AN INTEGRATED MACROECONOMETRIC AND INPUT-OUTPUT MODEL OF NIGERIA

BY

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A DISSERTATION

Submitted to the School of Graduate Studies in
Partial Fulfillment of the Requirements
for the Degree

Doctor of Philosophy

McMaster University

1989

AN INTEGRATED

MACROECONOMETRIC AND INPUT-OUTPUT MODEL OF NIGERIA

TO MY FATHER AND TO THE MEMORY OF MY MOTHER

DOCTOR OF PHILOSOPHY (1989)
(Economics)

McMASTER UNIVERSITY
Hamilton, Ontario
Canada

TITLE: An Integrated Macroeconometric and Input-Output Model of Nigeria

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NUMBER OF PAGES: xvi, 249

ABSTRACT

An integrated macroeconometric and input-output model of Nigeria is formulated and tested in this thesis. The linkage between final demand and value added by sector is achieved through a 1973 input-output table of Nigeria. The input-output table is combined with national accounts, budgeting, monetary and balance of payments accounts using annual observations over the period 1960-1983. The residuals in value added equations based on fixed input-output coefficients are modeled with the explicit inclusion of capital stock to capture supply constraints in a developing economy.

The complete model is made up of 5 input-output equations, 29 stochastic equations and 38 identities and definitions. The predictive ability of the model is evaluated based on dynamic historical simulation results. According to the tests the model performs reasonably well for most variables.

It is intended that the integrated model should help us to understand the structure and important features of the Nigerian economy and be of assistance in the analysis of macroeconomic and sectoral policy initiatives, forecasting and development planning. The integration also facilitates a number of analytical possibilities since the macro-model of final demand is complemented by the inter-sector supply

flows and the input-output model by the stochastic macroeconometric relationships.

The model is used to evaluate growth prospects for the Nigerian economy up to 2000 and the sensitivity of the growth paths to changes in the world price of oil. These simulation experiments have policy implications for the government. Oil price may increase in the future but such increase will be temporary. In the medium-term it will be prudent for the federal government to establish a stabilization fund that would reduce the impact of the cyclical patterns of foreign exchange earnings from oil exports.

Given the uncertainties in the world oil market and Nigeria's vulnerability to what happens, it is essential to promote the non-oil sectors of the economy in the long-term. Questions concerning the ways in which the structure of the economy could be altered, or which sectors of the economy should be emphasised in order to facilitate sustained economic growth could be analysed with the model. Simulation results from the model suggest that agricultural sector promotion strategy would reduce dependence on oil and would constitute a source of long-term economic development. This involves a shift in production and consumption activities toward agriculture. The inter-sectoral allocation of investments is also essential for the growth

strategy for Nigeria. A higher priority for investments in agriculture stimulates long-term increases in sectoral output and overall economic growth.

ACKNOWLEDGEMENTS

The guidance and support of many people contributed to making this study possible. I am greatly indebted to the members of my supervisory committee for the continued encouragement, patience and guidance they provided during the work on my thesis. Professor Byron Spencer (Chairman) and Professor Frank Denton provided stimulating insights, discussions, suggestions and valuable comments which enriched the contents and improved the analytical quality of this dissertation substantially.

Professor Stuart Mestelmen and Professor Atif Kubursi were a constant source of encouragement and help during my graduate studies at McMaster, for which I am thankful. Professor Dave Butterfield provided useful comments on the input-output aspect of this study. Anami Bhargava, Maria Berruti and Mahmoud Elkhafif helped in connection with computational aspects of the study. Special thanks are due to Mrs. Cecile Spencer for the excellent typing. Sunday Adebiyi helped in preparing the charts. A large number of persons in Nigeria helped me in collecting data for this study. Among them were Tajudeen Oshikoya, Ajibola Shittabey, Kehinde Oseni, Dada Emmanuel and Kemi Oshikoya.

My graduate studies at McMaster were supported by an

award from the Canadian Commonwealth Scholarship and Fellowship Committee and also by McMaster University which provided me with part-time teaching assistance and graduate scholarships.

