E. May God almighty from his infinite mercy bless all the lecturers of Mathematics department of University of Nigeria, Nsukka. I forget not Mrs. Ejikeme Chioma, who from the debt of her heart lends me some academic books.

To my wonderful parents Mr./Mrs. Ezaegu Vincent O.A. who, in addition to their financial support, have been praying and waiting for this, may God bless them and my siblings, and dear ones.

To my classmates, in their cooperation, especially Chima, Queeneth, Christopher, Chuks and many others too numerous to mention. God bless you all. Amen.

Abstract

In this paper, we apply the LINEST model of the Microsoft excel to the population, Nigeria (Naira) exchange rate with US Dollar and Internal Generated Revenue (IGR) of 2014 top-10 Nigerian states by IGR in billions of naira from 2010 to 2014 as in the data bases of National Population Commission (NPC), Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS) respectively. The indexed IGR is used as proxy for each state and the nation. The last census of 2006 by NPC is used as proxy to the national and states population, and the end of December CBN exchange rate with U.S. Dollar was used as well. The research which results into 14 equations (10 for states and 4 for the nation but all having $\frac{dy}{dx} > 0$ and $R^2 \geq 0$) proves that the states in discuss (including Lagos, Rivers, Kaduna and Enugu) over spend/levy, against assets, tax and securities, the members of the states beyond the normal exchange rate in order to meet-up with the IGR target. This is seen in the negative “Difference” of the last/8th column in all the phases’ table of chapter 4; the highest (90%) resulting in 2013 indicated that the nation experienced subsidy removal from fuel at the end of the year in 2013. At the other hand, the positive “Difference” (highest in 2010-70%) indicated that the concerned states submitted an invalid data, indeed below their IGR. The study showed that fuel subsidy removal generates and stimulates excess charges and expenses in the Nigerian economy. The author recommends that Nigeria should maintain subsidy assistance to the member states; charges levied on assets, tax and securities should not exceed the CBN exchange rating. Again, the nation/states in concern should use the formulated equations for predicting or estimating the IGR to the dynamic/uncertain exchange rate of Nigeria Naira with US Dollar. The national IGR equation, in billions of naira, is $y = 35.376x - 3905.5$.

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CHAPTER ONE

INTRODUCTION

1.1 Concept of Revenue:

Revenue is always the price per unit times the number of units sold. The **revenue** resulting from one or more business transactions is the total payment received, sometimes called the gross proceeds. If $R(x)$ is the revenue from selling x items at a price of m each, then R is the linear function $R(x) = mx$ and the selling price m can also be called the **marginal revenue**. Revenue is a very important concept in economic analysis. It is directly influenced by sales level, i.e., as sales increases, revenue also increases. The concept of revenue consists of three important terms; Total Revenue, Average Revenue and Marginal Revenue.

1.1.1 Total Revenue (TR):

Total Revenue refers to total receipts from the sale of a given quantity of a commodity. It is the total income of a firm. Total revenue is obtained by multiplying the quantity of the commodity sold with the price of the commodity.

$$\text{Total Revenue} = \text{Quantity} \times \text{Price}$$

1.1.2 Average Revenue (AR):

Average revenue refers to revenue per unit of output sold. It is obtained by dividing the total revenue by the number of units sold.

$$\text{Average Revenue} = \text{Total Revenue/Quantity}$$

1.1.3 Marginal Revenue (MR):

Marginal revenue is the additional revenue generated from the sale of an additional unit of output. It is the change in TR from sale of one more unit of a commodity.

$$MR_n = TR_n - TR_{n-1}$$

Where:

MR_n = Marginal revenue of n th unit;

TR_n = Total revenue from n units;

TR_{n-1} = Total revenue from $(n - 1)$ units; n = number of units sold.

Source: (<http://www.yourarticlelibrary.com/economics/revenue-the-meaning-and-concept-of-revenue-micro-economics/9089/>).

1.2 Internal Revenue

Monies collected by a government through imposition of levies and taxes on facilities, incomes, sale of goods and services, transfers of properties, and other domestic transactions, as opposed to monies collected from duties imposed on imports and other international transactions. Also called inland revenue. Source: (<http://www.businessdictionary.com/definition/internal-revenue.html#ixzz3uwVYsw75>).

1.3 Internally Generated Revenue (IGR):

Revenue generated internally apart from subventions, allocation, and grants from Govt. Examples of Internal Generated Revenue are student registration fees, rent of hall, rent of equipment, donations, dividends, interest, payment for transcript, payment for academic gown, etc.

Source:(<http://www.ui.edu.ng/sites/default/files/AUDITING%20OF%20INTERNAL%20GENERATED%20REVENUE.pdf>)

1.4 Aims and Objectives of The Study

1.4.1 Aims

The aim of this study is to formulate equations, using the LINEST model, which can predict or estimate the Internal Generated Revenue (IGR) of the states and the nation whenever the CBN exchange rate of Nigeria Naira with U.S. Dollar is given.

1.4.2 Objectives

The objective is to ascertain the uncertain prices of assets, in this case the Internal Generated Revenue (IGR), which has no generalized prediction in the economy.

1.5 Scope and Limitations of the Study

In this work, we are able to cover and indeed utilize the population, Nigeria (Naira) exchange rate with US Dollar and Internal Generated Revenue (IGR) of 2014 top-10 Nigerian states by IGR in billions of naira from 2010

to 2014 as in the data bases of National Population Commission (NPC), Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS) respectively.

We are limited to the indexed IGR which is used as proxy to the asset pricing in each state and the nation. The last census of 2006 by NPC is used as proxy to the national and states population, and the end of December CBN exchange rate with U.S. Dollar was used as well. Using these as basis, we can now formulate equations by the help of the LINEST model of the Microsoft excel, which can actually estimate only the IGR of each state and the nation.

CHAPTER TWO

LITERATURE REVIEW

One of the most vital aspects of research work involves the review of relevant literature to the study. According to Ali (1996), review of relevant literature is imperative in the early planning stage of the work because it is anticipated that the review should provide much of the theoretical reference point or basis for undertaking a proposed study. It is also hoped that at the completion of the research work, findings would be linked up with the literature reviewed relevant to the research work that would be carried out.

Microsoft Excel (2010) LINEST Model or function of the Microsoft office excel 2010.Ink

George Brown College (2014) Tutoring and Learning Centre, **Formula Sheet for Financial Mathematics**. An on-line download (https://www.georgebrown.ca/uploadedFiles/TLC/_documents/Formula%20Sheet%20for%20Financial%20Mathematics.pdf) on December, 2015.

Banabo and Koroye (2011) were of the opinion that Nigerian economy has to be diversified from a single oil revenue sustaining economy to a multiple revenue economy. The dependability on taxation alone by federal, states, and local governments may not be the way out of solving the consistently increasing capital and recurrent expenditures of the governments. They went further to assert that increasing cost of governance has forced some states to formulate other means of improving their revenue base due to dwindling oil revenue in 2009.

Agu, C. (2011) Fragile States! Contributed on Why Subnational Governments in Nigeria Cannot Subsist on Internally Generated Revenue?

Atakpa, M., Ocheni, S., and Nwakwo, B. C. (2012) Set up an Analysis of options for Maximizing Local Government internally generated Revenue in Nigeria,

Constitution of The Federal Republic of Nigeria 1999 CAP. C23 L.F.N. 2004,
Functions of a Local Government Council, Fourth Schedule Government
Printers, Abuja.

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Retrieved from <http://pointblanknews.com/pbnpvst.html>

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our problems, FIRS Boss Tells States Retrieved from
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El-Rufai, N. (2012) Anambra's budget of misplaced priorities Retrieved from
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Fashola, B. R. (2013) Lagos Mega Revenue (IGR) Now N23billion Monthly,
Retrieved from www.osundefender.org

Hamzat, K. O. (2012) Light Rail; our plan is to move Lagosians around with ease
by 2014. Retrieved from www.osundefender.org/%3Fp%3D39914

Kanemi, A. (2012) Economic activities have been paralyzed in Maiduguri
Retrieved from www.blueprinting.com/2012/03/economic-ac...

Khalil, S and Adelabu, S. A. (2011) wrote on Fiscal planning and local
government administration in Nigeria: They were on opinion on the quest for
sustainable rural development. Available online at

Naiyeju (2011) is of the opinion that states and local governments have continued to demonstrate total lack of interest in improving their lots towards improved revenue generation by preferring to use consultants to administer taxes, rather than modernizing their tax systems for enhanced revenue yield, and less dependency on allocation from the Federation Account. The preference for tax consultants in the collection of revenues negates the ongoing reforms in the country's revenue generation system.

National Population Commission (2014), 2006 Population and Housing Census of the Federal Republic of Nigeria; Distribution of Population by State and Sex. Available at www.population.gov.ng/index.php/censuses

Central Bank of Nigeria (CBN) Naira Exchange Rates Archives with U.S. Dollar (2010-2015) Retrieved from <http://www.centralbank.org/Rates/ExchRateByCurrency.asp> on December 9, 2015.

Babatude O. (2015) The National Bureau of Statistics on Wednesday released the Internally Generated Revenue profile of 23 states of the federation which generated N586.6bn in total in the 2014 fiscal year.

We have mentioned previous studies that researched on the "Internal Generated Revenue (IGR)" or its equivalent with different models but none applied the same analysis or result approach for predictions. In addition, we discovered that authors have not tried the LINEST model of the Microsoft excel to solving a similar/exact research problem(s).

CHAPTER THREE

METHODOLOGY

3.1 Model List

There are many models that are associated with Internal Generated Revenue (IGR). In this book, we explain the Linear Revenue Model, Simple Interest, Compound Interest, Annuity, Amortization and LINEST Model; and then utilize the LINEST Model.

3.1.1 Linear Revenue Model

In the linear revenue model we assume that the price p of a unit sold by a firm is the same no matter how many units are sold. (This is a reasonable assumption if the number of units sold by the firm is small in comparison to the total number sold by the entire industry.) Revenue is always the price per unit times the number of units sold. Let x be the number of units sold. (For convenience, we always assume that the number of units sold equals the number of units produced.) Then, if we denote the revenue by $R(x)$,

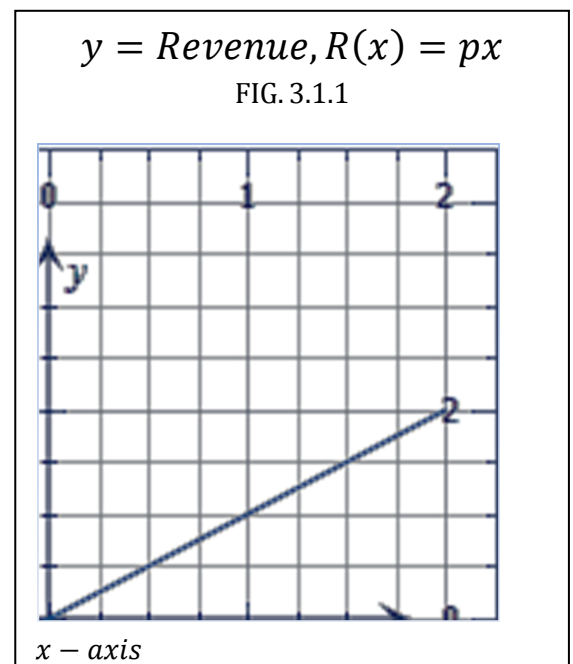
$$\begin{aligned} R(x) &= \text{revenue} \\ &= (\text{price per unit}) \times (\text{number sold}) \\ &= px \end{aligned}$$

Since $p > 0$, we must have $R(x) \geq 0$.

