

Optimal Control of the Nigerian Economy Under Extant Paradigm: Implications and Consequences

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Abstract

In most of our previous studies of the Nigerian economy, persistent recommendations have been made for Government to transform the economic and industrial landscape of the entire country by investing in infrastructure, manufacturing, electricity generation, transmission and distribution, services, construction, including factories and industries as well as creating the right environment for Private Sector-led investments. This study is an attempt to test the above hypothesis. A full blown model of the Nigerian economy was formulated and used to optimally control the economy under existing paradigm with a view to test if the economy will optimally grow and develop with poverty and hunger reducing on the one hand, and the implications and consequences for investments with impact on the citizens, on the other hand. Using the total differential systems modeling approach, linear programming and optimal control analysis, the result rejects the null hypothesis and upholds the alternative hypothesis because optimal control under the extant paradigm of the Nigerian economy will only result in a superficial development of the economy. Aggregate demand and supply, Crop and Fishery production and food security may improve considerably and produce a superficial growth and a false sense of welfare while the level of inflation, corruption and poverty will remain a major source of concern while sectoral investments will slump across board except in Crops and Fishery. Though people will invest and be employed in agricultural crop production and fishing and the problems of hunger and insecurity may be drastically reduced, the Nigerian economy will be largely impoverished, with corruption skyrocketing except Government heeds the persistent recommendations of our previous studies of the Nigerian economy.

Key Words: *Total differential systems modeling approach, Linear programming, Optimal Control Analysis, Sectoral investments, Poverty, Hunger, Growth and Welfare indicators.*

INTRODUCTION

Recent studies have revealed that the present state of the Nigerian economy is precarious; with low productivity, corruption and lack of real investments being among the reasons for the lack of optimum development and sluggish growth. The level of unemployment and poverty as well as inflation are alarming. In most of our previous studies of the Nigerian economy, Aruofo and Ogbeide (2022, 2024 and 2025); persistent recommendations have been made for Government to transform the economic and industrial landscape of the entire country by investing in critical

areas including infrastructure, manufacturing, electricity supply and distribution, services, construction as well as creating an enabling environment for Private Sector-led investments. This study is an attempt to test the relationship between the variables of the above hypothesis. A combined model of the Nigeria economy was formulated and used to optimally control the economy under existing paradigm with a view to test if the economy will optimally grow and develop on the one hand, with poverty and hunger reducing and the implications and consequences for investments in Nigeria as a whole, on the other hand, and the impact on the citizens.

OBJECTIVES OF THE STUDY

The objectives of the study among others, include:

1. To build a comprehensive and complete model of the Nigerian economy to optimally control the economy as a whole, using the total differential modeling approach (ecostatometrics) and linear programming.
2. In particular, to assess the impact on the economy, especially as they affect, Income and Investment, Aggregate Demand and Supply, Sectoral Outputs and investment, Growth and Growth rate, Inflation and unemployment, Poverty and Hunger, the External Sector, Corruption and Welfare, among others;
3. To analyze the implications and consequences of optimally controlling the economy as a whole between 2026 and 2027 under extant paradigm of the Nigeria economy.
4. To test the following Hypothesis:
H0: Government should not transform the economic and industrial landscape of the entire country by investing in infrastructure, manufacturing, electricity supply and distribution, services, construction, including factories and industries as well as creating the right environment for Private Sector-led investments.
HA: Government should transform the economic and industrial landscape of the entire country by investing in infrastructure, manufacturing, electricity supply and distribution, services, construction, including factories and industries as well as creating the right environment for Private Sector-led investments.
5. Draw Conclusion.

The paper is therefore divided into five parts. Part I is the introduction and states the objectives of the study. Part II is the literature review; while Part III is the methodology. In Part IV, the results of the analysis are presented. and Part V concludes the study and posits recommendation.

LITERATURE REVIEW

Optimal control entails the best possible managerial method, in a dynamic system, to achieve a designated goal by minimizing expense or maximizing return.

A paradigm is an intellectual construct which is a type of concept, a thinking aid, which helps in building a theory. This construct requires a high-level imagination which is proven through consequence. It summarizes perspectives in a specific field at any point in time (Kuhn,1962).

Paradigms are attributes of the laws through which the world is viewed by a group of people. It entails beliefs, assumptions, shared values and biases. An economic paradigm is therefore a basic principle describing how a system works or should work.

The extant paradigm in Nigeria depicts it as a mixed economy with a blend of elements of capitalism and socialism, with the existence of private and government businesses. It is also an emerging (developing) economy with significant potentials, but with challenges.

The major sectors include Oil and Gas, which constitutes a significant part, Agriculture, which provides some employment, Manufacturing which is growing slowly and Services including finance, telecom, entertainment, amongst others.

Currently, reforms since 2023 include policies aimed at stability and growth of the economy, removing fuel subsidy and effecting market-determined exchange rate system. There is also the tightening of the monetary policy to maintain price stability. However, challenges exist particularly, in areas of oil dependency, fiscal policy/exchange rate issues and external shocks like in transmittable health diseases.

To put this literature review under proper perspective, we shall present in summary some of the findings and recommendations in our previous studies that are relevant to this study. In their earlier studies, Aruofor and Ogbeide (2020), observed that Corruption is still rife in Nigeria in spite of all the interventions and there was no growth in the economy in the new democracy. They also noted in another study that the major clogs in the wheels of development of the Nigerian economy included first and foremost, Corruption, followed by Low Labour Productivity, Penchant for imported goods by Nigerians and excessive external borrowings (Aruofor and Ogbeide, 2024) and recommended that Nigeria should invest, as a matter of priority, in the Manufacturing, Electricity Supply, Services and Construction Sectors.

In another development, Aruofor and Ogbeide (2025), opined that there was need for Government to strive harder at truly diversifying the structure of the Nigerian economy in favour of multi-income generating sources while promoting non-oil exports and boosting investment in the Agricultural Sector. They recommended among others that Government must not relent in the fight against insecurity and corruption in Nigeria and that as the last resort, Government should establish more factories and industries especially in the rural areas in order to solve the unemployment problem in Nigeria. Aruofor and Ogbeide (2024), also observed that poverty, unemployment and insecurity were rife in the Nigerian economy and recommended that government should shun and fight corruption, indiscipline and greed in our everyday life as well as ensure the security of life and property in Nigeria among others (See also Aruofor and Ogbeide, 2022).

They revealed also that if Government can invest in manufacturing, services and adopt policies which will facilitate and promote non-oil exports in Nigeria, as well as address the issue of lopsided income distribution in the country and build more factories and industries especially in the rural areas of Nigeria; continue to fight corruption, indiscipline and greed in the society, the Nigerian economy will fan out, grow and develop (Aruofor and Ogbeide, 2024, 2025). They specifically recommended that Government should transform the economic and industrial landscape of the entire country by investing in infrastructure, electricity supply and distribution, services, construction, including factories and industries as well as creating the right environment for Private Sector-led investments and that not until investments are converted to physical infrastructure, including factories and industries would the problems of poverty, unemployment and inflation in Nigeria be solved (Aruofor and Ogbeide, 2025). The need to test the above hypothesis has informed this study.

METHODOLOGY

The approach used in this study is divided into three parts. The first is termed the total differential modeling approach (see Aruofor, 2001, 2004, 2007, 2013, 2017 and 2020) also Aruofor and Ogbeide, (2017 and 2022) and Aruofor and Okungbowa, (2018). The total differential modeling approach (ecostatometrics) is the reward of a personal commitment in research that dates back to 1976 by the author. The research results have been published in Aruofor (2020) and the researcher is encouraged to buy a copy of Aruofor, R. O. K. (2020a). “Economic Systems Engineering: Modeling And Applied Quantitative techniques For Economic And Development Planning. Amazon Books, ISBN:9798689936024” and its Epilogue, Aruofor, (2020b) online. It assumes and rightly so, that in the real world situation, every economic variable or subsystem depends on and is depended upon by other variables or subsystems.

A schematic representation of the above theory is presented in Fig. 1.

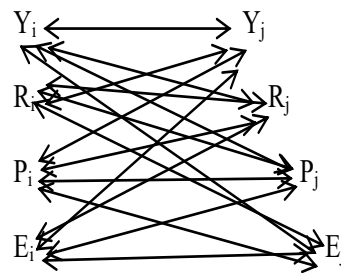


Fig: 1: The True Socio – Economic Causal Chain

Y = Production variables;
R = Primary Factors;
P = Policy instruments;
E = Environmental variables.

This theory was first mooted by Walras as early as 1874 even though it was not developed beyond the conceptual stage. The true practical empirical systems total differential modeling approach (Ecostatometrics), was achieved by Aruofor (2017) when Professor Rex Oforitse Aruofor delivered his inaugural lecture, titled “Economic Systems Engineering, Poverty, Unemployment and Under-Development: A Quest for Solution and Imperatives for Developing the Nigerian Economy” at Benson Idahosa University, Benin City, Nigeria on March 6. 2017. Since then it has crystallized into academic publications (see Aruofor, 2017, 2019 and 2020), Aruofor and Okungbowa, (2018) and also Aruofor and Ogbeide, (2017, 2022a, 2022b, 2023a, 2023a, 2024a, 2024b, 2024c, 2024d, 2024e, 2024f, 2025a, 2025b, 2025c, 2025d and 2025e). The total differential modelling approach relies on statistically significant multiple simple linear regression coefficients as opposed to multiple linear regression parameters. It is a blend between the traditional Input Output Analysis and Econometrics and assumes the structure of programming models. The theory behind it is that an economy is not truly dynamic but only dynamically static. It is the change that occurs in an economy in the current year(t) that determines where the economy (the endogenous variables) will be at the end of the current year (t) and not in the next year(t+1). This model is a departure from the normal econometric

approach, where the structure of the economy is determined by combinations of economic theories. The true structure of an economy is so complex that economic theory will be self defeating (see Duesenberry et al , 1965 and Gordon, 1968). **Indeed, Adeyoju (1975) had rightly noted that “the unstable nature of population and its growth, national income and its distribution, investment capacity, employment opportunities, balance of payments and raw material base often lead to conflicting theories of economic development”.** Thus, we do not need any elaborate theories to explain the working of an economy.

If we can estimate all the independent relationships among the variables of the economy taken two at a time, (depending on whether they are statistically significant) and classify the significant coefficients into a matrix, ***B***, according to whether they are endogenous or exogenous, then we would have in matrix notation,

$$\begin{aligned}
 Y &= BY + CX + A + U \\
 \therefore [I - B]Y &= CX + A + U \\
 Y &= [I - B]^{-1}CX + [I - B]^{-1}A + [I - B]^{-1}U \\
 \frac{dY}{dX} &= [I - B]^{-1}C \\
 \therefore dY &= [I - B]^{-1}CdX \\
 \text{i.e } \Delta Y &= [I - B]^{-1}C\Delta X \\
 \therefore Y_t &= [I - B]^{-1}CX_t - [I - B]^{-1}CX_{t-1} + Y_{t-1}
 \end{aligned}$$

Where, *Y*=endogenous and *X*=exogenous variables. The fact that the relationships are not estimated by multiple linear regressions means that the issue of simultaneous equation bias is by-passed and all the estimation difficulties, including multi-collinearity associated with econometric multiple linear regression, which renders it inconsistent and therefore non-operational, are also by-passed. Moreover, no complicated econometric and economic theories are needed to proceed. It is then possible to view the whole economy at a glance and the structure of the economy is determined automatically.