Before coming to McMaster I benefited greatly from my instructors at Ahmadu Bello University. Special thanks are due to Bright Ekuerhare whose delightful approach ignited my interest in Nigerian economy. The methodology of his course on "Nigerian Economy" exposed me to the interdependence of such pillars of economic scholarship as economic theory, empirical analysis and policy formulation as well as to leading scholarly published works, sources of primary and secondary data, and to government development policies on the Nigerian economy.

Finally, I wish to thank my Father, brothers, sisters and Mrs. Bimpe Okonofua, Mary Ottoh and Timothy Olowa for providing all the moral support I needed for the completion of this study. Above all, I am grateful to God.

All errors and omissions are, of course, my own responsibility.

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CHAPTER ONE

INTRODUCTION

1.1 Objectives of the Study.

An integrated macroeconometric and input-output model of Nigeria is formulated and tested in this thesis. The model represents the first attempt to combine an input-output table with an econometric model of Nigeria. The linkage between final demand and value added by sector is achieved through a 1973 input-output table of Nigeria. The input-output table is combined with national accounts, budgeting, monetary and balance of payments accounts using annual observations over the period 1960-1983.

The integrated model should help us to understand the structure and important features of the Nigerian economy and be of assistance in the analysis of macro-policy initiatives, forecasting and development planning. The integration also facilitates a number of analytical possibilities since the macro-model of final demand is complemented by the interindustry supply flows and the input-output model by the stochastic macroeconometric relationships. Aspects of both demand and supply are

emphasised in this framework. The residuals in sectoral value added equations are modelled with the explicit inclusion of capital stock to capture supply constraints in production in a developing economy. A wide range of possible policy alternatives can be selected and simulated within this framework. Questions concerning the ways in which the structure of the economy could be altered, or which sectors of the economy should be emphasised in order to facilitate adjustments to internal and external shocks and promote rapid and sustained economic growth could be analysed with such a model, with resulting prescriptions for policy.

In more specific terms, the thesis can be used:

1. to explain recent economic growth and development;
2. to provide a source of information on estimates of the structural parameters of the Nigerian economy;
3. to study the relationships among major economic variables and the determinants of their magnitudes and rates of change through time;
4. to study the roles of fiscal and monetary policies in determining the general level of economic activity;
5. to calculate multipliers as a basis for

indicating the effects of specific changes in various government policies and other exogenous variables;

6. to conduct historical conditional forecasting and policy simulation of major economic variables, given alternative government policies or changes in exogenous variables;
7. to forecast growth prospects of Nigeria and be applied in economic policy planning on the macroeconomic level.

1.2 Review of Macro-Econometric Models of Nigeria

Macroeconometric modeling for Nigeria began with the work of UNCTAD staff model of the Nigerian Economy for Project Link (Ball 1973). The model covers the sample period 1955-1966 and is made up of 38 equations. A major shortcoming of the model is the exclusion of a monetary and price sector.

The model by Ojo (1973) has 15 equations 9 of which are behavioural. There are 17 exogenous variables; the data cover the period 1951-1965. The degree of disaggregation in the model is quite low. The model is a Keynesian aggregate demand model with output disaggregated into agriculture and non-agriculture. The monetary and employment sectors are absent from this model.

The Uwujaren (1977) model covers the period 1953-1973. It has 62 equations and 33 exogenous variables. The model focuses on sectoral investment allocation and simulating government projections in the Third National Development Plan (1975-1980).

Ghosh and Kazi (1978) modelled the Nigerian economy with special emphasis on the expenditure side of the national accounts in the spirit of Keynesian theory of aggregate effective demand. The model covers the period 1958-1974.

The model by Olofin, Iyaniwura, Adeniyi and Olayide (1985) is a more recent macroeconometric model of Nigerian economy. The model has a total of 137 equations, of which 76 are stochastic. Most of these are either in simple linear forms or are log-linear. These were estimated using ordinary least squares method with correction for serial correlation where necessary, on 1960-1979 time series data. The degree of disaggregation in the model is high. A major shortcoming of the model is that for the agricultural output, an autoregressive specification or merely fitting the regressand on time trend was adopted. Furthermore the authors conclude that their model is not able to capture turning points, a major deficiency in a forecasting model.