Notice in the illustration beside that the straight line goes through $(0, 0)$ because nothing sold results in no revenue.

The slope is the price per unit.

Source: (http://www.math.tamu.edu/~epstein/C1_aj.pdf)



3.1.2. SIMPLE INTEREST

$$I = PRT$$

- **I** is the amount of interest earned
- **P** is the principal
- **R** is the simple annual (or nominal) interest rate (usually expressed as a percentage)
- **T** is the interest period *in years*

$$S = P + I$$

$$S = P(1 + RT), \text{ since } I = PRT .$$

- **S** is the future value (or maturity value). It is equal to the principal plus the interest earned. It is also called the Amount, **A**.

3.1.3 COMPOUND INTEREST, I_c

$$A = P(1 + r)^t$$

Where:

A = Amount accumulated after t-years

P = Principal

R = rate of payment

t = time of payment, usually annually.

Then,

$$I_c = A - P$$

I_c = Compound Interest.

3.1.4 ANNUITY (TYPES AND CLASSIFICATION)

CLASSIFYING RATIONALE	TYPE OF ANNUITY	
Length of conversion period relative to the payment period Date of payment Payment schedule	Simple annuity - when the interest compounding period is the same as the payment period ($C/Y = P/Y$). For example, a car loan for which interest is compounded monthly and payments are made monthly. Ordinary annuity – payments are made at the END of each payment period. For example, OSAP loan payment. Deferred annuity – first payment is delayed for a period of time.	General annuity - when the interest compounding period does NOT equal the payment period ($C/Y \neq P/Y$). For example, a mortgage for which interest is compounded semi-annually but payments are made monthly. Annuity due - payments are made at the BEGINNING of each payment period. For example, lease rental payments on real estate. Perpetuity – an annuity for which payments continue forever. (Note: payment amount $\leq$ periodic interest earned)
Beginning date and end date	Annuity certain – an annuity with a fixed term; both the beginning date and end date are known. For example, installment payments on a loan.	Contingent annuity - the beginning date, the ending date, or both are unknown. For example, pension payments.

Source: (<https://www.georgebrown.ca/uploadedFiles/TLC/documents/Formula%20Sheet%20for%20Financial%20Mathematics.pdf>).

The formula for the ordinary annuity is given as:

$$S = R \left\{ \frac{(1 + i)^n - 1}{i} \right\}$$

Where:

i = rate of payment

n = number of times in the period

R = principal borrowed and

S = is the annuity due.

3.1.5 AMORTIZATION involving SIMPLE ANNUITIES:

Amortization refers to the method of repaying both the principal and the interest by a series of equal payments made at equal intervals of time.

If the payment interval and the interest conversion period are *equal* in length, the problem involves working with a simple annuity. Most often the payments are made at the *end* of a payment interval meaning that we are working with an *ordinary simple annuity*.

The following formulas apply:

$$R = \frac{Pi}{1 - (1 + i)^{-n}}$$

Where:

i = rate of payment

n = number of times in the period

P = Principal borrowed and

R = Amortization due.

3.1.6 The LINEST Model and its Variables Description

The method used in this book is the LINEST Model(function) of the Microsoft excel, which uses regression model(analysis) to check for collinearity of the functions and removes any redundant independent variable column from the regression model when it identifies them; at the end displays in matrix format: the coefficients of the independent variables m_n , intercept b , standard error value for the m_n coefficients se_n , standard error value for the b constant se_b , coefficient of determination r_2 , the standard error estimate for the dependent variable se_y , the F statistic or F-observed value F , the degrees of freedom df , the regression sum of squares $ssreg$, and the residual sum of squares, $ssresid$.

- The following illustration shows the order in which the additional regression statistics are returned.

	A	B	C	D	E	F
1	m_n	m_{n-1}	...	m_2	m_1	b
2	se_n	se_{n-1}	...	se_2	se_1	se_b
3	r^2	se_y				
4	F	df				
5	ssreg	ssresid				

In addition, the **LINEST** function calculates the statistics for a line by using the "least squares" method to calculate a straight line that best fits your data, and then returns an array that describes the line. You can also combine **LINEST** with other functions to calculate the statistics for other types of models that are linear in the unknown parameters, including polynomial, logarithmic, exponential, and power series. Because this function returns an array of values, it must be entered as an array formula. The equation for the line is:

$$y = mx + b \text{ (for simple linear regression)}$$

–or–

$$y = m_1x_1 + m_2x_2 + \dots + b \text{ (for multiple linear regression)}$$

if there are multiple ranges of x-values, where the dependent y-values are a function of the independent x-values. The m-values are coefficients corresponding to each x-value, and b is a constant value. Note that y, x, and m can be vectors. The array that the **LINEST** function returns is $\{m_n, m_{n-1}, \dots, m_1, b\}$. **LINEST** can also return additional regression statistics. All these constants are in the illustration above. The syntax for the model is:

$$\text{LINEST}(\text{known_y's}, [\text{known_x's}], [\text{const}], [\text{stats}])$$

The arguments for the **LINEST** function syntax is shown in APENDIX B

In order to analyze or predict the Internal Generated Revenue (IGR), we conclude that the **LINEST** Model is the best-fit for my research on the topic: *“Mathematical Analysis and Predictions of Internal Generated Revenue (IGR) in some states in Nigeria”*.

3.2 The Data and Data Source

3.2.1 The Data

The data is built in fourteen phases. All the phases except phase 2 are the results of the Internal Generated Revenue (IGR), while the phase 2 is the result of the Central Bank of Nigeria (CBN) selling exchange rate. Phase 3 – 12 are the IGR of the 2014 top-10 states, which are computed for 5 years from 2010 – 2014 as the latest on-line post from the National Bureau of Statistics of Nigeria (NBS). The remaining phases are on national issues of the IGR or selling rate of the CBN.

The contents of the columns and the corresponding rows are as stated in each phase below. Each is made up of three tables (A, B and C). Table A is the main data extract, table B is the LINEST model array result of table A, while table C is the equivalent/interpretation of table B. Although, the actual interpretation could be seen in the lone illustration of page 11 above and in Appendix B below but not wholly utilized. Below the three tables, in each phase, is the equation for predicting/estimating the y_n – value deduced from the LINEST model array (table). Its variables are defined in each phase/table – top. Some assumptions have been made in the smaller tables attached to phase 13(pp. 22) and in the page (pp. 23) before phase 14 (also in Appendix F). Below are each phase and their corresponding tables and equations.

PHASE I

2014 IGR TOP-TEN STATES		CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (₦), y_1
STATE	POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	
LAGOS	9113605	156.5	157	157.5	276.1
RIVERS	5198716	156.5	157	157.5	89.1
DELTA	4112445	156.5	157	157.5	42.8
ENUGU	3267837	156.5	157	157.5	19.2
OGUN	3751140	156.5	157	157.5	17.4
OYO	5580894	156.5	157	157.5	16.3
AKWA IBOM	3902051	156.5	157	157.5	15.9
KADUNA	6113503	156.5	157	157.5	12.7
BAYELSA	1704515	156.5	157	157.5	10.9
ANAMBRA	4177828	156.5	157	157.5	10.4

TABLE 3.1A

0	0	0	3.30534E-05	-104.0147
0	0	0	1.10833E-05	56.061476
0.643588675	66.20445062	#N/A	#N/A	#N/A
2.257183733	5	#N/A	#N/A	#N/A
39573.20959	21915.14641	#N/A	#N/A	#N/A

TABLE 3.1B

$m_4=0$	$m_3=0$	$m_2=0$	$m_1=0.0000330533512813038$	$b=-104.01$
$se_4=0$	$se_3=0$	$se_2=0$	$se_1=0.0000110832964514019$	$se_b=56.06$
$r_2=0.64358867535369$	$se_y=66.2044506$			
$F=2.25718373284144$	$df=5$			
$ssreg=39573.21$	$ssresid=21915.1$			

TABLE 3.1C

$$y_1 = (3.31 * 10^{-5})x_1 - 104$$

PHASE 2
NIGERIA

MONTH	NATIONAL POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR		
		Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), y_2
December	140431790	167	167.5	168
November	140431790	164	164.5	165
October	140431790	154.76	155.26	155.76
September	140431790	154.75	155.25	155.75
August	140431790	154.73	155.23	155.73
July	140431790	154.73	155.23	155.73
June	140431790	154.73	155.23	155.73
May	140431790	154.73	155.23	155.73
April	140431790	154.73	155.23	155.73
March	140431790	154.74	155.24	155.74
February	140431790	154.75	155.25	155.75
January	140431790	154.75	155.25	155.75

TABLE 3.2A

0	1	0	1
0	0	0	0
1	0	#N/A	#N/A
#NUM!	10	#N/A	#N/A
197.4638667	0	#N/A	#N/A

TABLE 3.2B

$m_3=0$	$m_2=1$	$m_1=0$	$b=1$
$se_3=0$	$se_2=0$	$se_1=0$	$seb=0$
$r_2=1$	$se_y=0$		
$F=\#NUM!$	$df=10$		
$ssreg=197.4638$	$ssresid=0$		

TABLE 3.2C

$$y_2 = x_2 + 1$$

PHASE 3

LAGOS STATE

		CBN EXCHANGE RATE WITH US DOLLAR			
YEAR	POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	IGR IN BILLIONS (₦), y_3
2014	9113605	167	167.5	168	276.1
2013	9113605	154.7	155.2	155.7	384.3
2012	9113605	154.77	155.27	155.77	219.2
2011	9113605	155.7	156.2	156.7	202.8
2010	9113605	148.17	148.67	149.17	150

TABLE 3.3A

0	0	5.112391	0	-551.401
0	0	6.961633	0	1087.316
0.152373	94.83642551	#N/A	#N/A	#N/A
0.539294	3	#N/A	#N/A	#N/A
4850.385	26981.84281	#N/A	#N/A	#N/A

TABLE 3.3B

$m_4=0$	$m_3=0$	$m_2=5.11$	$m_1=0$	$b=-551.40$
0	0	6.961633	0	1087.316
0.152373	94.83642551			
0.539294	3			
4850.385	26981.84281			

TABLE 3.3C

$$y_3 = 5x_2 - 551$$

PHASE 4

RIVERS STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (₦), y_4
		Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	
2014	5198716	167	167.5	168	89.1
2013	5198716	154.7	155.2	155.7	87.9
2012	5198716	154.77	155.27	155.77	66.3
2011	5198716	155.7	156.2	156.7	52.7
2010	5198716	148.17	148.67	149.17	49.6

TABLE 3.4A

0	0	1.921569	0	-230.775
0	0	1.141353	0	178.2643
0.485815	15.5483369	#N/A	#N/A	#N/A
2.834471	3	#N/A	#N/A	#N/A
685.2357	725.2523412	#N/A	#N/A	#N/A

TABLE 3.4B

0	0	1.921569	0	-230.775
0	0	1.141353	0	178.2643
0.485815	15.5483369			
2.834471	3			
685.2357	725.2523412			