Thus, given a simple linear regression between two variables, *X* and *Y*, we proceed as follows and state the equation as below:

$$Y = a + bX + u$$

Where *Y* = the dependent variable

X = the independent variable

a & *b* = parameters

u = error term.

The estimate of the parameters *a* & *b*, is achieved by the application of least squares to the data on the variables, with a view to minimize the sum of squared deviations around the regression line (Koutsoyiannis, 1977 and Aruofor, 2001 and 2020).

The parameters can be estimated by solving the following normal equations:

$$a \sum 1 + b \sum X = \sum Y \quad (1)$$

$$a \sum X + b \sum X^2 = \sum XY \quad (2)$$

This was the basic procedure adopted and the coefficients were estimated by means of a computer software, ESM-Lab 4.4, that tested for statistical significance at the 5% level of

significance using the asymptotic t-ratios. For this study, the data were assembled from the Central Bank Statistical Bulletin (CBN, 2017, 2018, 2019 and 2021) and Aruofofor, (2017) and Aruofofor and Ogbeide (2019, 2024 and 2025). The time series ranged from 1981 to 2025. The list of variables consists of one hundred and thirty nine variables, comprising one hundred and twenty five (125) endogenous variables followed by fourteen (14) exogenous variables (see fig 2).

Fig 2: LEGEND OF VARIABLES NIGERIA MARKET ECONOMY

S/no.	ACRONYMS	ACTIVITY	UNIT
1	NGDP(t)	GDP at Current Basic Prices	N million
2	AGGDD	Aggregate Demand	N million
3	AGGSS	Aggregate Supply	N million
4	INVST(t)	Investment	N million
5	INVRATO	Investment ratio	
6	INDUST(t)	2. Industry	N million
7	MANUFC(t)	(c) Manufacturing	N million
8	OILREFIN	OIL Refining	N million
9	ELECTSS(t)	3. Electricity, Gas, Steam & Air conditioner	N million
10	WATER(t)	4. Water supply, sewage, waste Mang.	N million
11	CONSTN(t)	5. Construction	N million
12	SERVCS(t)	C. SERVICES	N million
13	TRADE(t)	1. Trade	N million
14	ACCOFOOI	2. Accommodation and Food Services	N million
15	TRASPOT(t)	3. Transportation and Storage	N million
16	TRANSEV(t)	e. Transport Services	N million
17	POSTCUR(t)	f. Post and Courier Services	N million
18	INFOCOM(t)	4. Information and Communication	N million
19	TELECOM(t)	a. Telecommunications and Information Services	N million
20	PUBLSHN(t)	b. Publishing,	N million
21	MPIC&SNC	c. Motion Pictures, Sound recording and Music production	N million
22	BRODCST(t)	d. Broadcasting	N million
23	ARTRECR	5. Arts, Entertainment & Recreation	N million
24	FININSUR(t)	6. Financial and Insurance	N million
25	FINANCE(t)	a. Financial Institutions	N million
26	INSURANS	b. Insurance	N million
27	REALEST(t)	7. Real Estate	N million
28	PROFSERV	8. Professional, Scientific & Technical Serv.	N million
29	ADMINSUI	9. Administrative and Support Services	N million
30	PUBADMN	10. Public Administration	N million
31	EDUCATN(t)	11. Education	N million
32	HLT&SOC	12. Human Health & Social Services	N million
33	OTHSERVS	13. Other Services	N million
34	DISPINC(t)	Disposable Income	N million
35	REALINC(t)	Real Income	N million
36	REALGDP(t)	Real GDP	N million
37	GROWTRT	Growth rate	%
38	GROWTH(t)	Growth	N million
39	CONS(t)	Consumption	N million
40	CAPITAL(t)	Capital accumulation	N million
41	FDI(t)	Foreign Direct Investment	N million
42	CPI(t)	Consumer Price Index	
43	INFLTD(t)	Inflation Dummy = 1 when CPI increases, otherwise = 0	
44	INFLATN(t)	Inflation = INFTD X CPI	
45	INFLTRT(t)	Inflation Rate	%
46	UNEMPL(t)	Unemployment Rate	%
47	LABCOMP	Labor Force Compensation	N million
48	MALE	Male Population	Million
49	FEMALE	Female Population	Million
50	URBAN	Urban Population	Million
51	RURAL	Rural Population	Million
52	CHLDRN	Children Population (16 years and below)	Million
53	CHDRNSS	Children Supply	Million
54	EPAWF	Estimated Potencial Active Work Force	Million
55	NADDWF	New Addition to Workforce	Million
56	POPOLD	Population of Old People (80 years and above)	Million
57	UNEMWF	Unemployed Work Force	Million
58	EMPWF	Employed Work Force	Million
59	EMPLMNT	Employment	Million
60	PRDTIVTY	Productivity	Million
61	LPROVITY	Labor Productivity	
62	AVWAGE	Average Wage Rate	Naira
63	DEMENT	Demand for Employment	
64	EMDDPR	Employment Demand Pressure	
65	POOR(t)	Poor	Million
66	EXTPOOR(t)	Extremely (Absolute) Poor	Million
67	POVRT(t)	Poverty Rate	%
68	SLAVERY	Slavery	
69	SAVINGS(t)	Savings	N million
70	BOT(t)	Balance of trade	N million

Fig 2: LEGEND OF VARIABLES NIGERIA MARKET ECONOMY CONTINUED

S/no.	ACRONYMS	ACTIVITY	UNIT
71	BOP(t)	Balance of payments	N million
72	EXTRES(t)	External reserve	N million
73	DBTBDN(t)	Debt burden or Bondage	
74	OILREV(t)	Oil revenue	N million
75	NOILREV(t)	Non-oil revenue	N million
76	CORPTD(t)	Corruption Dummy = 1 when DDMOPR increases, otherwise = 0	
77	CORRPTN	Corruption= CORPTD X DDMOPR.	
78	DDMONY	Demand for money	N million
79	DDMOPR	Demand for money pressure	
80	DEMOCY(t)	Dummy Variable 1.0 for New Democracy and 0 elsewhere.	
81	CORDEM(t)	Equals DEMOCY x CORRPTN	N million
82	PWLFARE	Personal Welfare (Per capita income)	Naira
83	STDOLIVN	Standard of Living	
84	PUPWER	Purchasing Power	
85	FODSRITY	Food Security	
86	HLTCARE	Health Care	
87	DDHCARE	Demand for Health Care	
88	HCRDDPR	Health Care Demand Pressure	
89	HRESDEV	Human Resource Development	
90	DDEDUC	Demand for Education	
91	EDUDDPR	Education Demand Pressure	
92	WEALTH	National Wealth	
93	PWEALTH	Personal Wealth	
94	IMPDPEN	Import Dependence	
95	DDIMP	Demand for Imports	
96	PENCIMP	Pendant for Imports	
97	CROPS	Agriculture Crops	N million
98	LIVESTOK	Livestock	N million
99	FORESTY	Forestry	N million
100	FISHRY	Fishery	N million
101	AGRICSEC	Agricultural Sector	N million
102	INVCROP	Investment in Agriculture Crops	N million
103	INVLSTOK	Investment in Livestock	N million
104	INVFOR	Investment in Forestry	N million
105	INVFISHY	Investment in Fishery	N million
106	INVAGRS	Investment in Agriculture	N million
107	INVINDUS	Investment in Industry	N million
108	INVMANU	Investment in Manufacturing	N million
109	INVOLREF	Investment in Oil Refining	N million
110	INVELECTS	Investment in Electricity Supply	N million
111	INVWATER	Investment in Water resources	N million
112	INVCONST	Investment in Construction Sector	N million
113	INVSERVCS	Investment in Services	N million
114	INVTRADE	Investment in Trade	N million
115	INVREALE	Investment in Real Estate	N million
116	INVEDUCA	Investment in Education	N million
117	INVHLT&S	Investment in Health and Social Services	N million
118	POVERTY		
119	HUNGR	Hunger	
120	CPDDPR	Food Crops Demand Pressure	
121	LSKDDPR	Livestock Demand Pressure	
122	FPRDDPR	Forest Products Demand Pressure	
123	FISDDPR	Fishery Demand Pressure	
124	INSECUR	Insecurity = Boko Haram=1 and 0 elsewhere	
125	TIME(t)	Time	Years
EXOGENOUS VARIABLES (POLICY INSTRUMENTS)			
126	EXCHRTRP	Exchange rate (Relative poverty)	N million
127	POP(t)	Population	Million
128	IMPORT(t)	Imports	N million
129	XPOTOIL(t)	Oil export	N million
130	XPTNOIL(t)	Non-oil export	N million
131	DODBT(t)	Domestic debts	N million
132	EXTDBT	External debts	\$ million
133	GEXPND(t)	Government expenditure	N million
134	PRIMELR(t)	Primary lending rate	%
135	INTSAV(t)	Interest rate	%
136	MONEYSS(t)	Money supply	N million
137	TAX(t)	Tax	N million
138	ACGSC	Agricultural Credit Guarantee Scheme	N million
139	DFUELPT	Domestic fuel price	N/Litre

THE CONSTRUCTION OF THE COMPOSITE MODEL OF NIGERIAN ECONOMY.

The Nigeria model consists of the primary sectors comprising of the agricultural sector, the manufacturing sector, industry, construction, transport, services, education and health; and other real sectors including national income, consumption and investment, population, labor and employment, foreign sector, economic indicators and policy instruments. Together, they comprise the endogenous variables of the model, while the exogenous variable consist of policy variables.

THE POPULATION MODEL AND DERIVATION OF VARIABLES

Extant models of the Nigerian economy lacked data on total active work force, employment, etc. These are major defects and according to Stolper, (1966), the development planner cannot afford to assume his facts; he must find them as best as he can. We therefore proceeded as follows:

The population of Nigeria is growing at approximately 3% per year. Given this fact, we back cast the population at 3% discount rate to 1901 and projected it to 2021 assuming that the population has been adjusted for deaths.