Macroeconometric model construction for Nigerian economy, although treating the underlying determinants of

demand and income, has emphasized less the determinants of sectoral production and output. The econometric models reviewed above lack detailed systematic treatment of the production sector.

A promising innovation seems to be the development of a more general system encompassing both the conventional macroeconometric model and the input-output model. The joint model would determine final demand from equations of economic behaviour and also allocate it over sectoral production activities by means of the input-output table.

Input-output data, although scarce compared to the availability of national income and product data, are an important source of sectoral detail that can be used to construct links between the demand side and production side of a macro model. Input-output analysis adds a new dimension to models of economic systems since it focuses on the interrelations and flows that occur among sectors of the economy. It represents a comprehensive view of the structure of the national economy, covering the inter-sectoral flow of goods and services. It specifies the interrelationships of production and consumption activities of the various sectors to which the economy has been classified. It is a powerful tool for analysing changes in the structure of the economy and brings into focus the possible repercussions of changes in the gross domestic

product and its components on the output of each of the specified production sectors.

1.3 Organisation of the Study

The construction of a macroeconometric model for an economy requires detailed knowledge of the structure of the economy. Chapter 2 of the thesis is devoted to reviewing the growth and structure of Nigerian economy. It also considers broad changes in economic policy and development planning experience. The chapter is intended to provide the general descriptive setting for the formal model construction.

The purpose of chapter 3 is to provide an appropriate perspective for the formulation of theoretical concepts and consequently the model of Nigerian economy. Chapter 4 is concerned with the estimation of the integrated macroeconometric and input-output model of Nigeria which reflects theoretical postulations, data constraints and the underlying structure of Nigerian economy.

Chapter 5 presents the model validation techniques and also evaluates the tracking ability of the complete model in a dynamic historical simulation context. Policy simulation and analysis are also undertaken with the integrated model. The model is also used to project the

growth patterns of the Nigerian economy for the period from 1984 to 2000 in Chapter 6.

The final chapter summarises the major findings of the study and offers suggestions for improvements and directions in which the thesis might be extended.

CHAPTER TWO

DESCRIPTIVE ANALYSIS OF THE NIGERIAN ECONOMY

2.1 Introduction

This chapter reviews the growth and structure of the Nigerian economy since independence in 1960.[1] Such a review of the developments and features of the economy serves as useful background for the construction, estimation and simulation of the model of the Nigerian economy in subsequent chapters.

Section 2.2 briefly explains the physical environment and the potential natural resources of the country. Section 2.3 analyses the changes in the structure of production while section 2.4 reviews developments in the government sector and public finance structure. The monetary sector is discussed in section 2.5. Section 2.6 is devoted to the external trade sector of the economy while section 2.7 reviews the development planning experience of the country. The underlying economic growth and recent structural adjustment program is the subject of section 2.8.

2.2 The Physical Environment

The Federal Republic of Nigeria is the most populous country in Africa. According to a United Nations estimate, Nigeria had a total population of 89 millions in 1983, which suggests that one of every six Africans is a Nigerian. With a land area of over 923,800 square kilometres, population of close to one hundred million and the enormous potential for development which its physical environment, natural and human resources provide, Nigeria is sometimes referred to as the "Giant of Africa."

Nigeria lies approximately between latitudes 4^{o}-14^{o} North and longitudes 3^{o} - 15^{o} East at the eastern end of the broad sweep of the West African coastline. The country is bordered on the east, west and north by the French-speaking countries of Cameroun, Benin and Niger and on the south by the Atlantic Ocean. Nigeria has modest physical features. Nine physical regions have been identified. The coastal creeks and lagoons region is a low-lying area about 30 metres above sea level. The Niger Delta, like the creeks and lagoons regions, is a low-lying region which possesses a system of natural water channels through which the River Niger finds its way to the sea. The coastal plain is a region of gently undulating landscapes which are developed on young sedimentary rocks. It covers extensive areas in Eastern Nigeria and a rather narrow tract in Western

Nigeria. The Western or Oyo plain is underlain by old metamorphic rocks which outcrop to form high hills in many districts. The Eastern borderlands of the country consists of a chain of low mountain ranges while the scarplands of South-Central Nigeria lies east of the lower Niger valley and possess plateau surfaces separated by river flood plains. The plateau surfaces are dotted with numerous hills and ridges.