TABLE 3.4C

$$y_4 = 1.9x_2 - 231$$

PHASE 5

DELTA STATE

		CBN EXCHANGE RATE WITH US DOLLAR			
YEAR	POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	IGR IN BILLIONS (₦), y_5
2014	4112445	167	167.5	168	42.8
2013	4112445	154.7	155.2	155.7	50.2
2012	4112445	154.77	155.27	155.77	45.6
2011	4112445	155.7	156.2	156.7	34.8
2010	4112445	148.17	148.67	149.17	26.1

TABLE 3.5A

0	0	0.652462	0	-61.9284
0	0	0.714775	0	111.6384
0.217373	9.737179051	#N/A	#N/A	#N/A
0.833244	3	#N/A	#N/A	#N/A
79.00203	284.4379676	#N/A	#N/A	#N/A

TABLE 3.5B

0	0	0.652462	0	-61.9284
0	0	0.714775	0	111.6384
0.217373	9.737179051			
0.833244	3			
79.00203	284.4379676			

TABLE 3.5C

$$y_5 = \frac{13}{20}x_2 - 62$$

PHASE 6

ENUGU STATE

		CBN EXCHANGE RATE WITH US DOLLAR			
YEAR	POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	IGR IN BILLIONS (₦), y_6
2014	3267837	167	167.5	168	19.2
2013	3267837	154.7	155.2	155.7	20.2
2012	3267837	154.77	155.27	155.77	12.2
2011	3267837	155.7	156.2	156.7	7.2
2010	3267837	148.17	148.67	149.17	13.8

TABLE 3.6A

0	0	0.295202	0	-31.5516
0	0	0.418431	0	65.35344
0.1423	5.700172192	#N/A	#N/A	#N/A
0.497726	3	#N/A	#N/A	#N/A
16.17211	97.47588905	#N/A	#N/A	#N/A

TABLE 3.6B

0	0	0.295202	0	-31.5516
0	0	0.418431	0	65.35344
0.1423	5.700172192			
0.497726	3			
16.17211	97.47588905			

TABLE 3.6C

$$y_6 = \frac{3}{10}x_2 - 32$$

PHASE 7

OGUN STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (₦), y_7
		Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	
2014	3751140	167	167.5	168	17.4
2013	3751140	154.7	155.2	155.7	13.8
2012	3751140	154.77	155.27	155.77	12.4
2011	3751140	155.7	156.2	156.7	10.8
2010	3751140	148.17	148.67	149.17	7.9

TABLE 3.7A

0	0	0.478905	0	-62.2818
0	0	0.113638	0	17.74879
0.855493	1.54806217	#N/A	#N/A	#N/A
17.76031	3	#N/A	#N/A	#N/A
42.56251	7.189489451	#N/A	#N/A	#N/A

TABLE 3.7B

0	0	0.478905	0	-62.2818
0	0	0.113638	0	17.74879
0.855493	1.54806217			
17.76031	3			
42.56251	7.189489451			

TABLE 3.7C

$$y_7 = \frac{12}{25}x_2 - 62$$

PHASE 8

OYO STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (₦), y_8
		Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	
2014	5580894	167	167.5	168	16.3
2013	5580894	154.7	155.2	155.7	15.3
2012	5580894	154.77	155.27	155.77	14.6
2011	5580894	155.7	156.2	156.7	8.9
2010	5580894	148.17	148.67	149.17	10.5

TABLE 3.8A

0	0	0.280777	0	-30.7003
0	0	0.220619	0	34.45774
0.350609	3.005427563	#N/A	#N/A	#N/A
1.619713	3	#N/A	#N/A	#N/A
14.63022	27.09778451	#N/A	#N/A	#N/A

TABLE 3.8B

0	0	0.280777	0	-30.7003
0	0	0.220619	0	34.45774
0.350609	3.005427563			
1.619713	3			
14.63022	27.09778451			

TABLE 3.8C

$$y_8 = \frac{7}{25}x_2 - 31$$

PHASE 9

AKWA IBOM STATE

		CBN EXCHANGE RATE WITH US DOLLAR			
YEAR	POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	IGR IN BILLIONS (₦), y_9
2014	3902051	167	167.5	168	15.9
2013	3902051	154.7	155.2	155.7	15.4
2012	3902051	154.77	155.27	155.77	13.5
2011	3902051	155.7	156.2	156.7	11.7
2010	3902051	148.17	148.67	149.17	10.1

TABLE 3.9A

0	0	0.275642	0	-29.6988
0	0	0.133404	0	20.83598
0.587302	1.817328744	#N/A	#N/A	#N/A
4.26924	3	#N/A	#N/A	#N/A
14.09995	9.908051287	#N/A	#N/A	#N/A

TABLE 3.9B

0	0	0.275642	0	-29.6988
0	0	0.133404	0	20.83598
0.587302	1.817328744			
4.26924	3			
14.09995	9.908051287			

TABLE 3.9C

$$y_9 = \frac{7}{25}x_2 - 30$$

KADUNA STATE		CBN EXCHANGE RATE WITH US DOLLAR			
YEAR	POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	IGR IN BILLIONS (₦), y_{10}
2014	6113503	167	167.5	168	12.7
2013	6113503	154.7	155.2	155.7	10.9
2012	6113503	154.77	155.27	155.77	11.5
2011	6113503	155.7	156.2	156.7	9.8
2010	6113503	148.17	148.67	149.17	11.6

TABLE 3.10A

0	0	0.074227	0	-0.2845
0	0	0.079033	0	12.34396
0.227218	1.076649009	#N/A	#N/A	#N/A
0.882078	3	#N/A	#N/A	#N/A
1.022481	3.477519266	#N/A	#N/A	#N/A

TABLE 3.10B

0	0	0.074227	0	-0.2845
0	0	0.079033	0	12.34396
0.227218	1.076649009			
0.882078	3			
1.022481	3.477519266			

TABLE 3.10C

$$500y_{10} = 37x_2 - 140$$

PHASE II

BAYELSA STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (₦), y_{11}
		Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	
2014	1704515	167	167.5	168	10.96
2013	1704515	154.7	155.2	155.7	10.5
2012	1704515	154.77	155.27	155.77	4.96
2011	1704515	155.7	156.2	156.7	10.5
2010	1704515	148.17	148.67	149.17	4.7

TABLE 3.11A

0	0	0.312687	0	-40.4764
0	0	0.20203	0	31.55436
0.443977	2.752193457	#N/A	#N/A	#N/A
2.395465	3	#N/A	#N/A	#N/A
18.14461	22.72370648	#N/A	#N/A	#N/A

TABLE 3.11B

0	0	0.312687	0	-40.4764
0	0	0.20203	0	31.55436
0.443977	2.752193457			
2.395465	3			
18.14461	22.72370648			

TABLE 3.11B

$$100y_{11} = 31x_2 - 4000$$

PHASE 12

ANAMBRA STATE

		CBN EXCHANGE RATE WITH US DOLLAR			
YEAR	POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	IGR IN BILLIONS (₦), y_{12}
2014	4177828	167	167.5	168	10.4
2013	4177828	154.7	155.2	155.7	8.7
2012	4177828	154.77	155.27	155.77	7.6
2011	4177828	155.7	156.2	156.7	6.1
2010	4177828	148.17	148.67	149.17	7.66

TABLE 3.12A

0	0	0.157254	0	-16.4503
0	0	0.099431	0	15.52978
0.454671	1.354518373	#N/A	#N/A	#N/A
2.501264	3	#N/A	#N/A	#N/A
4.58912	5.504160066	#N/A	#N/A	#N/A

TABLE 3.12B

0	0	0.157254	0	-16.4503
0	0	0.099431	0	15.52978
0.454671	1.354518373			
2.501264	3			
4.58912	5.504160066			

TABLE 3.12C

$$25y_{12} = 4x_2 - 400$$

PHASE 13

NATIONAL IGR 2014

CBN EXCHANGE RATE WITH US DOLLAR

		MONTH	NATIONAL POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	IGR IN BILLION(₦) y_{13}
STATE	2014 IGR	December	140431790	167	167.5	168	1889.96
LAGOS	276.1	November	140431790	164	164.5	165	1889.96
RIVERS	89.1	October	140431790	154.76	155.26	155.76	1889.96
DELTA	42.8	September	140431790	154.75	155.25	155.75	1889.96
ENUGU	19.2	August	140431790	154.73	155.23	155.73	1889.96
OGUN	17.4	July	140431790	154.73	155.23	155.73	1889.96
OYO	16.3	June	140431790	154.73	155.23	155.73	1889.96
AKWA IBOM	15.9	May	140431790	154.73	155.23	155.73	1889.96
KADUNA	12.7	April	140431790	154.73	155.23	155.73	1889.96
BAYELSA	10.9	March	140431790	154.74	155.24	155.74	1889.96
ANAMBRA	10.4	February	140431790	154.75	155.25	155.75	1889.96
SUM	510.8	January	140431790	154.75	155.25	155.75	1889.96
AVERAGE	51.08	<i>TABLE 3.13A</i>					
ASSUMMED NATIONAL IGR	1889.96						

0	0	1.85E-29	0	1889.96
0	0	4.74E-30	0	7.41E-28
1	6.65397E-29	#N/A	#N/A	#N/A
1.2611E+33	10	#N/A	#N/A	#N/A
5.5835E-24	4.42753E-56	#N/A	#N/A	#N/A

TABLE 3.13B

0	0	1.85E-29	0	1889.96
0	0	4.74E-30	0	7.41E-28
1	6.65397E-29			
1.2611E+33	10			
5.5835E-24	4.42753E-56			

TABLE 3.13C

$$y_{13} = (1.85 * 10^{-29})x_2 + 1889.96$$

4 YEARS IGR ON THE 2014 TOP-TEN STATES IGR IN NIGERIA, IN BILLION(₦)					
STATE	2010	2011	2012	2013	2014
LAGOS	150	202.8	219.2	384.3	276.1
RIVERS	49.6	52.7	66.3	87.9	89.1
DELTA	26.1	34.8	45.6	50.2	42.8
ENUGU	13.8	7.2	12.2	20.2	19.2
OGUN	7.9	10.8	12.4	13.8	17.4
OYO	10.5	8.9	14.6	15.3	16.3
AKWA IBOM	10.1	11.7	13.5	15.4	15.9
KADUNA	11.6	9.8	11.5	10.9	12.7
BAYELSA	4.7	10.5	4.96	10.5	10.96
ANAMBRA	7.66	6.1	7.6	8.7	10.4
SUM	291.96	355.3	407.86	617.2	510.86
AVERAGE	29.196	35.53	40.786	61.72	51.086
ASSUMMED NATIONAL IGR	1080.252	1314.61	1509.082	2283.64	1890.182

TABLE 3.14

PHASE 14

5 YEARS NATIONAL IGR

YEAR	NATIONAL POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_{14}
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4	
2014	140431790	167	167.5	168	1890.18
2013	140431790	154.7	155.2	155.7	2283.64
2012	140431790	154.77	155.27	155.77	1509.08
2011	140431790	155.7	156.2	156.7	1314.61
2010	140431790	148.17	148.67	149.17	1080.25

TABLE 3.14A

0	0	35.37611	0	-3905.53
0	0	34.89631	0	5450.346
0.255156	475.3829164	#N/A	#N/A	#N/A
1.027687	3	#N/A	#N/A	#N/A
232246	677966.7516	#N/A	#N/A	#N/A

TABLE 3.14B

0	0	35.37611	0	-3905.53
0	0	34.89631	0	5450.346
0.255156	475.3829164			
1.027687	3			
232246	677966.7516			

TABLE 3.14C

$$y_{14} = 35x_2 - 3906$$

(Note that 1000 billion = 1 trillion)

3.2.2 . Data Source

The data for our analysis has been extracted from the three different sectors of the Nigerian government, namely: National Population Commission (NPC), National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN).