- 1) Going by international standard, children are those people of ages Sixteen (16) years and below and was derived as:

$$\text{Children} = \text{Pop}_t - \text{Pop}_{t-16}$$
- 2) Population of people eighty years and below was derived as:

$$\text{Pop}_t - \text{Pop}_{t-80}$$
- 3) Estimated potential active work force (EPAWF) = $\text{Pop}_t - \text{Pop}_{t-80} - \text{Children}$.
- 4) Population of old people equals the residual.
- 5) Unemployed work force = EPAWF x Unemployment rate.
- 6) Employed work force (EMPWF) = EPAWF - Unemployed work force.
- 7) Employment = ΔEMPWF
- 8) Average wage rate = $\text{Labor Force Compensation} / \text{EMPWF}$
- 9) National Productivity = $\text{NGDP} / \text{Labor force compensation}$
- 10) Estimated potential active work force (EPAWF) = $\text{Pop}_t - \text{Pop}_{t-80} - \text{Children}$.
- 11) opulation of old people equals the residual.
- 12) Unemployed work force = EPAWF x Unemployment rate.
- 13) Employed work force (EMPWF) = EPAWF - Unemployed work force.
- 14) Employment = ΔEMPWF
- 15) Average wage rate = $\text{Labor Force Compensation} / \text{EMPWF}$
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- 17) Population of old people equals the residual.
- 18) Estimated potential active work force (EPAWF) = $\text{Pop}_t - \text{Pop}_{t-80} - \text{Children}$.
- 19) Population of old people equals the residual.
- 20) Unemployed work force = EPAWF x Unemployment rate.
- 21) Employed work force (EMPWF) = EPAWF - Unemployed work force.
- 22) Employment = ΔEMPWF
- 23) Average wage rate = $\text{Labor Force Compensation} / \text{EMPWF}$

$$24) \text{ National Productivity} = \text{NGDP/Labor force compensation}$$

$$25) \text{ Labor Productivity} = \text{NGDP/ EMPWF}$$

$$26) \text{ Demand for Employment} = \Delta \text{EMPWF}_{-1}$$

$$27) \text{ Demand Pressure for Employment} = (\Delta \text{EMPWF}_{-1}) / \text{Unemployed Work Force}$$

$$28) \text{ Demand for Health care} = \Delta \text{HGDP}_{-1}$$

$$29) \text{ Demand Pressure for Health care} = \Delta \text{HGDP}_{-1} / \text{Pop}$$

$$30) \text{ Demand for Education} = \Delta \text{EdGDP}_{-1}$$

$$31) \text{ Demand Pressure for Education} = \Delta \text{EdGDP}_{-1} / \text{Pop}$$

$$32) \text{ Demand for Imports} = \Delta \text{IMPOTS}_{-1}$$

$$33) \text{ Penchant for Imports} = \Delta \text{IMPOTS}_{-1} / \text{Pop}$$

$$34) \text{ Import Dependence} = \text{IMPORTS/NGDP}$$

$$35) \text{ Slavery} = \text{EXTDEBT/Pop}$$

Some other variables were derived from existing data as follows:

- $AGGDD = (\Delta \text{GDP})_{-1}$
- $AGGSS = \Delta \text{GDP}$
- $AGGDDPR = (\Delta \text{GDP})_{-1} / \text{POP}$
- $GROWT \text{ RATE} = ((\Delta \text{GDP}) / \text{GDP}_t) * 100$
- $DINCOM = \text{GDP} - \text{TAX}$
- $COLIVN = (\text{CONS}_{t-1} ((1 + (\text{INFRT}_t / 100))))$
- $POOR = \text{POP} / ((\text{RGDP} / \text{EXCHRT}) * \$720)$
- $ABPOOR = \text{POP} / ((\text{RGDP} / \text{EXCHRT}) * \$360)$
- $RICH = \text{POP} - (\text{POOR} + \text{ABPOOR})$
- $RPOVRT = (1 - ((\text{RGDP} / \text{EXCHRT}) / \text{RGDP}) * 100)$
- $DDMONY = (\Delta \text{MONYSS})_{-1}$
- $DDMOPR = ((\Delta \text{MONYSS})_{-1} / \text{POP})$
- $IMPDD = (\Delta \text{IMPORT})_{-1}$
- $IMPDDPR = ((\Delta \text{IMPORT})_{-1} / \text{POP})$
- $XPOTDD = (\Delta \text{EXPORT})_{-1}$
- $DBTBDN = (\text{EXDBT} / (\text{GDP} / \text{EXCHRT}))$
- $INVEDU = (\text{INVTNENT/NGDP}) * \text{EDUGDP}$
- $INVIND = (\text{INVTNENT/NGDP}) * \text{INDGD}$
- $\text{SECTORAL INVESTMENTS} = \text{INVESTMENT RATIO} * \text{SECTORAL GDP.}$
- $POVERTY = ((\Delta \text{CONSUMPTION})_{-1} / \text{POP})$
- $HUNGER = ((\Delta \text{AGRIC SECTOR GDP})_{-1} / \text{POP})$

However, the 2001 and 2006 census of the Nigerian economy by the National Bureau of Statistics was used to adapt the population of male and female, as well as urban and rural populations in Nigeria according to their shares.

LINEAR PROGRAMMING

The second part was the Linear Programme. The BMAT (Structural relationships) was estimated by the Total Differential Modeling Software, ESMLAB. The impact multiplier matrix of dimension (125 x 14) is what was used to formulate the Optimal Control Model of the Nigeria economy and solved as a Linear programme.

Linear programming was developed during the Second World War by George B. Dantzig in collaboration with other members of a group of officials of the U.S. department of the Air Force in 1947. It involves the maximization or minimization of a function subject to certain constraints on the variables which comprise the function. The adjective “linear” implies the assumption of proportionality of input and outputs regardless of the resulting solution values of the variables. It also implies the assumption that the result of simultaneously carrying out two or more activities is the sum of the result of the separate activities. The solution is obtained by the Simplex method which is based on what is generally termed the Simplex Algorithm which was also invented or devised by George B. Dantzig in 1947. This is an iterative approach which starts by identifying a finite set of solution from an infinite set of possible solutions. The finite set eventually contains the most important candidates for the best solution which is termed the optimal solution.

The constraints were formulated as aspiration levels and were derived as 10% of the 2025 state of the Nigeria economy, modified by converting all negative values to positive values and constituted the right hand side (RHS). All sectoral outputs were required to be underachieved ($<$ or $=$) by 2026 and also all other variables were constrained to be underachieved ($<$ or $=$) also by 2026. The Nigeria economy was duly adjusted to reflect the current domestic fuel price of N1200.00/litre, the external debt was updated as well as the prevailing exchange rate of N1600.00/US \$ and the economy was fully deregulated. In addition, the Sectoral investments (Investment ratio x Sectoral GDP), were expanded and all constrained to be overachieved ($<$ or $=$).

The welfare function was:

- i. Maximize increase in Oil and Non-oil exports, Government expenditure, Domestic debts and Agricultural Credit Guarantee scheme; and
- ii. Minimize increase in Exchange rate, Population, Imports, External debts, Money supply, Interest rate, Tax and Domestic Fuel price as they were undesirable to welfare and self reliant growth.
- iii. Primary Lending rate was set at zero (0) since it was already high.

The solution was obtained by solving the problem as a Linear Program using the Six Pap Linear Programming Software.

OPTIMAL CONTROL VIA LINEAR PROGRAMMING

The third part dealt with Optimal Control of the Nigerian economy, using Linear Programming formulation as above. Optimal control answers the question, “what is the best policy for achieving our welfare function, given our aspiration levels or constraints?” The solution determines the incremental policy instrumental levels to be added to the penultimate policy instruments to use to forecast the state of the economy for the next year, in this case 2026. We

can therefore examine any policy menu to determine if they are socially, morally and internationally acceptable or feasible, before using them to forecast the future. If not we have to restrict the model further.

Once the forecast of the 2026 state of the economy is achieved, through ESMLAB, then 10% of the absolute values become the aspiration levels for 2027, and the process continues as before until we are satisfied. In this study we were satisfied with two years.

The purpose of optimal control of an economy is to answer the following questions:

- i. Given our aspiration levels and constraints, and given our objective or welfare function, how do we choose our targets or instruments in order to achieve our goals or aspiration levels?
- ii. Is such a path satisfactory?
- iii. If it is, do we have the resources that is consistent with such a path e.g. manpower, institutions and capital?
- iv. If not, can we afford them and can they be imported?
- v. What are the policy implications of such a path?

Actually, optimal control already exists in Econometrics though with some inherent difficulties and weaknesses:

First, the welfare function is defined as a quadratic function which does not lend itself to a ready intuitive interpretation or appeal.

Secondly, the optimization methods such as quadratic hill climbing employed for the solution is hectic.

Thirdly, in econometric optimal control, the targets must be achieved exactly with associated difficulties.

Lastly, it depends on an econometric model which as we have demonstrated is very weak (see Aruofor, 2020a)

These problems are overcome by recourse to Ecostatometric optimal control which adopts Linear Programming (LP) as the tool of control. The welfare function can therefore be stated in terms of a linear welfare function (1, -1 or 0) which is easier to appreciate because it appeals to reality and has ready intuitive meaning. This approach is not only operational; it is a positive and objective approach as it is superior to the traditional optimal control. The approach is also dynamic and proactive as it is sequential and adaptive in its control. This is in conformity with real life decision making. It simulates reality by systematically creeping into the future using the solution for period t as input into the problem of period $t + 1$.

RESULTS AND DISCUSSION:

The incremental impact multiplier Table 1, used to formulate the Linear Programme, describes the impact of the exogenous variables on the endogenous variables. This reduced form hides the complex inter-dependencies that exists within the economy. Indeed, these inter-dependencies are intractable by inspection but by targeting the future, it is possible to chart a way forward using linear programming. The policy prescription for the two years are as follows:

	EXCHTRP	POP(t)	IMPORT(t)	XPOTIL(t)	XPTNOIL(t)	DODBT(t)	EXTDBT(t)	GEXPDN(t)	PRIMELR(t)	INTSAV(t)	MONYSS(t)	TAX(t)	ACGSC(t)	DFUEL(t)
2026	1600	257.0253	6487912	22807041	-1469514	9613634	125120000	9215396	39.05195	30.31686	14686730	-2356934	-3841241	1200
2027	1600	263.0253	7350912	38907041	-1469514	9613634	125120000	11085396	39.05195	30.31686	36986730	-2356934	29058759	1200

The high points of the result of the optimal control for the two years shall be presented as charts to enable one comprehend the direction of change in the Nigerian economy.

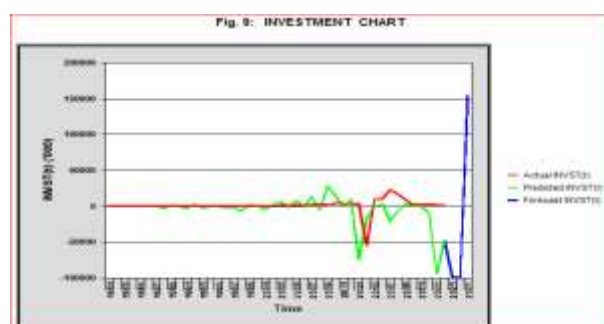
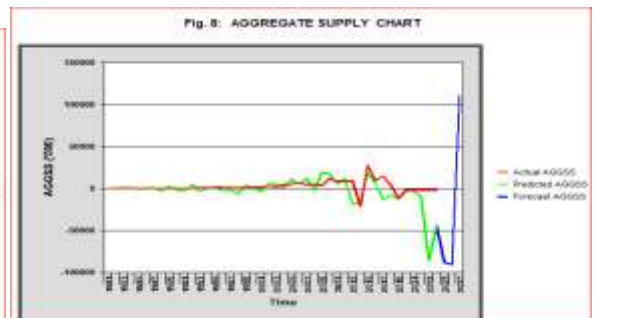
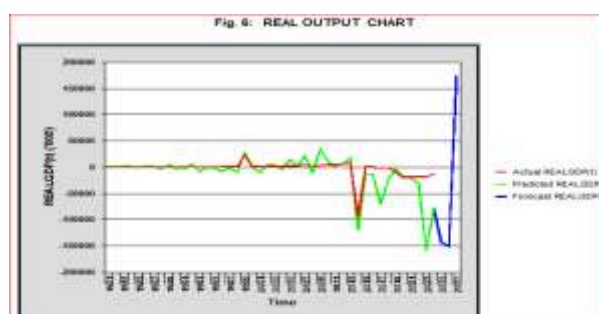
Table 1: IMPACT MULTIPLIERS AND LINEAR PROGRAMMING MODEL OF NIGERIA ECONOMY