The Jos plateau is regarded as the hydrological centre of Nigeria because of its veritable watershed from which rise virtually all streams flowing from the northern half of Nigeria to Lake Chad and the Niger and Benue Rivers. Away from the plateau the land drops steadily northward. Low land areas also predominate in the Rima and Chad Basins regions at the extreme north-west and north-east of the country respectively.

With its generally low relief and its situation well within the tropics, Nigeria has a climate which is characterised by relatively high temperatures throughout the year. The maximum daily average temperature is about 31^{o}C in the South and 19^{o}C in the North. There is however considerable variations in daily and seasonal rythm. The annual total rainfall in the South averages about 4,300 milimetres and about 1,780 milimetres along the West coast. The rainfall decreases fairly sharply inland falling to 510

milimetres in the extreme North. The amount and timing of the rainfall is very important for successful agriculture as delays in rains and occassional droughts have been responsible for crop failures. The important influence of rainfall on vegetation of Nigeria is also remarkable. Swamp forests and rain forests are found in the South where most of the tree crops, roots and tubers are grown. Grasslands of various type occupy the rest of the country. This area is noted for the growth of various type of cereal crops and for its animal husbandry.

The most important river in Nigeria is the River Niger, the third longest in Africa. Its principal tributary is the River Benue. The Kainji dam and the 1295 square kilometres lake behind it served to control the annual flooding of the lower Niger valley. The dam and the lake built primarily to generate hydroelectricity have also become a major source of fish for the region as well as water for irrigation.

Soil distribution pattern in the country reflect both the climatic condition and its geological structure. In broad terms we can distinguish between heavily leached reddish brown, sandy soils in the South and light or moderately leached, yellowish brown, sandy soils in the Northern parts. The geological structure of the Northern and South-western areas of the country is that of old

crystalline basement complex rocks. They are highly mineralised and give rise to soils of high nutrient status, although variable from place to place. Cases of soil erosion occur in the very densely populated parts of Eastern Nigeria.

Nigeria is richly endowed with natural and mineral resources such as crude petroleum, iron ore, coal, natural gas, tin and bauxite. Current knowledge of the geology of the country also suggests that gold and uranium may be economically explored. Crude petroleum oil is currently the most economically viable natural resource, and it accounts for about 90 percent of the total export earnings of the country.

2.3 Economic Growth and Production Structure

The nominal gross domestic product (GDP) of Nigeria in 1983 was estimated at 53,347 million naira. With an estimated population of 89 million, the per capita income amounted to 600 naira (U.S.$801). Nigeria ranks as a middle income oil exporting country. The real GDP in 1983 measured in 1973 naira was 13,931 million naira compared to 3,976 million naira in 1960. The average annual growth rate of real gross domestic product at 1973 prices between 1960-1983 was 7.2 percent. The implicit price deflator for GDP rose at an average annual rate of 10 percent in the same period.

The composition of sectoral GDP and structure of production have undergone major changes. The development of the petroleum industry in the early 1970s transformed Nigeria from an agricultural-based economy to a major oil exporter. Increased petroleum earnings prompted high levels of economic growth and by the mid-1970s Nigeria emerged as the dominant economy in sub-Saharan Africa and as the continent's major exporter of crude petroleum oil. The changing structure of production and the share of various economic sectors in GDP for selected years are shown in Table 2.1.

2.3.1 The Agricultural Sector

Prior to the 1970s agriculture was the most important sector of the Nigerian economy accounting for about 60 percent of GDP and more than 75 percent of exports earnings. However, with the expansion of the crude petroleum-mining sector, agricultural development entered a period of relative decline. Although it continued to be a major source of employment, the agricultural sector contribution to the nominal GDP declined from 63 percent in 1960 to 28.7 percent in 1983.