NPC: (Source: <http://www.population.gov.ng/index.php/censuses>) .

NBS: (Source: <http://www.punchng.com/business-economy/lagos-22-others-collected-n586-6bn-igr-in-2014-nbs/>) .

CBN: (Source: <http://www.cenbank.org/Rates/ExchRateByCurrency.asp>) and

SUBSIDY:(<http://nigerianrc.org/sites/default/files/NNRC%20Highlighting%20the%20Facts%20of%20Fuel%20Subsidy%20in%20Nigeria.pdf>) .

CHAPTER FOUR

MODEL RESULTS

4.1 Result Description

The results of each data in the phases of chapter three above are more emphasized in this chapter. The “Predicted columns”, “Difference columns” and the figures with its contents are the major reasons of this chapter, which vary from the previous.

At the other hand, interpretations/suggestions have been given beneath each table and figure for a better result in subsequent researches. Below are phases corresponding with those in chapter three above.

PHASE I

2014 IGR TOP-TEN STATES		CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (₦), Y ₁	PREDICTED IGR	DIFFERENCE
STATE	POPULATION, X ₁	Buying Rate (₦), X ₂	Central Rate (₦), X ₃	Selling Rate (₦), X ₄			
LAGOS	9113605	156.5	157	157.5	276.1	197.65	-78.45
RIVERS	5198716	156.5	157	157.5	89.1	68.07	-21.03
DELTA	4112445	156.5	157	157.5	42.8	32.11	-10.69
ENUGU	3267837	156.5	157	157.5	19.2	4.16	-15.04
OGUN	3751140	156.5	157	157.5	17.4	20.15	2.75
OYO	5580894	156.5	157	157.5	16.3	80.72	64.42
AKWA IBOM	3902051	156.5	157	157.5	15.9	25.15	9.25
KADUNA	6113503	156.5	157	157.5	12.7	98.35	85.65
BAYELSA	1704515	156.5	157	157.5	10.9	-47.59	-58.49
ANAMBRA	4177828	156.5	157	157.5	10.4	34.28	23.88

TABLE 4.1

RESULT 4.1(i): (a) We suggest that the nation should use the "Predicted IGR" in column 7, if constant CBN exchange rate is maintained for the end of the months year average as it was taken and used (see Appendix C). Since this is a case of 2014.

(b) Column 8 (Difference):

- The positive quantities indicate that those states submitted an invalid data, indeed below their Internal Generated Revenue (IGR).
- While the negative quantities indicate that those states over-levied charges at the end of each month in 2014.

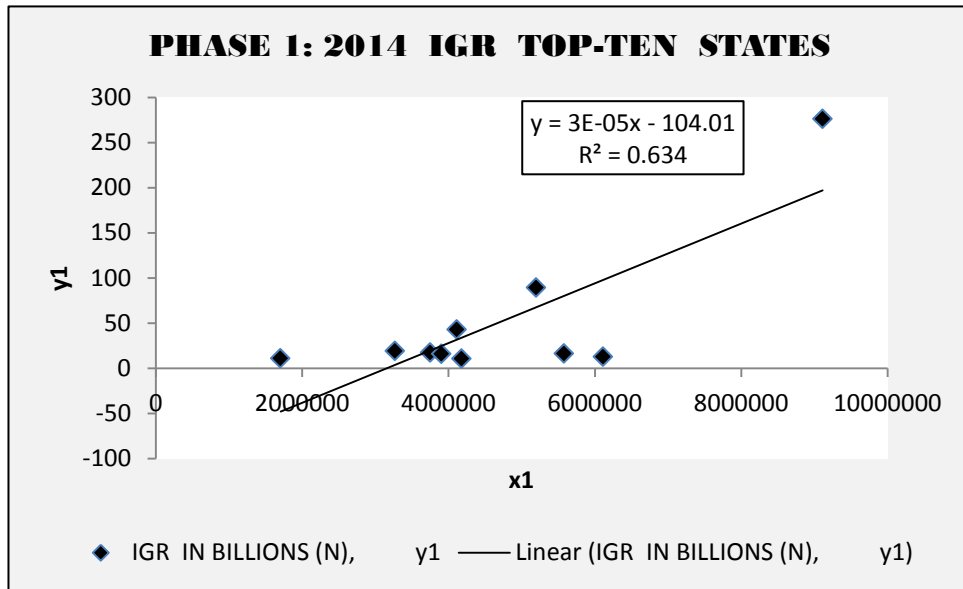


FIG. 4.1

Result 4.1(ii): We accept the equation y_1 , table 4.1 and its fig. 4.1, since our $R^2 > 0$.

PHASE 2

NIGERIA

MONTH	NATIONAL POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			PREDICTED SELLING RATE	DIFFERENCE
		Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), y_2		
December	140431790	167	167.5	168	168	0
November	140431790	164	164.5	165	165	0
October	140431790	154.76	155.26	155.76	155.76	0
September	140431790	154.75	155.25	155.75	155.75	0
August	140431790	154.73	155.23	155.73	155.73	0
July	140431790	154.73	155.23	155.73	155.73	0
June	140431790	154.73	155.23	155.73	155.73	0
May	140431790	154.73	155.23	155.73	155.73	0
April	140431790	154.73	155.23	155.73	155.73	0
March	140431790	154.74	155.24	155.74	155.74	0
February	140431790	154.75	155.25	155.75	155.75	0
January	140431790	154.75	155.25	155.75	155.75	0

TABLE 4.2

Result 4.2(i): Here, we assert that the CBN exchange rate with US dollar is accurate; since the "**Predicted Selling Rate**" is same with the "**Selling Rate.**" Again, the "**Difference**" column zero throughout.

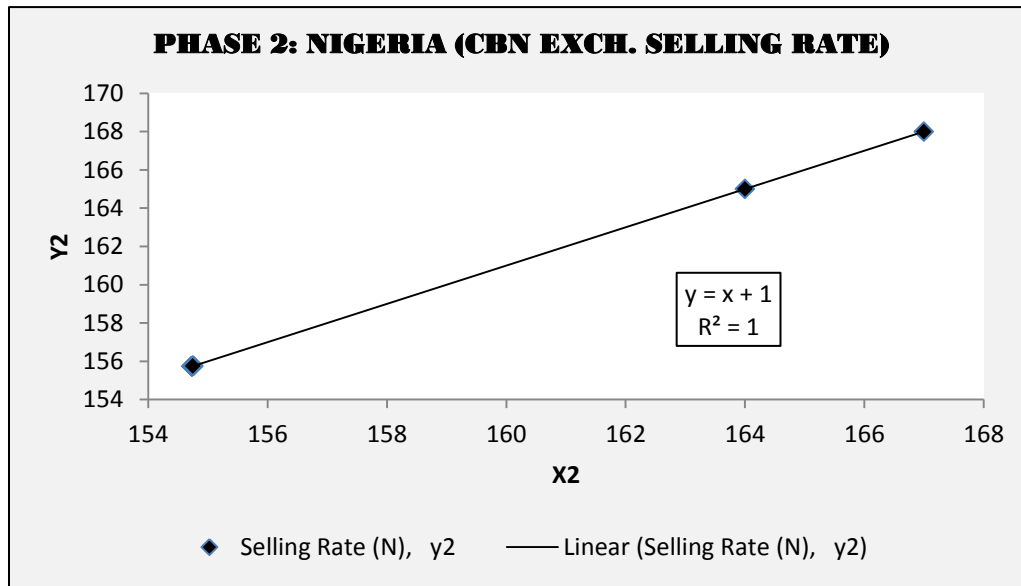


FIG. 4.2

Result 4.2(ii): $R^2 = 1$ means that there is a perfect correlation in the sample; which means that there is no difference between the estimated y-value and the actual y-value. Hence, we accept all data given in the sample and as well in the fig. 4.2

PHASE 3

LAGOS STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_3	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
2014	9113605	167	167.5	168	276.1	302.37	26.27
2013	9113605	154.7	155.2	155.7	384.3	239.49	-144.81
2012	9113605	154.77	155.27	155.77	219.2	239.85	20.65
2011	9113605	155.7	156.2	156.7	202.8	244.60	41.80
2010	9113605	148.17	148.67	149.17	150	206.10	56.10

TABLE 4.3

RESULT 4.3(i):

(a) We suggest that Lagos state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (Difference):

- The positive quantities indicate that Lagos state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Lagos state over-levied charges at the end of each year in concern.

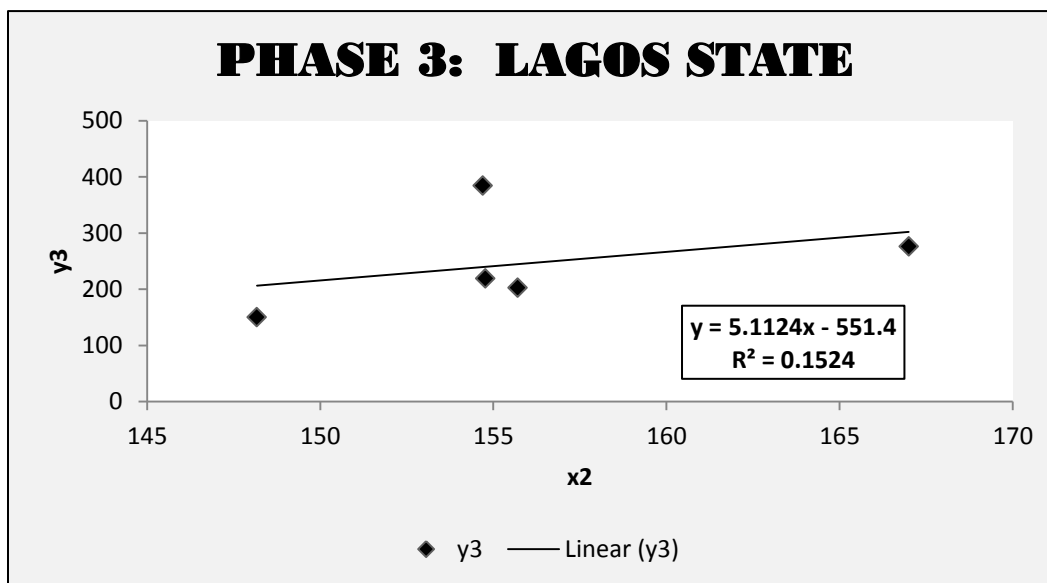


FIG. 4.3

Result 4.3(ii):

We accept the equation y3, table 4.3 and its fig. 4.3, since our $R^2 > 0$.

PHASE 4

RIVERS STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (₦), y_4	PREDICTED IGR	DIFFERENCE
		Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4			
2014	5198716	167	167.5	168	89.1	90.13	1.03
2013	5198716	154.7	155.2	155.7	87.9	66.49	-21.41
2012	5198716	154.77	155.27	155.77	66.3	66.63	0.33
2011	5198716	155.7	156.2	156.7	52.7	68.41	15.71
2010	5198716	148.17	148.67	149.17	49.6	53.94	4.34

TABLE 4.4

RESULT 4.4(i):

(a) We suggest that Rivers state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (**Difference**):

- The positive quantities indicate that Rivers state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Rivers state over-levied charges at the end of each year in concern.