S/no.	EXCHTRPI	POP(t)	IMPORT(t)	XPOTOL(t)	XPOTNOIL(t)	DOOBT(t)	EXTDBT(t)	GEXPND(t)	PRIMELR(t)	INTSAV(t)	MONYSS(t)	TAX(t)	ACGSC(t)	DFUEL(t)	ASP10%	
1	NGDP(t)	17126.47	5737.327	-0.36043	-0.92374	-9.75442	0.386221	0.010953	1.16776	18071.27	78169.77	-0.02816	-2.52598	-0.12121	40488.04 <	12690468
2	AGGDD	-88015.1	89819.98	0.924573	-0.67778	6.092267	-5.22767	-0.158	-2.48723	-796400	1507269	2.369281	7.709484	-1.32905	-70374.9 <	5853343
3	AGGSS	-59962.2	33791.46	0.329794	0.026552	3.615482	-3.2702	-0.06526	-1.507	-420938	767076.3	1.166964	4.102716	-0.80972	-60552.7 <	4482691
4	INVST(t)	-69023.1	14874.13	0.462234	-0.08924	6.09562	-3.33028	-0.12133	-1.92174	-339253	492965.5	1.42592	6.029911	-0.8301	-70014.4 <	4743161
5	INVRATO	0.000307	-0.00044	-3.4E-09	1.17E-10	-3.5E-08	1.73E-08	6.73E-10	1.17E-08	0.000981	-0.00195	-8.8E-09	-2.9E-08	4.36E-09	0.00025 <	0.201262
6	INDUST(t)	-10547	25057.97	-0.08714	-0.05437	1.033678	-0.89813	-0.02267	-0.58825	3183.248	225920.5	0.344242	1.347138	-0.234	-5965.23 <	1564639
7	MANUFCT	10779.37	-5288.73	-0.25172	0.017959	-1.39515	0.871485	0.010788	0.455993	183586.4	-193617	-0.5516	-1.44066	0.269334	11481.61 <	1256316
8	OILREFIN	308.3725	-237.132	0.009689	-0.0024	-0.01699	0.015973	0.000674	0.002733	-3163.14	1938.164	0.00489	-0.0123	-0.0021	282.0422 <	20788.95
9	ELECTS(t)	1052.851	-503.666	-0.01688	0.008442	-0.02294	0.051123	0.001514	0.023516	8017.857	-17021	-0.02976	-0.08219	0.016094	825.6975 <	115306.8
10	WATER(t)	79.56298	2.497115	-0.00267	0.000623	-0.00049	0.002597	4.97E-05	0.001102	1458.86	-1693.58	-0.00216	-0.00213	0.001201	82.26375 <	19781.47
11	CONSTN(t)	7794.973	-6031.4	-0.08883	0.044702	-0.31636	0.412719	0.010309	0.217038	50784.23	-109342	-0.22744	-0.69449	0.119201	6108.494 <	805870.9
12	SERVCS(t)	-55659.4	-12192.2	1.034212	-0.14203	6.00487	-3.06022	-0.07566	-2.14629	-596845	607793.8	1.819325	5.763794	-0.88397	-62036.4 <	4672995
13	TRADE(t)	-19484.4	-4829.97	0.353687	-0.03895	2.072263	-1.0476	-0.02601	-0.74123	-198940	197517	0.620218	1.969938	-0.30225	-21893.1 <	1446051
14	ACCOFOOT	1740.512	-1138.78	-0.02263	0.012668	-0.03521	0.088506	0.0025	0.042904	12442.37	-27099.4	-0.04998	-0.14618	0.026875	1340.554 <	172329.6
15	TRASPOT(t)	2766.127	-2082.97	-0.03411	0.016059	-0.17384	0.148012	0.003567	0.088705	21955.85	-34797.8	-0.09035	-0.28764	0.042715	2102.183 <	273297.5
16	TRANSEV(t)	-6.67706	10.35419	0.000141	0.00011	0.005457	-0.00109	5.01E-06	-0.00103	-215.329	166.2959	0.000432	0.001693	-0.00028	-10.6187 <	3980.751
17	POSTCUR(t)	-56.628	38.23556	0.000154	-0.00022	0.002826	-0.00348	-6.3E-05	-0.00167	-334.504	791.3547	0.001464	0.004376	-0.00079	-50.9312 <	566.3813
18	INFOCOM(t)	10474.02	-5210.54	-0.06833	1.71E-05	-0.54314	0.637253	0.010452	0.20754	51754.7	-82007.3	-0.30052	-0.89518	0.162114	9454.367 <	2290968
19	TELECOM(t)	15338.59	-8011.72	-0.13356	0.011877	-0.54541	0.858832	0.018642	0.420354	82620.66	-138796	-0.44549	-1.41875	0.229127	14103.29 <	2161600
20	PUBLSHN(t)	-49.138	23.50658	0.000208	-0.00032	0.001285	-0.00277	-6.8E-05	-0.00121	-232.772	528.0933	0.001261	0.004598	-0.00075	-38.8579 <	275.6008
21	MPIC&SNC	768.7696	-597.673	-0.00365	0.001937	-0.03786	0.050472	0.00092	0.012182	4653.496	-8185.65	-0.02348	-0.0694	0.012634	594.9824 <	191518.9
22	BRODCST(t)	-1326.79	823.2379	0.014509	-0.02211	-0.01438	-0.0831	-0.00186	-0.01983	-13114.4	31902.01	0.038143	0.107247	-0.02212	-739.626 <	116783.1
23	ARTRECR(t)	-171.282	17.88451	-0.00245	-0.00076	-0.00481	-0.00993	-0.00025	-0.00158	611.4445	-284.747	0.001327	0.012827	-0.00025	-133.87 <	12515.93
24	FININSUR(t)	-6306.06	1286.743	0.076673	-0.01299	0.474873	-0.36831	-0.00761	-0.19079	-54616.4	71969.8	0.191962	0.58009	-0.09684	-6088.54 <	121806.3
25	FINANCE(t)	-5485.07	1109.467	0.066493	-0.01114	0.413166	-0.31996	-0.00661	-0.16592	-47311.2	62360.94	0.166455	0.504416	-0.084	-5300.68 <	103141.6
26	INSURANS	-376.385	-113.402	0.00617	-0.00041	0.035219	-0.0221	-0.00046	-0.01298	-4054.06	3973.23	0.011999	0.036221	-0.00613	-433.214 <	44826.98
27	REALEST(t)	-19667.2	5190.559	0.224924	-0.05019	1.558945	-1.13412	-0.02553	-0.59484	-168225	225634.2	0.579054	1.851121	-0.29213	-18749.2 <	246598.5
28	PROFSERV	-5455.32	-789.943	0.093282	-0.01446	0.573642	-0.29298	-0.00741	-0.19822	-54937.6	58554.6	0.165151	0.55872	-0.08072	-5876.08 <	297252.7
29	ADMINSTR	-59.0666	21.43733	0.00032	-0.00012	0.004127	-0.00345	-5.2E-05	-0.00178	-328.29	652.1244	0.001535	0.005053	-0.00078	-57.1378 <	159.3831
30	PUBADMN	-10673.4	9808.025	0.082041	-0.05917	0.256268	-0.61957	-0.01405	-0.33984	-71251.6	171893	0.25873	0.975219	-0.16354	-8545.19 <	30426.91
31	EDUCATN(t)	-5746.76	4155.88	0.038338	-0.03127	0.296949	-0.32278	-0.00087	-0.16165	-34952.2	77922.17	0.151638	0.511655	-0.084	-4767.83 <	176036.9
32	HLT&SOC	-1015.58	777.9344	0.010786	-0.0048	0.072309	-0.06305	-0.00125	-0.03316	16179.98	0.028801	0.084146	-0.01735	-876.141 <	22490.09	
33	OTH&SERV	-1217.28	-763.359	-0.03674	-0.01281	-0.16504	-0.07354	-0.00088	0.04605	9970.461	-23787.4	-0.02617	-0.00342	0.000905	-683.805 <	351049.9
34	DISPINC(t)	-178029	68772.56	0.901475	-0.36702	11.75038	-10.5728	-0.14432	-5.44981	-936684	1996956	4.785069	14.95227	-2.43135	-172337 <	1814675
35	REALINC(t)	115.3977	-87.3205	-0.00015	-0.00013	0.025671	0.00272	3.42E-05	0.001108	-1107.15	520.9165	-0.0027	-0.01582	0.000517	35.60618 <	81633.35
36	REALGDP(t)	-103333	72963.86	0.664794	-0.79993	2.420799	-6.10605	-0.10935	-2.87507	-636076	1701314	2.970648	10.16871	-1.73802	-87787.4 <	7749272
37	GROWTRT	0.070721	-0.01311	-9E-07	5.14E-07	-7.4E-06	3.73E-06	1.4E-07	2.27E-06	0.77851	-0.60006	-1.8E-06	-7.1E-06	7.36E-07	0.063251 <	2
38	GROWTH(t)	-0.01099	0.009839	4.3E-08	-3.2E-08	7.87E-07	-6.8E-07	-1.8E-08	-4E-07	-0.05654	0.141929	3.13E-07	1.01E-06	-1.8E-07	-0.00994 <	1.137878
39	CONS(t)	-43115.2	5572.811	-1.02072	-0.14199	0.539677	-2.75752	-0.07462	-0.38527	302769.6	-357998	0.011714	3.626002	0.196265	-32766.1 <	5256197
40	CAPITAL(t)	68704.4	-44935.1	-0.61941	0.22263	-4.09083	4.055329	0.084225	1.83748	502286.3	-870971	-2.08754	-6.09573	1.036899	54797.72 <	5266940
41	FDI(t)	680.9569	244.9291	-0.0132	0.004406	0.039179	0.01925	-0.00089	0.025409	142.1524	1667.012	-0.04629	-0.1417	0.011762	431.8903 <	155445.8
42	CPI(t)	-0.19425	0.041776	2.23E-06	5.03E-07	1.88E-05	-1.1E-05	-2.6E-07	-8.4E-06	-1.56671	1.451621	6.48E-06	1.89E-05	-3.3E-06	-0.24225 <	16.24224
43	INFLTD(t)	-5.7E-05	-0.00086	-6.3E-09	-8.6E-10	-5.1E-08	3.31E-08	-2.2E-10	1.51E-08	0.003339	-0.01005	-2E-08	-2.3E-08	1.4E-08	-9.2E-05 <	0.194635
44	INFLATN(t)	-0.23107	-0.00098	3.73E-06	5.38E-08	2.51E-05	-1.3E-05	-3.2E-07	-9.5E-06	-2.08759	1.537054	8.27E-06	2.57E-05	-3.7E-06	-0.26139 <	14.66385
45	INFLTRT(t)	0.307976	-0.18621	-2.6E-06	1.63E-06	-2.4E-05	1.74E-05	5.27E-07	9.23E-06	2.413131	-3.52139	-7E-06	-3.2E-05	3.92E-06	0.258645 <	6.560523
46	UNEMPL(t)	0.006262	0.00036	-6.7E-08	1.18E-08	-1.8E-06	5.7E-07	1.85E-08	4.26E-08	0.076731	-0.07567	-9.1E-08	-5.9E-07	6E-09	0.007051 <	3.400081
47	LABCOMP	44192.45	-20884	-0.36245	-0.01011	-2.7573	2.448579	0.051966	1.186246	213103.1	-349006	-1.3052	-3.89383	0.669121	41570.11 <	7139237
48	MALE	0.03885	-0.01412	-2.7E-07	1.33E-07	-1.4E-06	2.47E-06	3.27E-08	4.32E-07	0.299127	-0.48341	-9.9E-07	-2.9E-06	5.73E-07	0.030982 <	15.04137
49	FEMALE	0.038233	-0.01389	-2.6E-07	1.3E-07	-1.4E-06	2.43E-06	3.22E-08	4.25E-07	0.294376	-0.47573	-9.7E-07	-2.8E-06	5.64E-07	0.03049 <	14.80259
50	URBAN	0.020617	-0.02218	-6.5E-07	3.25E-07	-3.6E-07	1.35E-06	1.28E-08	7.71E-07	0.289984	-0.66564	-1.1E-06	-2.9E-06	4.53E-07	0.010314 <	5.349547
51	RURAL	0.036207	-0.03895	-1.1E-06	5.71E-07	-6.2E-07	2.38E-06	2.25E-08	1.35E-06	0.509258	-1.16897	-1.9E-06	-5.1E-06	7.95E-07	0.018113 <	9.394687
52	CHILDRN	-0.0579	0.046855	3.78E-07	-4.7E-07	2.52E-07	-3.6E-06	-7.4E-08	-1.4E-06	-0.34406	0.956569	1.53E-06	5.49E-06	-8.5E-07	-0.04395 <	5.186809
53	CHDRNSS	0.011	-0.04356	-3.8E-07	1.39E-07	-4.3E-06	1.83E-06	1.39E-08	9.92E-07	0.223932	-0.5321	-1.1E-06	-2.4E-06	6.04E-07	0.005925 <	4.03109
54	EPAWF	0.111856	-0.08205	-9.8E-07	3.79E-07	-7.6E-06	6.67E-06	1.33E-07	2.98E-06	0.780588	-1.44502	-3E-06	-1.1E-05	1.67E-06	0.098664 <	18.79065
55	NADDWF	-0.00032	-0.00076	-7.9E-09	9.12E-09	6.12E-08	-1.4E-08	2.39E-10	-1.9E-08	0.004064	-0.00694	6.95E-09	-1.3E-08	-1.3E-07	-0.00065 <	0.271093
56	POPOLD	0.021637	-0.01685	-1.9E-07	6.53E-08	-1.6E-06	1.28E-06	2.7E-08	0.58E-07	0.1438	-0.26376	-5.8E-07	-2.1E-06	3.2E-07	0.019067 <	3.550295
57	UNEMWF	0.064228	-0.04413	-4E-07	2.42E-07	-7.8E-06	4.16E-06	7.94E-08	2.02E-06	0.385643	-0.66872	-1.8E-06	-6.5E-06	7.89E-07	0.057766 <	6.333569
58	EMPWF	0.114564	-0.09266	-1.4E-06	8.66E-07	-5.3E-06	7.29E-06	1.39E-07	3.63E-06	0.981143	-2.17078	-4.2E-06	-1.2E-05	1.98E-06	0.087202 <	13.04936
59	EMPLMNT	-0.														