At independence in 1960, Nigeria was a predominantly agricultural country dependent on exports of cash crops such as cocoa, palm kernels, coffee, cotton, rubber and

groundnuts. Since the mid-1970s cocoa has been the only agricultural crop which makes a significant contribution to exports. The production and export of palm products has declined dramatically. Nigeria was once the world's leading exporter of palm oil but it is now heavily dependent on imports of palm products in order to meet domestic needs. Cotton production fell by more than 70 percent between 1960 and 1983. Exports of cotton declined rapidly throughout the 1970s and by 1979 ceased completely. Exports of rubber remain small at around 25,000 metric tons per year.

Subsistence foodcrops production has also declined while food imports have increased substantially. Traditional smallholder farmers who use simple techniques of production and the bush-fallow system of cultivation account for about 75 percent of Nigeria's total agricultural production. The decline in agricultural output can be attributed more importantly to the growing significance of the crude petroleum-mining sector which diverted attention away from the agricutural sector, and led to a change in relative prices favouring the non-tradeables and penalising the agricultural tradeable sector. Price incentives to small scale farmers were also discouraged as government marketing boards set low producer prices for cash crops which bear no relationship to their international prices.

Government efforts to improve the agricultural sector have generally been directed towards large scale irrigation schemes and provisions of support services under the Integrated Agricultural Development Projects (ADPs). The ADPs were financed by the World Bank, and the federal and state governments. River Basins Development Authorities (RBDA) were set up in the late 1970s to complement the ADPs and to promote agricultural development around the water resources of Nigeria's river basins. The RBDA and marketing boards have been widely criticized for inefficiency and corruption.

2.3.2 The Petroleum-Mining Sector

The production of crude petroleum oil started in 1958. From a meagre share of 0.14 percent in 1960, its contribution to nominal GDP increased to 17 percent in 1983. Its peak contribution was recorded in 1974 at 31 percent following the Arab oil embargo. Since 1974, the petroleum industry has been the mainstay of the Nigerian economy and the major determinant of the country's economic growth. It accounts for more than 90 percent of total foreign exchange earnings and more than 75 percent of total government revenues. However, given that oil extraction requires heavy reliance on imported capital goods and only minimal use of domestic resources, the petroleum-mining

sector's contribution to employment is negligible. The backward and forward linkage with the rest of the economy are very low, indicating a rentier economy whose rent accrues entirely as foreign exchange .

According to official estimates, in 1986 Nigeria possessed about 20,000 million barrels of oil reserves. This is sufficient to maintain output at the current rate of extraction for another 30 to 35 years[2]. The first commercial discoveries were made in the late 1950s in the Niger River Delta region of southern Nigeria. Average production increased from 0.06 million barrels per day (mbd) in 1958 to 2.25 mbd in 1974, and then fell to 1.78 mbd in 1975. By 1979 production rose to a record level of 2.44 mbd. After a gradual decline to 2.06 mbd in 1980, production fluctuated wildly owing to slack demand and developments in world oil market. Production slumped to 1.44 mbd in 1982 and decreased further to 1.23 mbd in 1983 due to weakened world markets prices and subsequent Organization of Petroleum Exporting Country (OPEC) allocation to Nigeria.

Government activity in this sector has expanded greatly due to the strategic position that the oil industry occupies in the economy. In 1971 the federal Government-owned Nigerian National Oil Corporation (NNOC) was established to be a participant in the operations of the

foreign oil companies. In 1977 the NNOC was merged with the Ministry of Petroleum Resources to form the Nigerian National Petroleum Corporation (NNPC). The NNPC is charged with responsibility for looking after government interests in the oil industry and it has 60 percent equity shares in the operation of multi-national oil companies. The government is responsible for about 75 percent of total investment in the mining sector. The NNPC is also responsible for the exportation of oil and the domestic distribution of refined petroleum.

Nigeria exported its entire output of crude oil before the completion of the 0.6 mbd petroleum refinery at Port Harcourt in 1965. A second refinery with a capacity of 0.95 mbd was constructed in 1977 at Warri and a third inland refinery with a capacity of 0.95 mbd in Kaduna uses both domestic light crudes and imported heavy crudes. However Nigeria still processes up to 0.5 mbd of crude oil abroad to meet domestic requirements because of underutilization of refinery capacity .

Development of an integrated petrochemical industry has progressed slowly. Construction of a number of processing units at the refineries in Warri and Kaduna are currently underway. A new petrochemical complex to produce 300,000 tons per year of ethylene cracker based on oil and natural gas is planned to be operational by 1990.