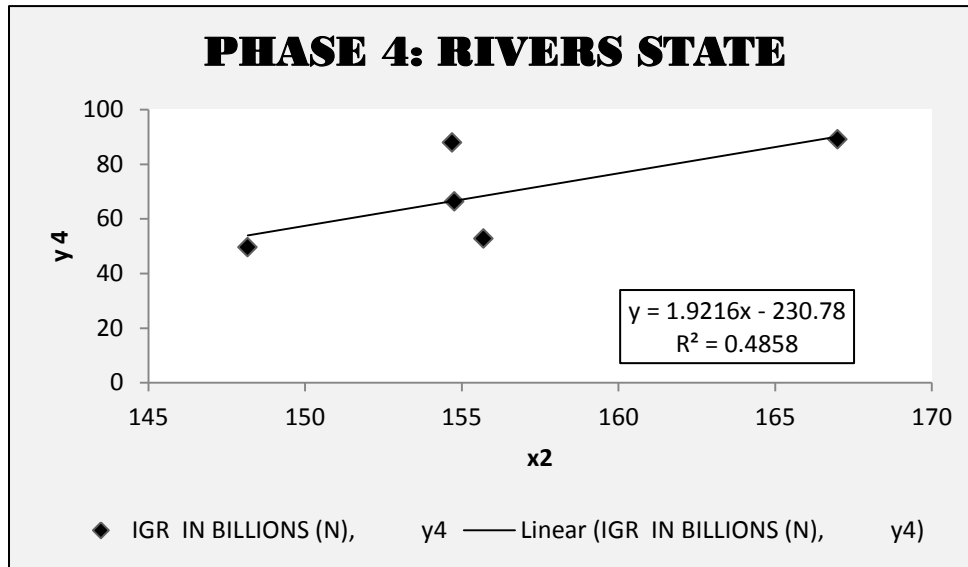


FIG. 4.4

Result 4.4(ii):

We accept the equation y4, table 4.4 and its fig. 4.4, since our $R^2 > 0$.

PHASE 5

DELTA STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_5	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
2014	4112445	167	167.5	168	42.8	47.04	4.24
2013	4112445	154.7	155.2	155.7	50.2	39.01	-11.19
2012	4112445	154.77	155.27	155.77	45.6	39.06	-6.54
2011	4112445	155.7	156.2	156.7	34.8	39.67	4.87
2010	4112445	148.17	148.67	149.17	26.1	34.75	8.65

TABLE 4.5

RESULT

4.5(i):

(a) We suggest that Delta state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (**Difference**):

- The positive quantities indicate that Delta state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Delta state over-levied charges at the end of each year in concern.

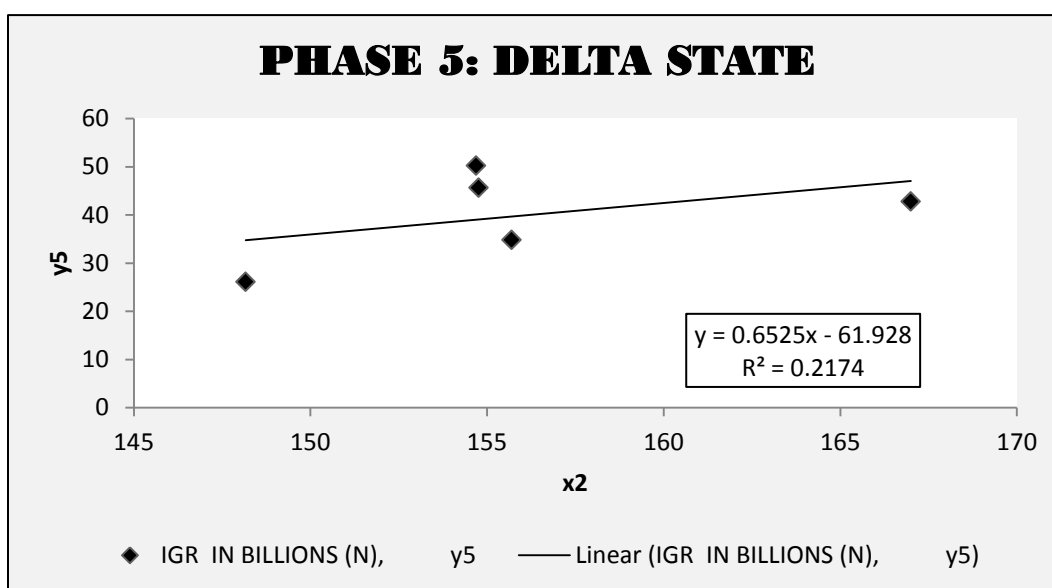


FIG. 4.5

Result 4.5(ii):

We accept the equation y5, table 4.5 and its fig. 4.5, since our $R^2 > 0$.

PHASE 6

ENUGU STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_6	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
2014	3267837	167	167.5	168	19.2	17.75	-1.45
2013	3267837	154.7	155.2	155.7	20.2	14.12	-6.08
2012	3267837	154.77	155.27	155.77	12.2	14.14	1.94
2011	3267837	155.7	156.2	156.7	7.2	14.41	7.21
2010	3267837	148.17	148.67	149.17	13.8	12.19	-1.61

TABLE 4.6

RESULT

6(i):

(a) We suggest that Enugu state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (Difference):

- The positive quantities indicate that Enugu state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Enugu state over-levied charges at the end of each year in concern.

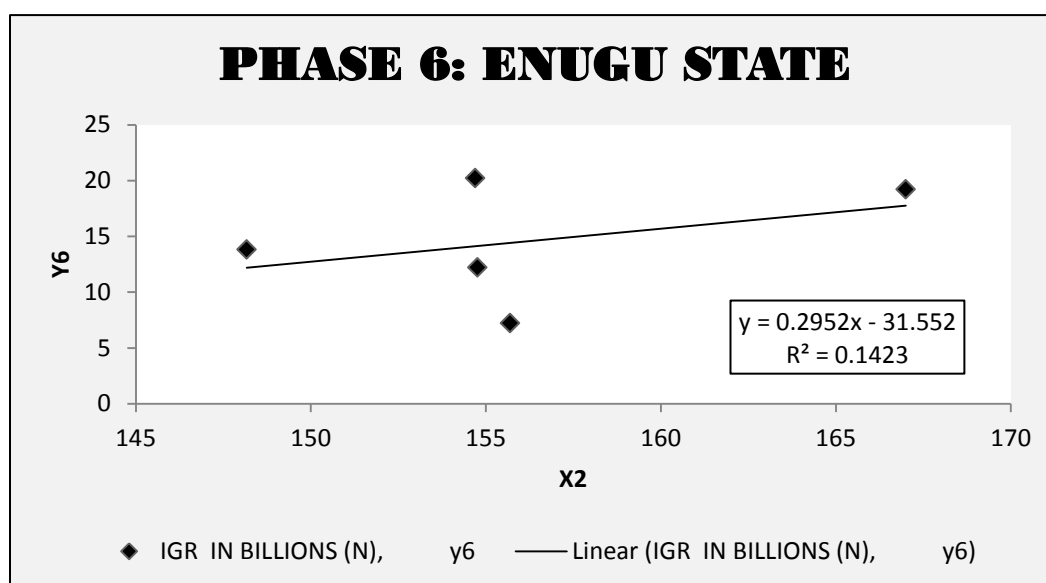


FIG. 4.6

Result 4.6(ii):

We accept the equation y6, table 4.6 and its fig. 4.6, since our $R^2 > 0$.

PHASE 7

OGUN STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_7	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
2014	3751140	167	167.5	168	17.4	17.69	0.29
2013	3751140	154.7	155.2	155.7	13.8	11.80	-2.00
2012	3751140	154.77	155.27	155.77	12.4	11.84	-0.56
2011	3751140	155.7	156.2	156.7	10.8	12.28	1.48
2010	3751140	148.17	148.67	149.17	7.9	8.68	0.78

TABLE 4.7

RESULT 4.7(i):

(a) We suggest that Ogun state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (**Difference**):

- The positive quantities indicate that Ogun state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Ogun state over-levied charges at the end of each year in concern.

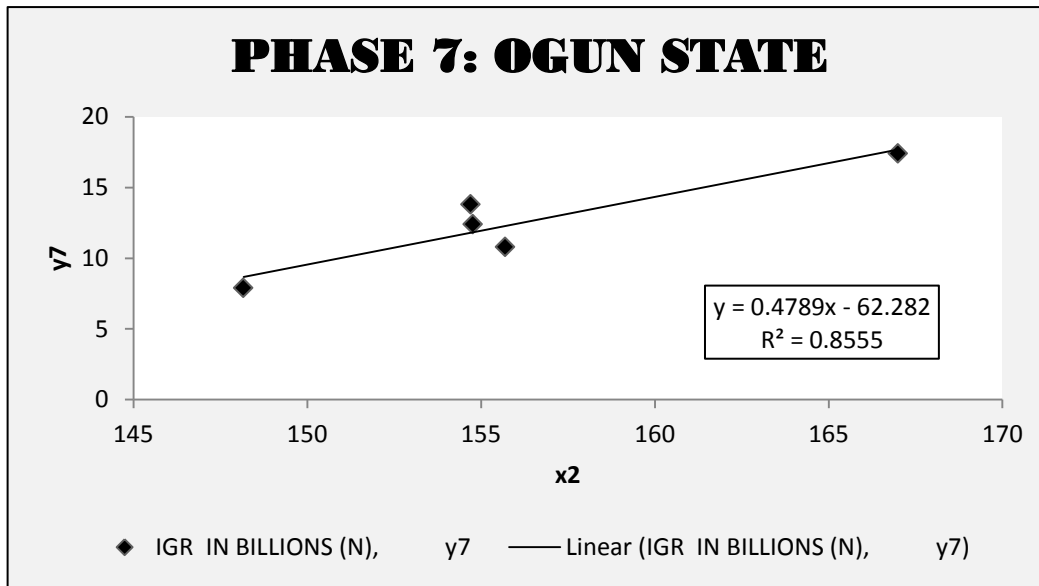


FIG. 4.7

Result 4.7(ii):

We accept the equation y_7 , table 4.7 and its fig. 4.7, since our $R^2 > 0$.

PHASE 8

OYO STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_8	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
2014	5580894	167	167.5	168	16.3	16.19	-0.11
2013	5580894	154.7	155.2	155.7	15.3	12.74	-2.56
2012	5580894	154.77	155.27	155.77	14.6	12.76	-1.84
2011	5580894	155.7	156.2	156.7	8.9	13.02	4.12
2010	5580894	148.17	148.67	149.17	10.5	10.91	0.41

TABLE 4.8

Result 4.8(i):

(a) We suggest that Oyo state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (**Difference**):

- The positive quantities indicate that Oyo state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Oyo state over-levied charges at the end of each year in concern.