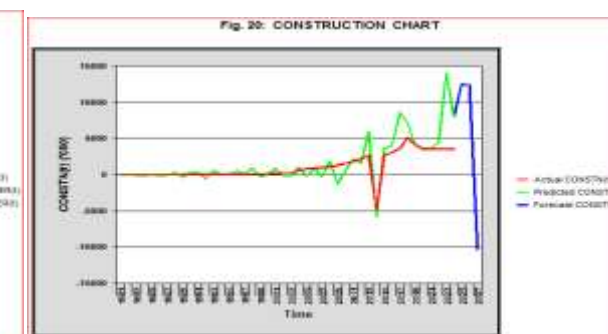
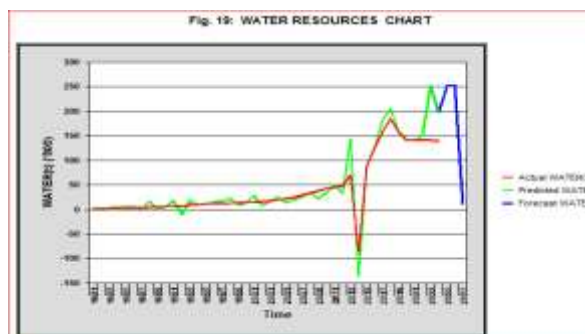
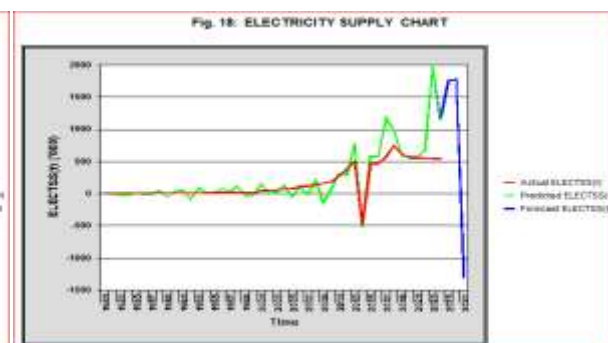
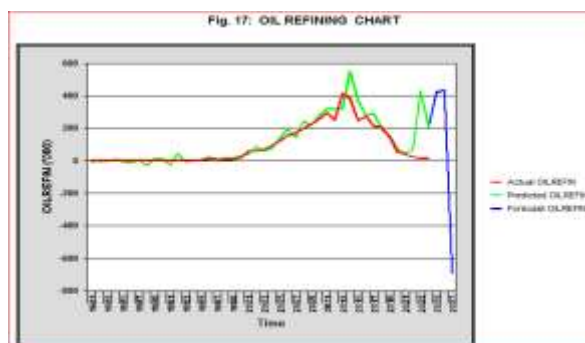
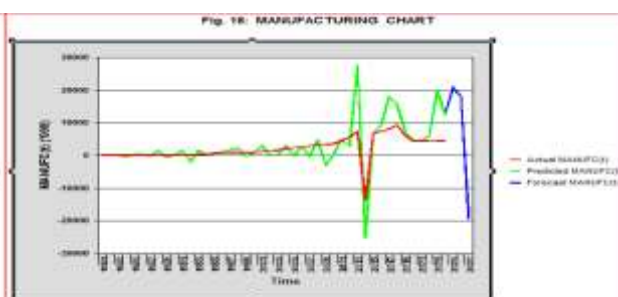
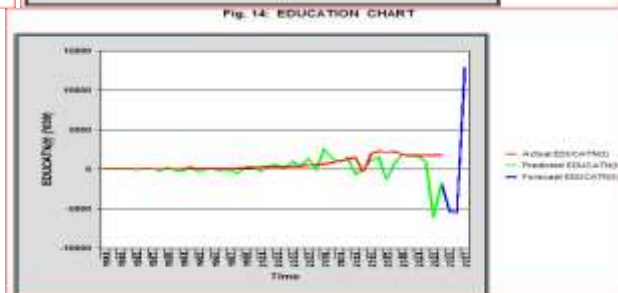
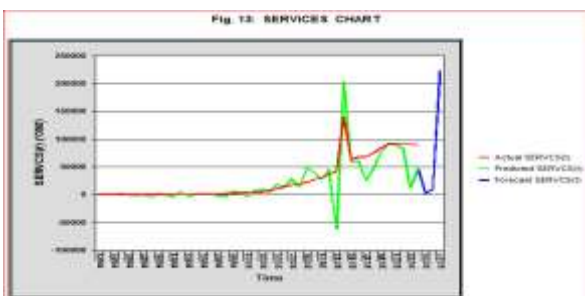
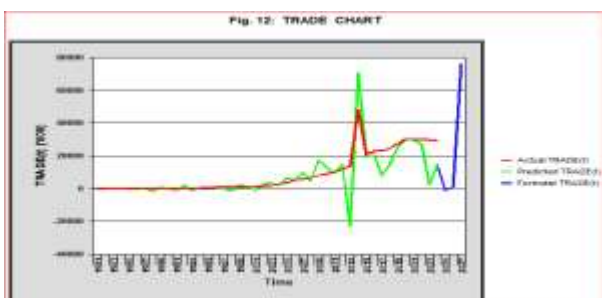
Table 1: IMPACT MULTIPLIERS AND LINEAR PROGRAMMING MODEL OF NIGERIA ECONOMY CONT'D