In addition to its petroleum resources Nigeria is also endowed with the proven largest deposits of natural gas in Africa. Proven gas reserves are assessed at more than 24,000 million cubic metres (CUM), most of which are located with the petroleum deposits in and around the Niger Delta Region. About 80 percent of the current oil-associated gas produced in the country is flared off. In a bid to curtail the wasteful flaring of gas, which is estimated to be of potential value of $4,400 million per year, the Federal Government issued a decree penalizing oil companies for this practice. Nigeria's most ambitious scheme to utilize flared gas was to construct a gas liquefaction plant, with a daily capacity of at least 45 million (CUM), on the River Bonny called the Bonny Liquefied Natural Gas (LNG) consortium.

Nigeria also possesses substantial deposits of other minerals such as lignite and subtuminous coal, tin, columbite, iron ore and uranium. Tin is the only major non-hydrocarbon mineral currently being extracted in the country. Uranium deposits have been discovered at Gombe in Northern Nigeria, but have yet to be exploited.

2.3.3 The Industrial Sector

The industrial sector consists of the manufacturing and construction sectors. The share of manufacturing in nominal GDP increased from 4.8 percent in 1960 to 11

percent in 1983. Industrial development in the period following independence in 1960 was characterised by the etablishment of import-substituting manufacturing industries to produce consumer goods. By 1983 about 60 percent of the manufacturing sector output still came from light industries producing basic consumer goods such as packaged food, textiles, and beverages that do not involve complex technologies. These industries, established in the 1960s under the import substitution strategy, were heavily protected behind a complex structure of tariff barriers and special incentives such as pioneer status, tax holiday and accelerated depreciation schemes. The structure of the manufacturing sector needed to promote sustained industrial growth was weak. Imported raw materials constitute about 65 percent of total raw materials used in local industry. Manufacturing is therefore vulnerable to distruption when imports are restricted as they were between 1981 and 1983.

Before the 1970s the proportion of gross output repatriated as profits and salaries by the foreign firms was very high while the level of domestic participation in the ownership and management structure of industries was very low. During the mid-1970s industrial policy shifted towards increasing domestic participation in the ownership and management structure of industries. The 1972 Nigerian Enterprises Promotion Decree, which was strengthened and

extended in 1977, aimed at increasing indigenous participation as well as setting limits on profits repatriated during a given period.

The construction sector contributed about 4.8 percent to GDP in 1960 and 6.2 percent in 1983. The heavy industries requiring complex capital technology that were established in the mid-1970s are still in their pioneering stages. The complexes that assemble components for passenger cars and commercial vehicles were established during this period. However domestic demand for assembled cars remains well above supply as the cost of imported components and the difficulties in obtaining import licences have reduced output. The creation of an integrated iron and steel industry has been a high priority of successive developments plans. The first steel complex located in Aladja in the Delta region of Nigeria was formally opened in 1982. The complex, which has a capacity of 1 million tons per year, supplies billets and wire rods to 3 steel rolling mills at Oshogbo, Katsina and Jos in the Western, Northern and Central parts of the country respectively. Each of the three rolling mills has an initial annual capacity of 210,000 tons of steel products, with plans to expand, in stages, to 750,000 tons. The rolling mills, however, are grossly underutilized due to

inadequate production and supplies at the Aladja steel plant complex.

A larger steel complex at Ajaokuta is expected to cost an estimated US $7,000 million making it the largest industrial investment project in sub-saharan Africa[3]. In recent years industrial policy in the steel industry has shifted to the development of rolled product plants, foundries, and special steel plants, all based on local resources. Nigeria's annual steel requirements are expected to reach 6 million metric tons by 1990, of which 5.2 million tons are expected to be met by output from the Ajaokuta steel complex[4].

2.3.4 The Infrastructural Sector

This sector which includes public utilities, transportation and communication activities contributed about 5.3 percent to GDP in 1960 and 5.0 percent in 1983. The sector witnessed fast growth since the end of the civil war due to a concerted effort of the government to improve and expand infrastructure and social overhead.