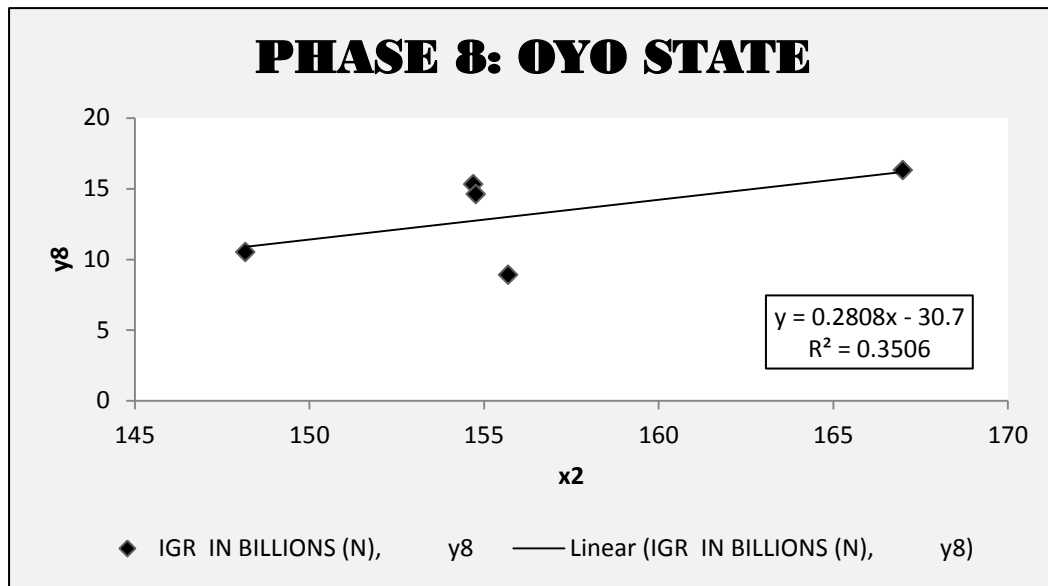


FIG. 4.8

Result 4.8(ii):

We accept the equation y_8 , table 4.8 and its fig. 4.8, since our $R^2 > 0$.

PHASE 9

AKWA IBOM STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_9	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
2014	3902051	167	167.5	168	15.9	16.33	0.43
2013	3902051	154.7	155.2	155.7	15.4	12.94	-2.46
2012	3902051	154.77	155.27	155.77	13.5	12.96	-0.54
2011	3902051	155.7	156.2	156.7	11.7	13.21	1.51
2010	3902051	148.17	148.67	149.17	10.1	11.14	1.04

TABLE 4.9

RESULT 4.9(i):

(a) We suggest that Akwa Ibom state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (**Difference**):

- The positive quantities indicate that Akwa Ibom state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Akwa Ibom state over-levied charges at the end of each year in concern.

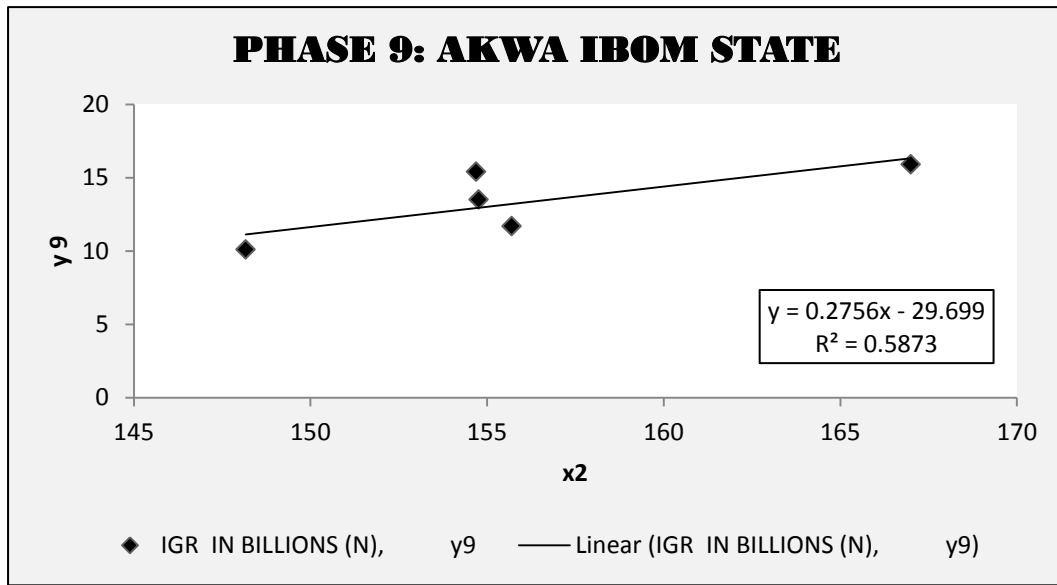


FIG. 4.9

Result 4.9(ii):

We accept the equation y9, table 4.9 and its fig. 4.9, since our $R^2 > 0$.

PHASE 10

KADUNA STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_{10}	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
2014	6113503	167	167.5	168	12.7	12.11	-0.59
2013	6113503	154.7	155.2	155.7	10.9	11.19	0.29
2012	6113503	154.77	155.27	155.77	11.5	11.20	-0.30
2011	6113503	155.7	156.2	156.7	9.8	11.27	1.47
2010	6113503	148.17	148.67	149.17	11.6	10.71	-0.89

TABLE 4.10

RESULT 4.10(i):

(a) We suggest that Kaduna state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (**Difference**):

- The positive quantities indicate that Kaduna state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Kaduna state over-levied charges at the end of each year in concern.

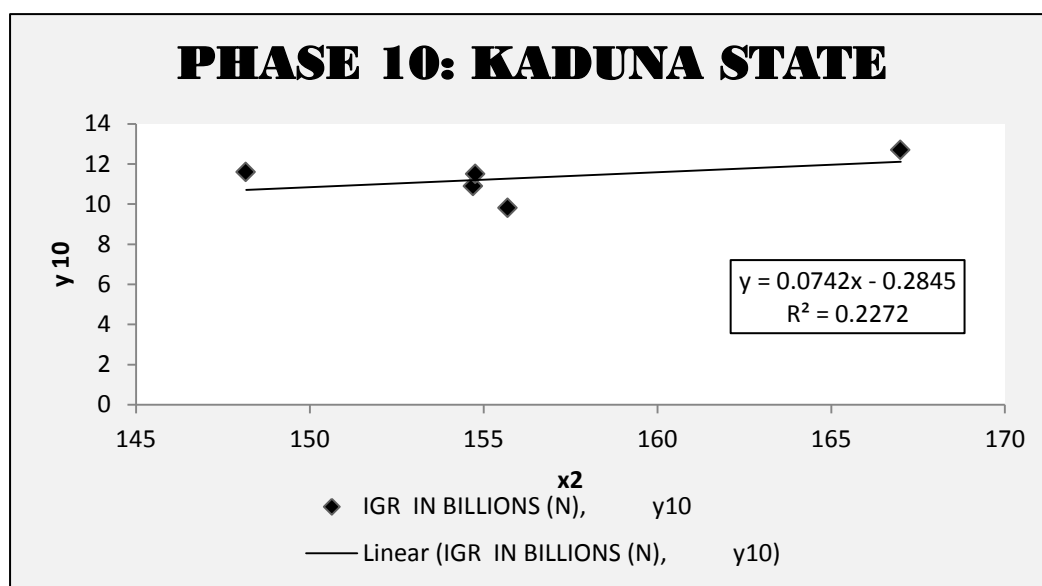


FIG. 4.10

Result 4.10(ii):

We accept the equation y_{10} , table 4.10 and its fig. 4.10, since our $R^2 > 0$.

PHASE II

BAYELSA STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR				IGR IN BILLIONS (N), y_{11}	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4				
2014	1704515	167	167.5	168		10.96	11.74	0.78
2013	1704515	154.7	155.2	155.7		10.5	7.90	-2.60
2012	1704515	154.77	155.27	155.77		4.96	7.92	2.96
2011	1704515	155.7	156.2	156.7		10.5	8.21	-2.29
2010	1704515	148.17	148.67	149.17		4.7	5.86	1.16

TABLE 4.11

Result 4.11(i):

(a) We suggest that Bayelsa state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (**Difference**):

- The positive quantities indicate that Bayelsa state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Bayelsa state over-levied charges at the end of each year in concern.

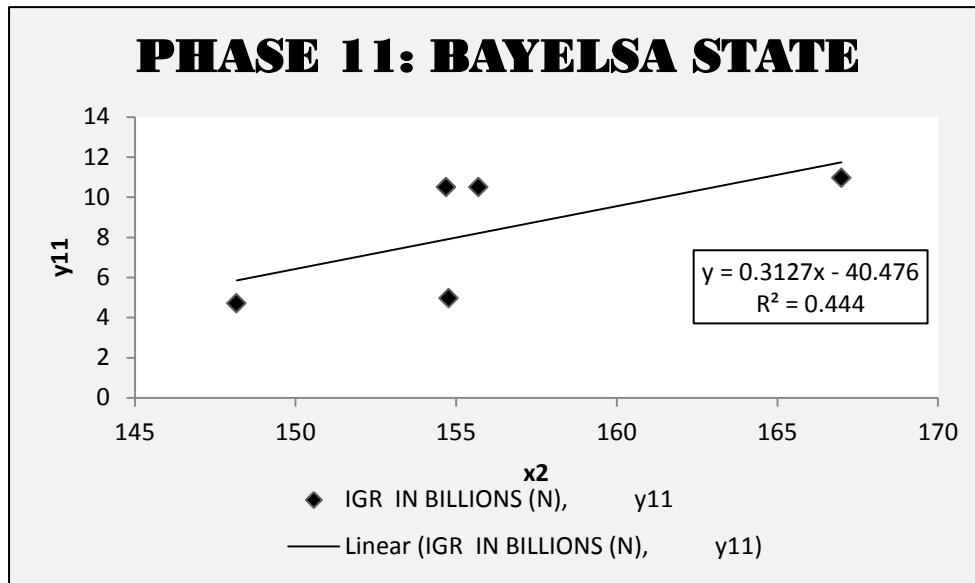


FIG. 4.11

Result 4.11(ii):

We accept the equation y11, table 4.11 and its fig. 4.11, since our $R^2 > 0$.

PHASE 12

ANAMBRA STATE

YEAR	POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLIONS (N), y_{12}	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
2014	4177828	167	167.5	168	10.4	9.82	-0.58
2013	4177828	154.7	155.2	155.7	8.7	7.88	-0.82
2012	4177828	154.77	155.27	155.77	7.6	7.90	0.30
2011	4177828	155.7	156.2	156.7	6.1	8.04	1.94
2010	4177828	148.17	148.67	149.17	7.66	6.86	-0.80

TABLE 4.12

RESULT 4.12(i):

(a) We suggest that Anambra state should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.

(b) Column 8 (Difference):

- The positive quantities indicate that Anambra state submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
- While the negative quantity indicates that Anambra state over-levied charges at the end of each year in concern.