S/no.	EXCHTRPI	POP(t)	IMPORT(t)	XPTOL(t)	XPTNOL(t)	DODBT(t)	EXTDBT(t)	GEXPON(t)	PRIMELR(t)	INTSAV(t)	MONYSS(t)	TAX(t)	ACGSC(t)	DFUELPT(t)	ASP10%26	
64	EMDDPR	0.002701	-0.00133	-2.4E-09	2.36E-08	1.09E-07	1.12E-07	2.62E-09	6E-08	0.023396	-0.03453	-6E-08	-1.9E-07	3.34E-08	0.002019 <	0.001082
65	POOR(t)	-0.27797	0.124916	2.8E-06	-8.4E-07	1.53E-05	-1.5E-05	-3.7E-07	-9E-06	-1.78324	3.520638	8.9E-06	2.72E-05	-4.4E-06	-0.25427 <	13.18428
66	EXTPOOR(t)	-0.2126	0.179883	1.93E-06	-1.3E-06	1.88E-05	-1.2E-05	-3.7E-07	-7E-06	-1.63615	3.35762	6.05E-06	2.27E-05	-3.1E-06	-0.16605 <	13.53058
67	POVRT(t)	-0.00455	0.003072	-2.1E-08	-1.2E-08	1.01E-07	-2E-07	-9.3E-09	-1.2E-07	-0.00658	0.03776	7.74E-08	3.69E-07	-4.2E-08	-0.00405 <	0.087817
68	SLAVERY	-206.155	231.3467	0.00253	-0.00112	0.016168	-0.01434	-0.00024	-0.00777	-1456.64	3884.69	0.0079	0.022524	-0.00441	-165.125 <	22853.73
69	SAVINGS(t)	6231.289	-1456.54	-0.06938	-0.01841	-0.82069	0.326571	0.008786	0.214822	22472.99	2700.148	-0.15887	-0.66235	0.061083	8313.701 <	850872.1
70	BOT(t)	-9003.96	9932.055	0.131198	-0.06387	-0.19786	-0.50722	-0.00757	-0.37123	-59640.8	167485.1	0.371001	1.152275	-0.17732	-6246.57 <	636710.9
71	BOP(t)	-4788.49	4556.199	-0.20865	-0.02428	-0.07468	-0.11679	-0.01725	-0.06628	28461.39	-25516.3	-0.09414	0.349936	0.052108	-3619.86 <	803505.7
72	EXTRES(t)	-56.119	9.136832	0.000301	0.000185	0.002586	-0.00344	-3.3E-05	-0.00201	-326.242	585.7066	0.001658	0.00397	-0.00084	-62.6371 <	2690.939
73	DBTBDN(t)	0.001418	-0.000078	-1.8E-08	9.17E-09	-8.7E-08	8.82E-08	1.22E-09	4.6E-08	0.014584	-0.02284	-4.8E-08	-1.4E-07	2.21E-08	0.001163 <	0.050387
74	OILREV(t)	1831.064	-3751.37	-0.00862	0.030402	-1.24836	0.036711	-0.00141	0.178949	920.9907	30428.99	-0.02825	-0.38294	-0.00768	1566.592 <	192921.4
75	NOILREV(t)	-1646.55	2177.267	-0.00206	-0.04972	-0.22466	-0.12361	-0.0026	-0.01813	-15907.2	38295.24	0.061493	0.141114	-0.0396	-380.181 <	337273.6
76	CORPTD(t)	-0.00288	0.00352	4.63E-08	-5.3E-09	2.88E-07	-2.4E-07	-3.6E-09	-1.3E-07	-0.02146	0.058784	1.4E-07	3.64E-07	-7.8E-08	-0.00248 <	0.358825
77	CORRPTN(t)	-336.754	226.2108	0.002134	-0.00133	0.01223	-0.01878	-0.00046	-0.00966	-1683.57	4537.557	0.009286	0.033595	-0.00534	-273.382 <	28007.91
78	DDMONY(t)	-15881.2	-1339.64	0.31442	-0.05014	1.624361	-0.90624	-0.5638	-167238	180754.2	0.490929	1.81246	-0.23587	-0.23587	-16034.7 <	495605.7
79	DDMOPR(t)	-29.6101	22.62708	0.000225	5E-05	0.0057	-0.00213	-6.3E-05	-0.00063	-284.215	338.1755	-6.7E-06	0.00131	-0.0003	-28.2094 <	990.9706
80	DEMOCY(t)	-0.00108	0.001136	-3E-08	1.35E-08	9.75E-08	-4.1E-08	-2.4E-09	-4.4E-08	0.00264	-0.00189	6.42E-09	1.35E-07	-1.3E-08	-0.00118 <	0.219481
81	CORDEM(t)	-338.298	227.2162	0.002141	-0.00133	0.012259	-0.01886	-0.00046	-0.0097	-1693.24	4559.237	0.009323	0.033729	-0.00536	-274.64 <	28134.74
82	PWLFARE	-1346.53	933.9523	0.00454	-0.00537	0.066583	-0.08324	-0.00148	-0.03981	-8176.29	19513.68	0.035413	0.106422	-0.01907	-1191.38 <	10900.45
83	STDOLIVN	-1600.09	743.7034	0.00913	-0.00687	0.123173	-0.08705	-0.00246	-0.04291	-9130.32	17584.01	0.034376	0.133456	-0.01994	-1442.04 <	101143.5
84	PUPWER	4.998411	-2.3558	-0.00013	2.85E-05	-0.00062	0.000259	7.22E-06	0.000149	51.29934	-62.9114	-0.00016	-0.00045	6.44E-05	4.337967 <	226.7111
85	FODSRITY	-206.058	94.44938	0.001422	-0.00016	0.013746	-0.01226	-0.00027	-0.00635	-1547.96	2395.709	0.005738	0.016514	-0.00314	-211.321 <	5081.176
86	HILTCARE	4.627458	-2.62605	-4E-05	1.41E-05	-0.00019	0.000278	4.54E-06	0.000109	30.65979	-49.1678	-0.00012	-0.00045	6.42E-05	3.965714 <	749.7384
87	DDHCARE	95.46201	7.84728	-0.00291	0.000958	-0.00326	0.004397	1.15E-05	0.001143	1563.283	-1682.57	-0.00235	-0.0042	0.001296	73.9828 <	16960.43
88	HCRDDPR	0.655729	0.107062	-1.7E-05	5.87E-06	-7.5E-06	2.9E-05	2.09E-07	8.08E-06	9.884783	-11.3058	-1.5E-05	-3.4E-05	9.02E-06	0.533902 <	99.26942
89	HRESDDEV	-14.6716	8.209869	9.51E-05	-0.00011	0.000375	-0.00083	-1.6E-05	-0.00039	92.0365	219.69	0.000374	0.001383	-0.0002	-11.5224 <	172.1489
90	DDDEDUC	-78.5916	325.9614	-0.00592	0.002129	-0.0071	-0.00595	6.13E-05	-0.00261	-1410.003	1454.227	-0.0046	-0.00867	0.000312	-171.064 <	13974.85
91	EDUDDPR	-2.39475	1.308078	3.87E-06	-1.1E-05	-0.00019	-0.00013	-3.5E-06	-2E-05	-11.6361	44.93947	3.67E-05	5.84E-05	-2.9E-05	-2.27854 <	231.8193
92	WEALTH	-0.00033	0.000326	2.54E-09	-1.6E-09	1.43E-08	-1.9E-08	-4.4E-10	-1.1E-08	-0.00211	0.006016	1.11E-08	3.12E-08	-6.5E-09	-0.00027 <	0.02631
93	PWEALTH	63.19192	-54.5363	-0.00096	0.00024	-0.01245	0.004083	6.43E-05	0.002704	573.7761	-786.405	-0.00192	-0.00778	0.000796	62.34683 <	2046.852
94	IMPDPEN	-0.00054	0.000361	8.63E-09	-6.1E-09	4.52E-08	-2.9E-08	-1.1E-09	-1.9E-08	-0.00534	0.009227	1.76E-08	6.29E-08	-7.8E-09	-0.00039 <	0.022891
95	DDIMP	-2354.29	10868.59	0.106379	-0.01028	-0.80203	-0.27088	-0.00153	0.095283	-5716.66	175929.4	-0.02354	-0.30592	-0.06286	-541.267 <	1564865
96	PENCIMP	-13.5247	18.59814	0.000531	0.000306	-0.00512	-0.00098	2.23E-05	0.000348	86.5647	541.1599	-4.2E-05	-0.00216	-0.00047	-17.6454 <	9336.759
97	CROPS	-52285.4	38118.28	0.389169	-0.38755	2.066764	-3.00481	-0.08515	-1.10864	-423182	888671.3	1.222835	4.252085	-0.71933	-40280.8 <	733909
98	LIVESTOK	63.65598	41.38867	0.006761	-0.01897	-0.17013	0.000363	-0.00035	0.017444	-5752.37	20503.98	0.008719	-0.02766	-0.0064	502.0088 <	259020.7
99	FORESTY	22.71802	3.913137	0.000731	-0.00245	-0.02313	0.000749	-2.5E-05	0.002565	-667.315	2541.832	0.000941	-0.00463	-0.00068	79.83121 <	35160.96
100	FISHRY	-1574.83	863.3365	0.01641	-0.00486	0.025126	-0.08249	-0.00361	-0.0345	-16348.4	23234.41	0.027168	0.086243	-0.02151	-1568.32 <	115618.3
101	AGRICSEC	-59511.6	43098.12	0.446748	-0.4401	2.355377	-3.41633	-0.09674	-1.26211	-481875	1010265	1.391008	4.838023	-0.81847	-45903.7 <	805163.7
102	INVCROP	-20865.4	16069.14	0.448372	-0.05334	0.860355	-1.04631	-0.05408	-0.65741	-234178	365411	0.878276	1.993343	-0.47	-18134.9 <	402980.8
103	INVSTOK	1053.218	-1268.43	0.020562	0.003711	-0.04988	0.065499	-0.00034	0.032458	-5574.33	-11882	-0.01298	-0.07167	0.006743	961.1207 <	176478.1
104	INVFOR	139.5851	-167.54	0.00272	0.000496	-0.00661	0.008662	-4.4E-05	0.004294	-738.429	-1571.98	-0.00171	-0.00948	0.00089	127.4147 <	23398.86
105	INVFISHY	-917.024	731.4748	0.015348	2.93E-05	-0.00995	-0.0662	-0.00227	-0.02155	-10399.1	16595.5	0.033312	0.062113	-0.0221	-968.212 <	33587.24
106	INVAGRS	-10180.3	102.8922	0.218398	-0.04114	1.437347	-0.39937	-0.01867	-0.46919	-89640.3	92204.65	0.131344	1.1266	-0.13521	-10489.6 <	675541.3
107	INVINDUST	-5471.71	2808.398	0.067362	-0.02222	0.109366	-0.28924	-0.0107	-0.1379	-32942.2	83002.04	0.132669	0.500865	-0.09371	-3939.18 <	233844.4
108	INVMANUI	3881.152	-466.075	-0.06564	0.064714	-0.00646	0.208143	0.004117	0.0709	46007.54	-86789.6	-0.15373	-0.33521	0.064891	2488.434 <	208393.6
109	INVIOILREF	140.0259	-20.4481	0.000624	4.36E-06	-0.0076	0.010036	0.00017	0.002642	480.3826	-730.356	-0.00297	-0.01091	0.001563	143.8463 <	9957.542
110	INVELECTS	349.094	-165.258	-0.00463	0.002685	-0.01574	0.019269	0.000288	0.007554	3118.359	-5381.32	-0.00956	-0.03022	0.005095	261.9033 <	21401.95
111	INVWATER	78.4043	-46.9272	-0.00066	0.00024	-0.00462	0.004136	7.73E-05	0.00178	560.4964	-950.886	-0.00179	-0.00604	0.001023	65.9564 <	5244.113
112	INVCONSTI	3420.62	-1295.4	-0.04745	0.033312	-0.0935	0.184229	0.003532	0.077	31721.82	-59368.1	-0.09949	-0.30649	0.053189	2553.431 <	202389.3
113	INVSERVCS	88301.6	-42881	-0.45351	0.249353	-4.80917	5.108245	0.105292	2.268085	623191.5	-1072898	-2.4722	-7.2626	1.393556	84026.93 <	6077952
114	INVTRADE	30303.22	-14480	-0.38893	0.083047	-1.67234	1.753229	0.036328	0.779494	212730.3	-365335	-0.84624	-2.49118	0.477064	28962.41 <	2091712
115	INVREALE	14034.5	-6194.39	-0.12183	0.029278	-0.6158	0.825354	0.017086	0.35004	81173.52	-153898	-0.35678	-1.12944	0.211914	13699.76 <	983754.8
116	INVEDUCA	415.0582	-411.665	-0.00151	0.002458	-0.04329	0.024493	0.001035	0.013236	3265.668	-6395.5	-0.00995	-0.03724	0.006407	403.9692 <	34384.19
117	INVHLT&S	50.29278	-57.6085	0.000416	0.000148	-0.00704	0.002542	0.000147	0.001628	138.8359	-347.664	-0.00085	-0.00455	0.000417	40.67795 <	4371.291
118	POVERTY	-185.615	358.755	-0.0026	-0.00136	0.003527	-0.0113	-0.00061	-0.00343	-893.52	3197.941	5.21E-05	0.005244	-0.00194	-113.995 <	9209.702
119	HUNGAR	44.5483	-34.6273	-0.00016	3.66E-05	-0.00119	0.002176	7.97E-05	0.000137	217.9968	-486.528	-0.00079	-0.00305	0.000582	42.65085 <	2937.143
120	CPDDPR	42.33791	-34.4548	-0.00012	3.93E-05	-0.00116	0.002118	7.59E-05	0.00112	199.7037	-476.879	-0.00078	-0.00302	0.000562	40.32896 <	2786.416
121	LSKDDPR	2.192228	-2.25299	-9.9E-06	6.43E-06	-1E-04	0.00013	3.62E-06	5.85E-05	9.047317	-30.908	-5.8E-05	-0.00018	3.58E-05</		