The principal supplier of electricity in Nigeria is the Nigerian Electric Power Authority (NEPA) formed in 1973. Demand for power has however continued to outstrip capacity. In comparison with other West African countries, Nigeria has a well developed transportation system. There are

about 124,000 kilometeres of roads and the railway network covers 3,500 km. There are 2 international airports, 11 domestic airports and 6 principal seaports. However congestion, lack of proper maintenance and poor planning have resulted in unreliable services .

2.3.5 The Services Sector

This sector includes general administration of the government and distribtuion. The growth of general government activities was facilitated by the increased oil revenues amd the creation of new states. The contribution of the services sector to nominal GDP increased from 21 percent in 1960 to 30 percent in 1983. As a major source of employment it is second only to the agricultural sector.

2.4 Public Finance

Nigeria operates a federal system with three tiers of government, federal, state and local. However the revenue jurisdiction of the Nigeria fiscal structure is centralised and concentrated in the federal governments which collects about 95 percent of the total Nigerian government revenue. It wields enormous financial power as well as borrowing power. It is legally required to share part of its revenue proceeds with the state and local governments. The state and local governments rely on

statutory and non-statutory transfers from the federal government most of their revenue. Statutory grants are revenues that belong to all the governments of the Federation in the Distributional Pool Account (DPA) and are to be shared among them on the basis of a revenue allocation formula. Non-statutory grants are those that the Federal government may make to a state to supplement the revenue of that state in the form of conditional matching and unconditional grants[5].

Table 2.2 summarizes the various sources of revenue collected by the federal government. Resource-based revenue has increased tremendously, reflecting the growing importance of the oil sector as the principal source of government revenue since the early 1970s. Total revenue from the oil sector, which consists of petroleum profits tax, minning rents and royalties, increased from a meagre share of 3.9 percent in 1961 to 81 percent in 1980. Mining rents and royalties have been by far the most important components of non-tax revenues since the 1970s. They accounted for about 80 percent of the total non-tax revenues in 1983.

A notable feature of Nigerian fiscal development since the 1970 is the displacement of indirect taxation by direct taxation. Indirect taxes in the form of import, export and excise duties accounted for 72 percent of total

revenue in 1961 but declined to 19 percent by 1983. Revenue from personal income tax and corporation income tax is insignificant compared to the resource-based revenues.

The pattern of federal government expenditure is presented in Table 2.3. Between 1961 and 1970, the expenditure of the federal government increased by about 380 percent. The largest increase in expenditure was in general administration and defence whose share increased from 29.5 percent in 1961 to 72.7 percent in 1970. This tremendous increase in expenditure on defence and internal security was due mainly to the financing of the civil war between 1967 and 1970. On the otherhand the share of total expenditures on economic services, social services and transfers declined substantially during the same period.

The striking feature of the expenditure pattern of the federal government in the 1970s and 1980s is the steady fall in the proportion of total expenditures on general administration and defence with a corresponding increase in those economic services and social services.

The federal government had substantial current surpluses throughout the 1970s while high capital expenditure on economic services and infrastructure such as transportation and communications facilities resulted in overall budgetary deficits. Federal government budget

deficits are financed through external borrowing and domestic sources mostly through the banking system.

Reliable and adequate data on fiscal operations and accounts of state and local government are scanty compared to the federal government. The existing data suggest a diminishing importance of State Government own-revenue sources. Such internally generated revenue include sales taxes, personal income tax and community poll taxes. The states own-revenue sources deteriorated as they failed to exploit their tax sources when more statutory transfers from the federal government were made available to them due to the increase in oil revenues.

State government expenditures are concentrated on the provision of economic and social services while local governments have expenditure jurisdiction over the maintenance and regulation of local public facilities, refuse disposal and primary education. Overall the federal government had current budget surpluses in the 1970s the state governments consistently maintained budgetary deficits.