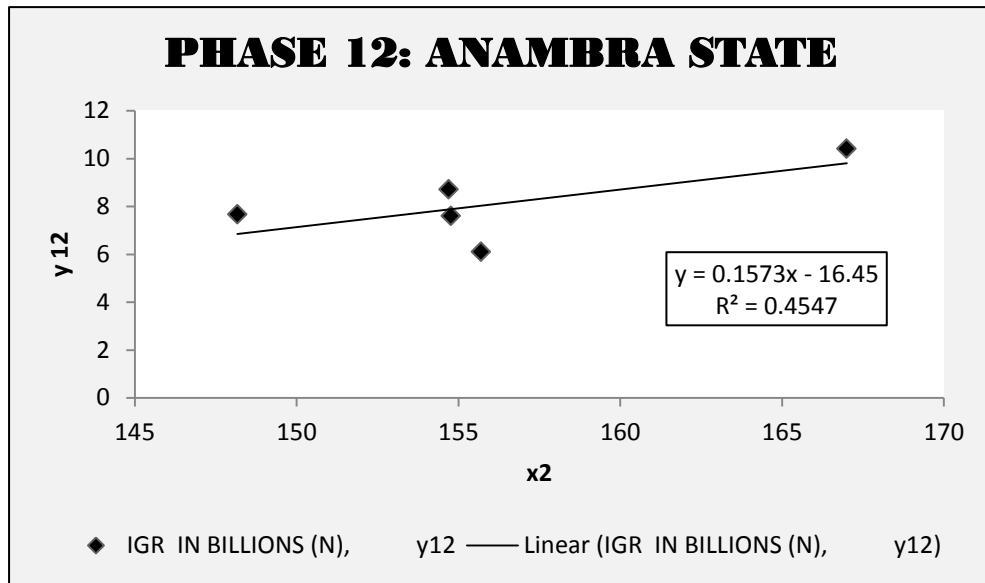


FIG. 4.12

Result 4.12(ii):

We accept the equation y12, table 4.12 and its fig. 4.12, since our $R^2 > 0$.

PHASE 13

NATIONAL IGR 2014

MONTH	NATIONAL POPULATION, x_1	CBN EXCHANGE RATE WITH US DOLLAR			IGR IN BILLION(N) y_{13}	PREDICTED IGR	DIFFERENCE
		Buying Rate (N), x_2	Central Rate (N), x_3	Selling Rate (N), x_4			
December	140431790	167	167.5	168	1889.96	1890	0.04
November	140431790	164	164.5	165	1889.96	1890	0.04
October	140431790	154.76	155.26	155.76	1889.96	1890	0.04
September	140431790	154.75	155.25	155.75	1889.96	1890	0.04
August	140431790	154.73	155.23	155.73	1889.96	1890	0.04
July	140431790	154.73	155.23	155.73	1889.96	1890	0.04
June	140431790	154.73	155.23	155.73	1889.96	1890	0.04
May	140431790	154.73	155.23	155.73	1889.96	1890	0.04
April	140431790	154.73	155.23	155.73	1889.96	1890	0.04
March	140431790	154.74	155.24	155.74	1889.96	1890	0.04
February	140431790	154.75	155.25	155.75	1889.96	1890	0.04
January	140431790	154.75	155.25	155.75	1889.96	1890	0.04

TABLE 4.13

RESULT 4.13(i):

(a) We totally reject this data since the R^2 below is approximately equal to zero

- (b) At the same time suggest that the National Population Commission (NPC) should always, at least in months, update the population value of the nation. This should have been helpful in the accuracy of our data/prediction.

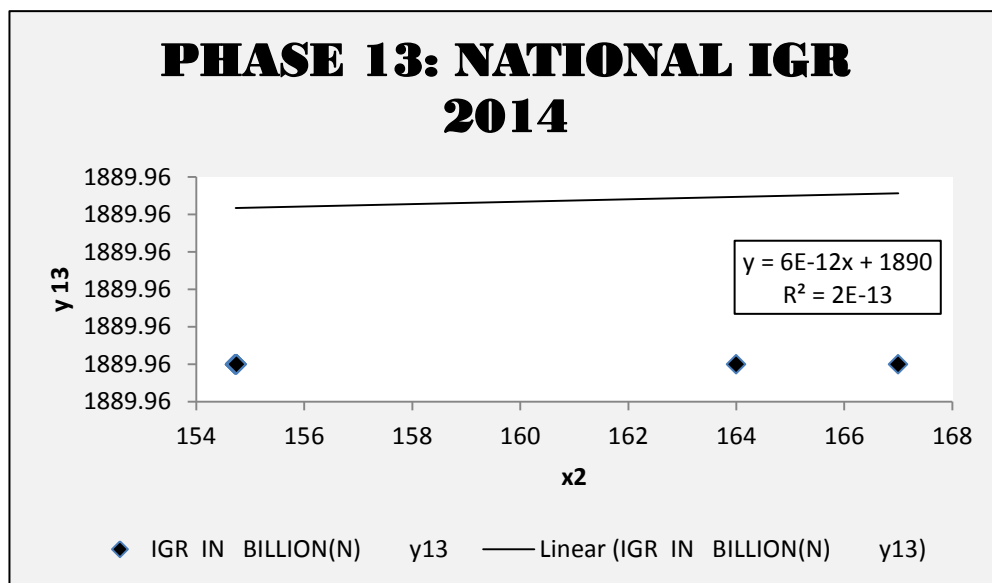


FIG. 4.13

Result 4.13(ii):

We assert that the regression equation is not helpful in predicting a y_{13} - value, since $R^2 \approx 0$.

PHASE 14

5 YEARS NATIONAL IGR

		CBN EXCHANGE RATE WITH US DOLLAR					
YEAR	NATIONAL POPULATION, x_1	Buying Rate (₦), x_2	Central Rate (₦), x_3	Selling Rate (₦), x_4	IGR IN BILLIONS (₦), y_{14}	PREDICTED IGR	DIFFERENCE
2014	140431790	167	167.5	168	1890.18	2002.29	112.11
2013	140431790	154.7	155.2	155.7	2283.64	1567.17	-716.47
2012	140431790	154.77	155.27	155.77	1509.08	1569.64	60.56
2011	140431790	155.7	156.2	156.7	1314.61	1602.54	287.93
2010	140431790	148.17	148.67	149.17	1080.25	1336.16	255.91

TABLE 4.14

RESULT 4.14(i):

- (a) We suggest that Nigeria should use the "**Predicted IGR**" in column 7 for the CBN exchange rate with US dollar calculated at the end of December for the five years.
- (b) Column 8 (**Difference**):
- The positive quantities indicate that Nigeria submitted an invalid data, for the years in concern, indeed below their Internal Generated Revenue (IGR).
 - While the negative quantity indicates that Nigeria over-levied charges at the end of the year in concern.

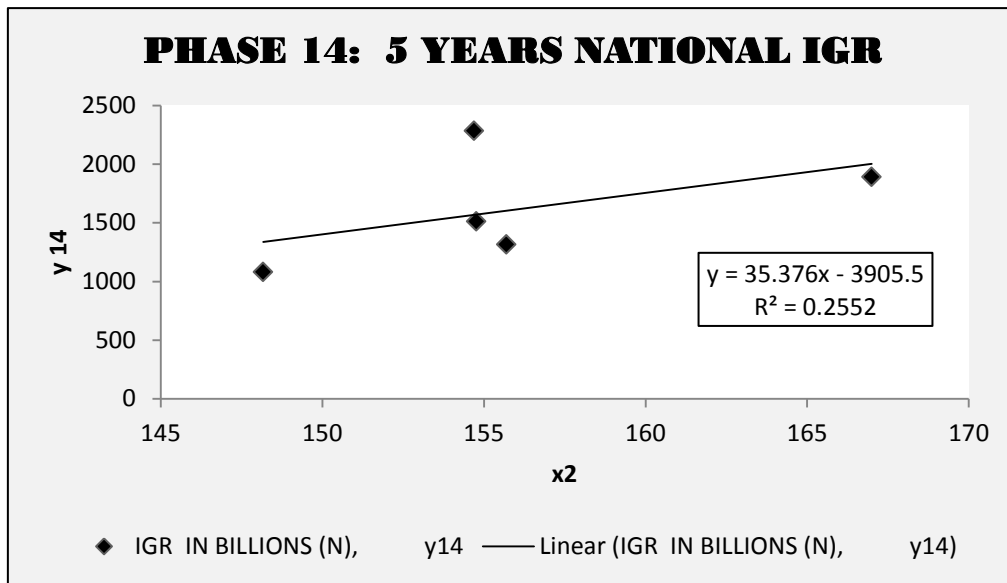


FIG. 4.14

Result 4.14(ii):

We accept the equation y14, table 4.14 and its fig. 4.14, since our $R^2 > 0$.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

We have developed methods which could be used to reach important and lasting insights about the determination of the Internal Generated Revenue (IGR) of some Nigerian states: Lagos, Rivers, Delta, Enugu, Ogun, Oyo, Akwa Ibom, Kaduna, Bayelsa , Anambra and the nation, Nigeria. In the same vein, the equation for perfectly ($R^2=1$) estimating the selling rate of CBN Nigerian naira with U.S. Dollar was developed as well.

In the uncertain economy, we now know that Internal Generated Revenues (IGR) are very hard to predict over short time horizons (phase 1, pp. 26/27 and phase 13, pp. 38/39), but on a long run (for about 5-years on our research) can be forecasted (see ch. 4, phases 2 – 12 and 14, and Appendix H). The study showed that fuel subsidy removal generates and stimulates excess charge and expenses in the Nigerian economy.

5.2 Recommendation

The author recommends that Nigeria should maintain subsidy assistance to the member states; charges levied on assets, tax and securities should not exceed the CBN exchange rating. Again, the nation/states in concern should use the formulated equations for predicting or estimating the IGR to the dynamic/uncertain exchange rate of Nigerian Naira with US Dollar.

We also recommend/suggest that National Population Commission (NPC), (see Appendix E), should update the states and national population daily, monthly and yearly for a better accuracy in research. The delay in the submission of IGR (see Appendix D and F) by states and the nation should be resolved.

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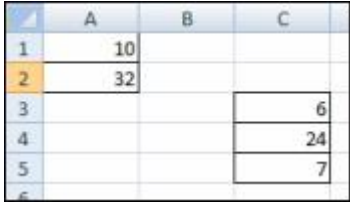
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APPEDIX A

EXCEL ERRORS

If a formula cannot correctly evaluate a result, Excel displays an error value, such as #####, #DIV/0!, #N/A, #NAME?, #NULL!, #NUM!, #REF!, and #VALUE!. Each error type has different causes, and different solutions.

The following table contains links to articles that describe these errors in detail, and a brief description to get you started.

Link to in-depth article	Description
Correct a ##### error	Excel displays this error when a column is not wide enough to display all the characters in a cell, or a cell contains negative date or time values. For example, a formula that subtracts a date in the future from a date in the past, such as =06/15/2008-07/01/2008, results in a negative date value.
Correct a #DIV/0! error	Excel displays this error when a number is divided either by zero (0) or by a cell that contains no value.
Correct a #N/A error	Excel displays this error when a value is not available to a function or formula.
Correct a #NAME? error	This error is displayed when Excel does not recognize text in a formula. For example, a range name or the name of a function may be spelled incorrectly.
Correct a #NULL! error	Excel displays this error when you specify an intersection of two areas that do not intersect (cross). The intersection operator is a space character that separates references in a formula. For example, the areas A1:A2 and C3:C5 do not intersect, so entering the formula =SUM(A1:A2 C3:C5) returns the #NULL! error. 
Correct a #NUM! error	Excel displays this error when a formula or function contains invalid numeric values.
Correct a #REF! error	Excel displays this error when when a cell reference is not valid. For example, you may have deleted cells that were referred to by other formulas, or you may have pasted cells that you moved on top of cells that were referred to by other formulas.