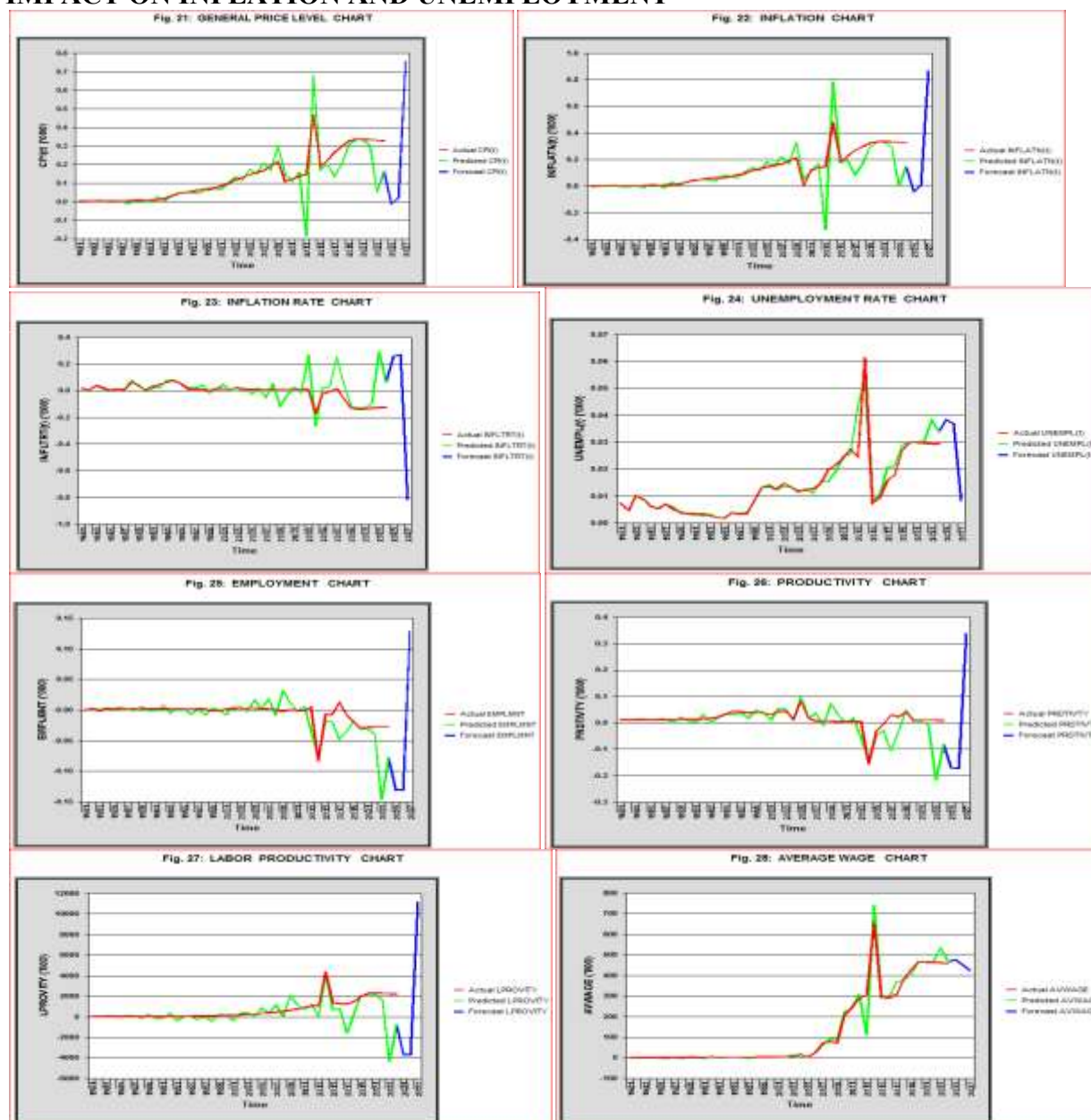
OPTIMAL CONTROL RESULTS. IMPACT ON INCOMES AND OUTPUTS



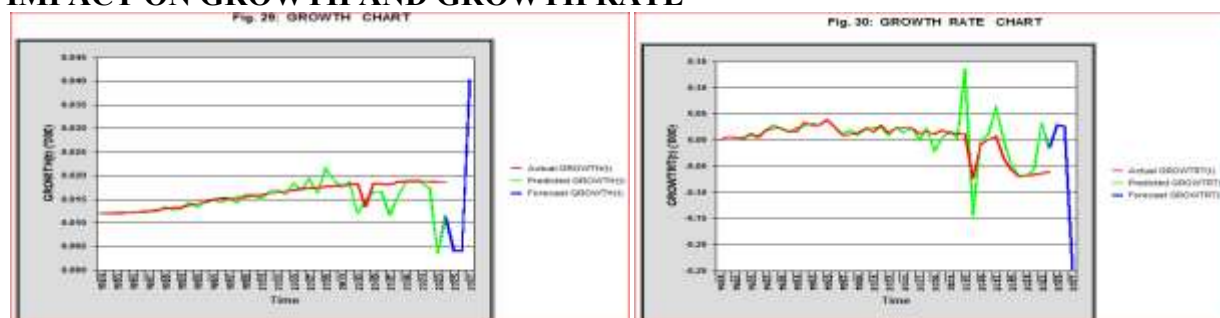
IMPACT ON SECTORAL OUTPUTS



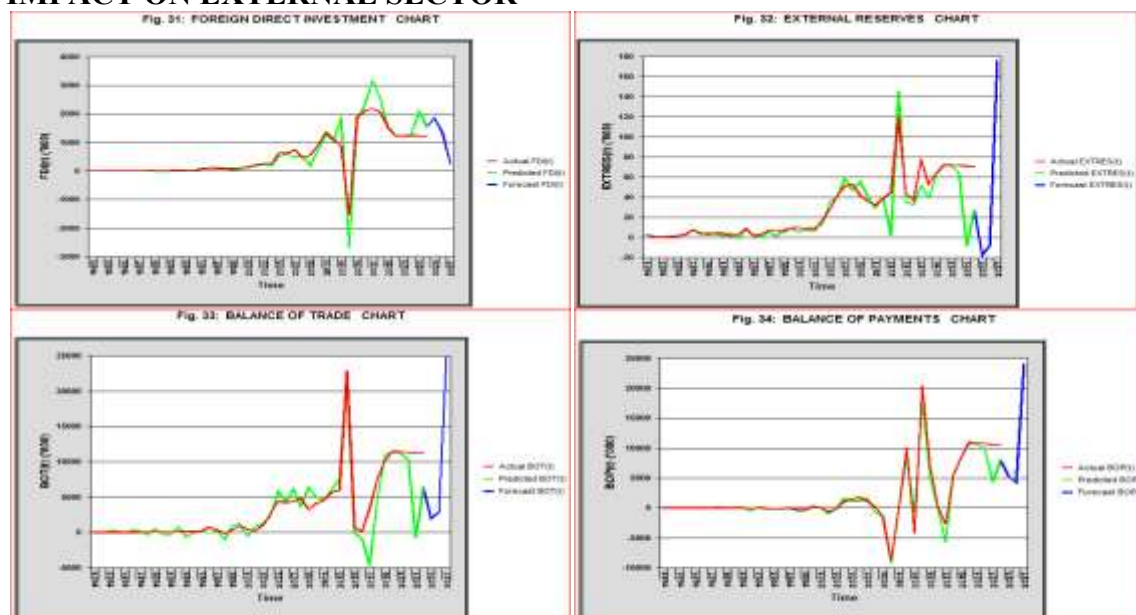
IMPACT ON INFLATION AND UNEMPLOYMENT



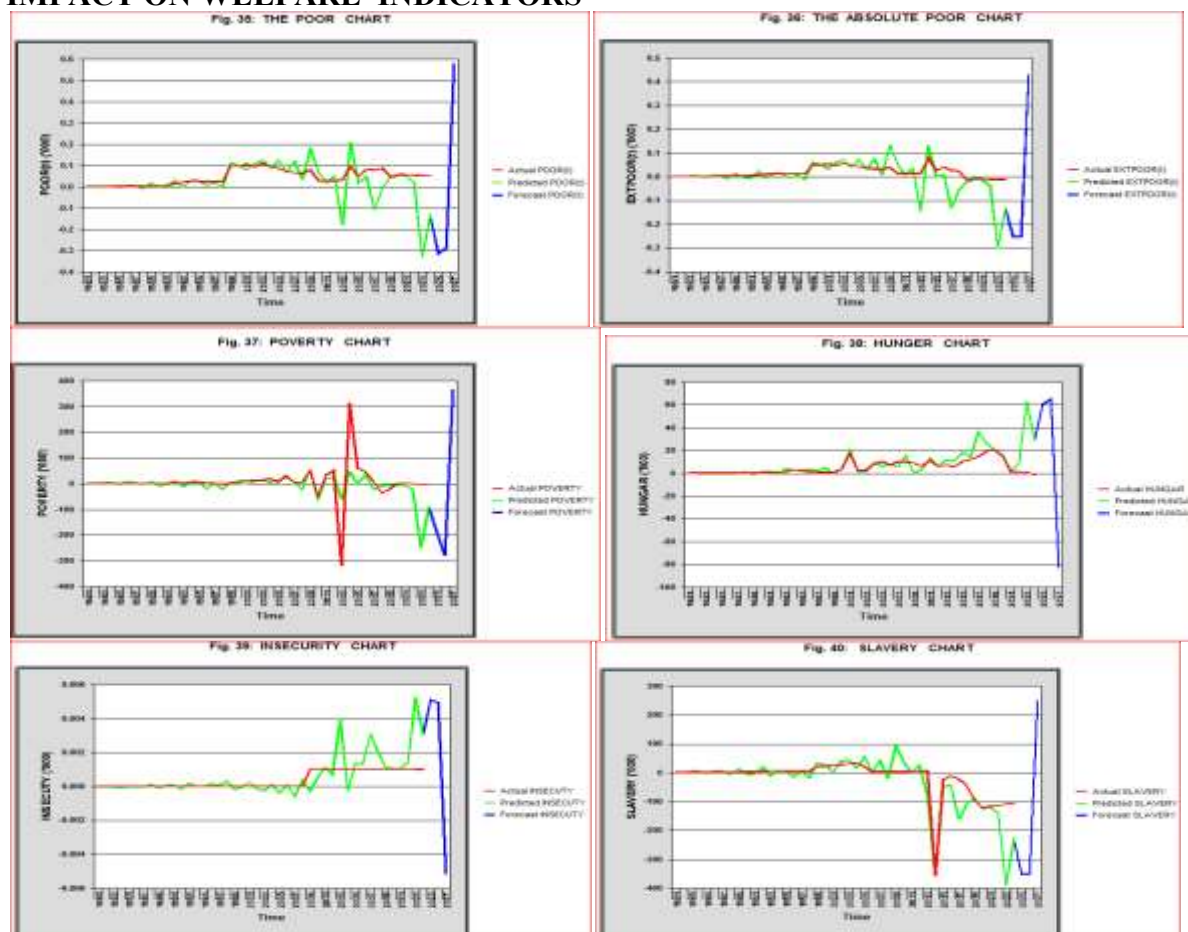
IMPACT ON GROWTH AND GROWTH RATE

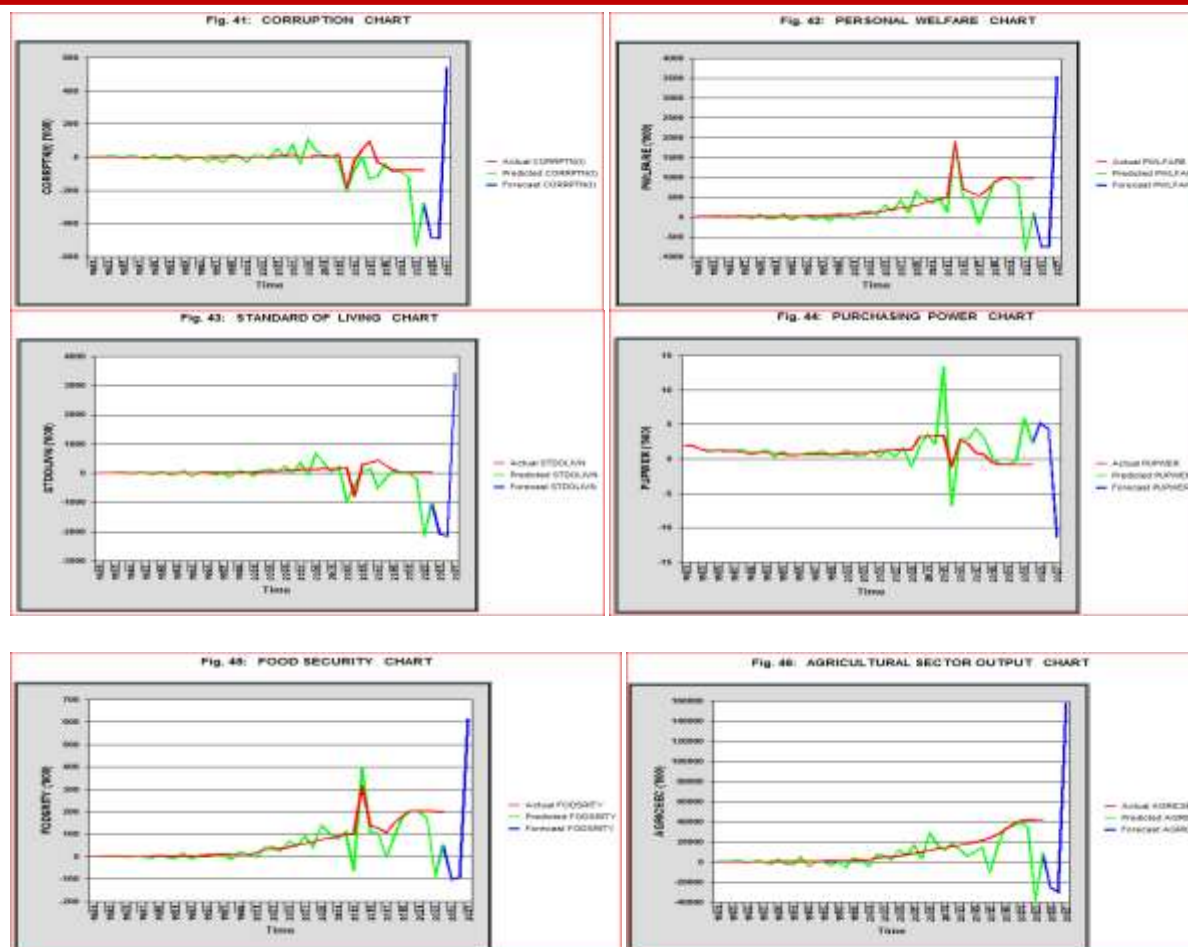


IMPACT ON EXTERNAL SECTOR

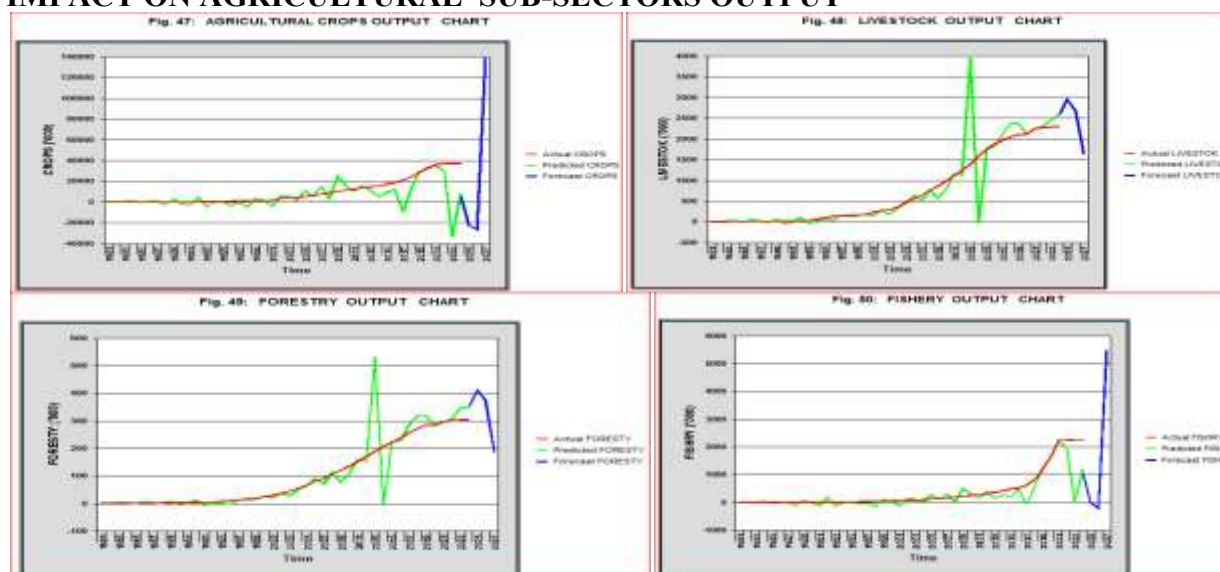


IMPACT ON WELFARE INDICATORS

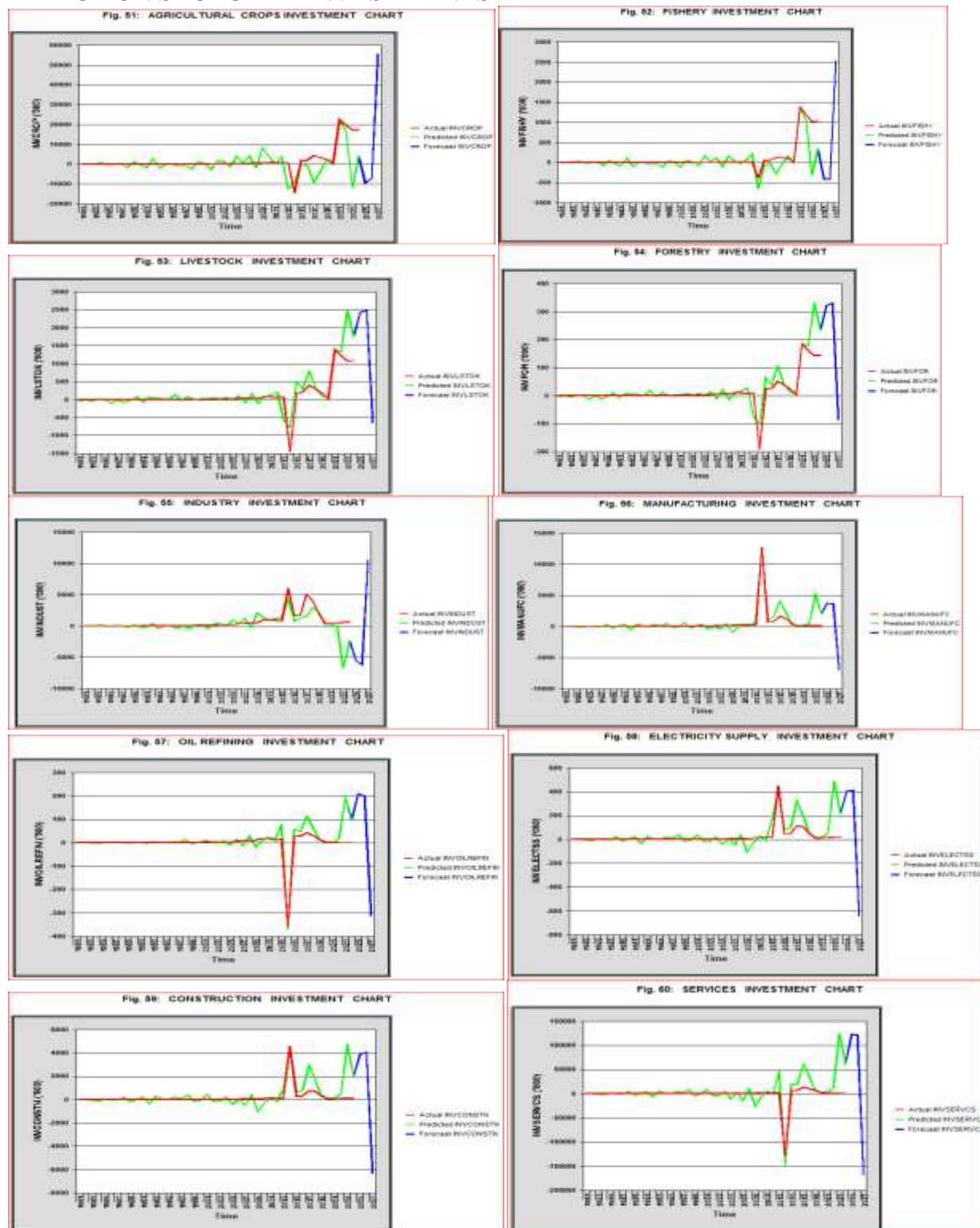




IMPACT ON AGRICULTURAL SUB-SECTORS OUTPUT



IMPACT ON SECTORAL INVESTMENTS



CONCLUSION

From the Charts, Fig. 3 to Fig. 60, we can infer that Nigeria will return to being a rudimentary agrarian society, with no technology and no modernization. Though Aggregate demand and supply, Crop and Fishery production and food security may improve considerably and produce a superficial growth and a false sense of welfare, the level of inflation, corruption and poverty will remain a major source of concern and sectoral investments will slump across board except for Industry, Crops and Fishery. Though people will invest and be employed in agricultural crop production and fishing and the problems of hunger and insecurity may be drastically reduced, the Nigerian economy will be largely impoverished, with corruption skyrocketing except Government heeds the persistent recommendations to transform the economic and industrial landscape of the entire country by investing in infrastructure, manufacturing, electricity supply and distribution, services, construction, including factories and industries as well as creating the right environment for Private Sector-led investments.

The study therefore rejects the Null hypothesis and accepts the Alternative hypothesis.

RECOMMENDATION

Government should transform the economic and industrial landscape of the entire country by investing in infrastructure, manufacturing, electricity generation, transmission and distribution, services, construction, including factories and industries as well as creating the right environment for Private Sector-led investments.

WE REST OUR CASE.

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