APPENDIX B

MICROSOFT EXCEL SYNTAX

Syntax

```
LINEST(known_y's, [known_x's], [const], [stats])
```

The LINEST function syntax has the following arguments:

Syntax

- ↓ **known_y's** Required. The set of y-values that you already know in the relationship $y = mx + b$.
- If the range of **known_y's** is in a single column, each column of **known_x's** is interpreted as a separate variable.
 - If the range of **known_y's** is contained in a single row, each row of **known_x's** is interpreted as a separate variable.
- ↓ **known_x's** Optional. A set of x-values that you may already know in the relationship $y = mx + b$.
- The range of **known_x's** can include one or more sets of variables. If only one variable is used, **known_y's** and **known_x's** can be ranges of any shape, as long as they have equal dimensions. If more than one variable is used, **known_y's** must be a vector (that is, a range with a height of one row or a width of one column).
 - If **known_x's** is omitted, it is assumed to be the array {1,2,3,...} that is the same size as **known_y's**.
- ↓ **const** Optional. A logical value specifying whether to force the constant b to equal 0.
- If **const** is TRUE or omitted, b is calculated normally.
 - If **const** is FALSE, b is set equal to 0 and the m-values are adjusted to fit $y = mx$.
- ↓ **stats** Optional. A logical value specifying whether to return additional regression statistics.
- If **stats** is TRUE, **LINEST** returns the additional regression statistics; as a result, the returned array is {mn,mn-1,...,m1,b;sen,sen-1,...,se1,seb;r2,sey;F,df;ssreg,ssresid}.
 - If **stats** is FALSE or omitted, **LINEST** returns only the m-coefficients and the constant b.

The additional regression statistics are as follows.

Statistic	Description
se1,se2,...,sen	The standard error values for the coefficients $m_1, m_2, \dots, m_n$.
seb	The standard error value for the constant b (seb = #N/A when const is FALSE).
r2	The coefficient of determination. Compares estimated and actual y-values, and ranges in value from 0 to 1. If it is 1, there is a perfect correlation in the sample — there is no difference between the estimated y-value and the actual y-value. At the other extreme, if the coefficient of determination is 0, the regression equation is not helpful in predicting a y-value. For information about how r2 is calculated, see "Remarks," later in this topic.
sey	The standard error for the y estimate.
F	The F statistic, or the F-observed value. Use the F statistic to determine whether the observed relationship between the dependent and independent variables occurs by chance.
df	The degrees of freedom. Use the degrees of freedom to help you find F-critical values in a statistical table. Compare the values you find in the table to the F statistic returned by LINEST to determine a confidence level for the model. For information about how df is calculated, see "Remarks," later in this topic. Example 4 shows use of F and df.
ssreg	The regression sum of squares.
ssresid	The residual sum of squares. For information about how ssreg and ssresid are calculated, see "Remarks," later in this topic.

The following illustration shows the order in which the additional regression statistics are returned.

	A	B	C	D	E	F
1	m_n	m_{n-1}	...	m_2	m_1	b
2	se _n	se _{n-1}	...	se ₂	se ₁	seb
3	r2	sey				
4	F	df				
5	ssreg	ssresid				

APPENDIX C

Central Bank of Nigeria | Exchange Rate | Records 2014 End of The Months Extract.

Index Model Ass. Code	Currency (\$)	Rate Year	Rate Month	Buying Rate (₦)	Central Rate (₦)	Selling Rate (₦)
42004	US DOLLAR	2014	December	167	167.5	168
41970	US DOLLAR	2014	November	164	164.5	165
41943	US DOLLAR	2014	October	154.76	155.26	155.76
41912	US DOLLAR	2014	September	154.75	155.25	155.75
41880	US DOLLAR	2014	August	154.73	155.23	155.73
41851	US DOLLAR	2014	July	154.73	155.23	155.73
41820	US DOLLAR	2014	June	154.73	155.23	155.73
41789	US DOLLAR	2014	May	154.73	155.23	155.73
41759	US DOLLAR	2014	April	154.73	155.23	155.73
41729	US DOLLAR	2014	March	154.74	155.24	155.74
41698	US DOLLAR	2014	February	154.75	155.25	155.75
41670	US DOLLAR	2014	January	154.75	155.25	155.75
TOTAL				1878.4	1884.4	1890.4
AVERAGE				156.533333	157.033333	157.533333

5 YEARS END OF THE YEAR CBN EXCHANGE RATE OF NIGERIA NAIRA WITH US DOLLAR

Date	US CURRENCY	YEAR	MONTH	BUYING RATE	CENTRAL RATE	SELLING RATE
12/31/2014	US DOLLAR	2014	December	167	167.5	168
12/31/2013	US DOLLAR	2013	December	154.7	155.2	155.7
12/31/2012	US DOLLAR	2012	December	154.77	155.27	155.77
12/30/2011	US DOLLAR	2011	December	155.7	156.2	156.7
12/31/2010	US DOLLAR	2010	December	148.17	148.67	149.17

APPENDIX D

TOP TEN STATES BY IGR IN BILLIONS OF NAIRA

1-Lagos --	N276.1
2-Rivers --	N89.1
3-Delta --	N42.8
4-Enugu --	N19.2
5-Ogun --	N17.4
6-Oyo --	N16.3
7-Akwa Ibom --	N15.9
8-Kaduna --	N12.7
9-Bayelsa --	N10.9
10-Anambra --	N10.4

Source: <http://www.punchng.com/business/business-economy/lagos-22-others-collected-n586-6bn-igr-in-2014-nbs/>

Excerpt

Lagos, 22 others collected N586.6bn IGR in 2014 – NBS

The National Bureau of Statistics on Wednesday released a snapshot of the Internally Generated Revenue profile of 23 states of the federation for the year 2014. The bureau stated in the report, a copy of which was obtained by our correspondent in Abuja, that Lagos State recorded the highest IGR of N276.1bn in the period under review. The N276.1bn generated by Lagos last year was N108.1bn or 28.1 per cent lower than the N384.2bn, which the state earned as IGR in the 2013 fiscal period. Further analysis revealed that the amount that Lagos earned in 2014 was also 47 per cent of what all the other 22 states collected as IGR in the same period.

The report stated that while the figures for the other 13 states were still being expected, Rivers State, with a total IGR of N89.1bn, followed on the revenue chart. The N89.1bn earned by Rivers State represented an increase of N1.19bn when compared to the N87.91bn for 2013.

Others are Akwa Ibom, with N15.6bn; Anambra, N10.4bn; Bayelsa, N10.9bn; Enugu, N19.2bn; Katsina, N6.2bn; Kogi, N6.5bn; Ekiti, N3.4bn; Osun, N8.5bn; Oyo, N16.3bn; and Imo, N8.1bn. The rest are Niger, N5.7bn; Plateau, N8.2bn; Zamfara, N3.1bn; Delta, N42.8bn; Benue, N8.2bn; Bauchi, N4.8bn; Kaduna, N12.7bn; Katsina, N6.2bn; Kebbi, N3.8bn; Nasarawa, N4.05bn; Ogun, N17.4bn; Sokoto, N5.6bn and Zamfara, N3.1bn.

The report listed the 13 states that had yet to provide details of their IGR for 2014 as Abia, Adamawa, Borno, Cross River, Ebonyi, Edo, Gombe, Jigawa, Kano, Kwara, Ondo, Taraba and Yobe.

APPENDIX E

2006 NATIONAL POPULATION CENSUS

Population by State

Table DS 1: Distribution of Population by States

1 Abia	2,845,380
2 Adamawa	3,178,950
3 Akwa Ibom	3,902,051
4 Anambra	4,177,828
5 Bauchi	4,653,066
6 Bayelsa	1,704,515
7 Benue	4,253,641
8 Borno	4,171,104
9 Cross River	2,892,988
10 Delta	4,112,445
11 Ebonyi	2,176,947
12 Edo	3,233,366
13 Ekiti	2,398,957
14 Enugu	3,267,837
15 Gombe	2,365,040
16 Imo	3,927,563
17 Jigawa	4,361,002
18 Kaduna	6,113,503
19 Kano	9,401,288
20 Katsina	5,801,584
21 Kebbi	3,256,541
22 Kogi	3,314,043
23 Kwara	2,365,353
24 Lagos	9,113,605
25 Nasarawa	1,869,377
26 Niger	3,954,772
27 Ogun	3,751,140
28 Ondo	3,460,877
29 Osun	3,416,959
30 Oyo	5,580,894
31 Plateau	3,206,531
32 Rivers	5,198,716
33 Sokoto	3,702,676
34 Taraba	2,294,800
35 Yobe	2,321,339
36 Zamfara	3,278,873
37 FCT Abuja	1,406,239
Nigeria	140,431,790

APPENDIX F

4 YEARS IGR ON THE 2014 TOP-TEN STATES IGR IN NIGERIA, IN BILLION(₦)					
STATE	2010	2011	2012	2013	2014
LAGOS	150	202.8	219.2	384.3	276.1
RIVERS	49.6	52.7	66.3	87.9	89.1
DELTA	26.1	34.8	45.6	50.2	42.8
ENUGU	13.8	7.2	12.2	20.2	19.2
OGUN	7.9	10.8	12.4	13.8	17.4
OYO	10.5	8.9	14.6	15.3	16.3
AKWA IBOM	10.1	11.7	13.5	15.4	15.9
KADUNA	11.6	9.8	11.5	10.9	12.7
BAYELSA	4.7	10.5	4.96	10.5	10.96
ANAMBRA	7.66	6.1	7.6	8.7	10.4
SUM	291.96	355.3	407.86	617.2	510.86
AVERAGE	29.196	35.53	40.786	61.72	51.086
ASSUMMED NATIONAL IGR	1080.252	1314.61	1509.082	2283.64	1890.182

APPENDIX G

NATIONAL IGR EVALUATED DATA WITH MICROSOFT EXCEL

0	0	35.37611	0	-3905.53
0	0	34.89631	0	5450.346
0.255156	475.3829164	#N/A	#N/A	#N/A
1.027687	3	#N/A	#N/A	#N/A
232246	677966.7516	#N/A	#N/A	#N/A

0	0	35.37611	0	-3905.53
0	0	34.89631	0	5450.346
0.255156	475.3829164			
1.027687	3			
232246	677966.7516			

$$y_{14} = 35x_2 - 3906$$

(Note that 1000 billion = 1 trillion)

APPENDIX H

THE PREDICTING EQUATIONS

$y_1 = (3.31 * 10^{-5})x_1 - 104$	NATIONAL IGR 2014
$y_2 = x_2 + 1$	NIGERIA CBN SELLING PRICING
$y_3 = 5x_2 - 551$	LAGOS STATE
$y_4 = 1.9x_2 - 231$	RIVERS STATE
$y_5 = \frac{13}{20}x_2 - 62$	DELTA STATE
$y_6 = \frac{3}{10}x_2 - 32$	ENUGU STATE
$y_7 = \frac{12}{25}x_2 - 62$	OGUN STATE
$y_8 = \frac{7}{25}x_2 - 31$	OYO STATE
$y_9 = \frac{7}{25}x_2 - 30$	AKWA IBOM STATE
$500y_{10} = 37x_2 - 140$	KADUNA STATE
$100y_{11} = 31x_2 - 4000$	BAYELSA STATE
$25y_{12} = 4x_2 - 400$	ANAMBRA STATE
$y_{13} = (1.85 * 10^{-29})x_2 + 1889.96$	NATIONAL IGR 2014
$y_{14} = 35x_2 - 3906$	5 YEARS NATIONAL IGR

(Note that 1000 billion = 1 trillion)