Nigeria has made use of external financing for its programme of economic development since the introduction of its First Development Plan in 1962. In the 1960s and the early part of 19[illegible]s, both the federal and state governments maintained a cautious attitude towards external borrowing

and debt servicing presented few real problems. The sharp rise in foreign reserves from petroleum, and the launching of several large-scale capital-intensive projects starting in the mid-1970s heralded a dramatic change in attitudes towards external borrowing. In 1978, for example, the federal government negotiated loans worth more than $778 million on the Euromarket and from a consortium of international banks.[6] By 1983, the total external debt commitments stood at $12,936 million (Table 2.4). More than 50 percent of the outstanding external debt consisted of medium-term loans at floating interest rates. The net result was a heavy concentration of debt maturity at a time when international real interest rates were high and when Nigeria's earnings of foreign currency were declining due to lower price of oil. Debt servicing alone cost $2,173 million in 1983 representing about 20 percent of total foreign exchange earnings. The ability of the government to keep pace with its external debt repayments may depend heavily on maintaining current low levels of imports, on a stabilization of export earnings from petroleum, and on the extension of trade credits and multilateral aid flows.

2.5 Monetary Sector

The money market in Nigeria, like most developing countries, is characterised by its dual nature. An

unorganised money market caters to the needs of the rural sector while an organised money market is confined to the industrial urban sector. The low level of banking use coupled with limited banking facilities, especially in the rural areas, mean that credit needs are met mainly by friends, relatives, traders and local merchants.

At the apex of the organised Nigerian banking system is the Central Bank of Nigeria (CBN). The establishment of the CBN in 1959 had, as one of its objectives, to promote and integrate the banking system with the Nigerian economy. Hitherto, the economy operated under the West African Currency Board. The Board had introduced West African pounds to replace the varieties of circulating exchange media in the British West African colonies. Nigeria and other colonies were allowed no autonomy to conduct monetary policy. The Nigerian pound was fully backed by the Board and convertible into the British pound as the legitimate foreign exchange.

With the establishment of the CBN, an era of discretionary monetary policy was born. The CBN is the sole bank of currency issue. In 1973 a decimal system of currency was adopted with the introduction of the Nigerian naira to replace the pound sterling. The naira was valued at exactly one half pound at that time. The CBN is banker to the government, holder of the gold and foreign exchange

reserves, and lender of last resort to the commercial banks.

Monetary aspects of macroeconomic management are conducted by the CBN. The main objectives of monetary policy are to reduce the pressure of inflation; to control monetary and credit expansion but at the same time to use sectoral allocation of credit to guide it into productive sectors; to promote the growth of indigenous business in furtherance of the government policy of indigenisation of the various sector of the economy; and to monitor and control the liquidity of the banking system. (Okigbo, 1979:56).

The major instruments of monetary policy used by the CBN are credit guidelines, sectoral credit guidelines, liquidity ratio control, interest rates variations and moral suasion. Open market operations is seldomly utilized as a medium for macroeconomic management due to the underdeveloped nature of the money and capital markets.

Table 2.5 summarizes the liabilities and assets of the banking system. The proportion of currency in total liabilities of the banking system declined steadily from 51.2 percent to 25 percent. The decrease in the share of currency reflects the growth in time and savings deposits. Deposits from the public are the principal source of funds for the commercial banks which constitute the core of the Nigerian banking sector. The proportion of time and

savings deposits in total liabilities increased tremendously from 19.5 percent in 1960 to 41.7 percent in 1983. The increase in time and savings deposits can be attributed to the oil boom and to the rapid expansion of banking facilities resulting from the rural banking programme that was initiated in 1977. The share of demand deposits in total liabilities of the banking system fluctuated widely. The growth of demand deposits has been limited by the extent to which cheques are used for settlement of debts in the country. The prevailing tendency to distrust cheques and difficulties in opening chequeing accounts results in strong preference for cash transactions. Most transactions in Nigeria are accomplished in cash and many of the loans granted by the banks are drawn out in cash because of the prevailing banking habit. Nigeria's commercial banks therefore keep substantial cash assets to meet depositors' and borrowers' cash requirements.

Net claims on government as a proportion of total assets increased tremendously to 52.4 percent in 1970. Investment in government securities is the major source of banking sector credit to the government. Its major components are treasury bills and certificates introduced in 1960 and 1968 respectively. The increase in banking sector credit to the government up to 1970 reflected the reliance that the government placed on domestic banking system to

finance the civil war. During the 1970s the share of government credit in total assets declined mainly because of increased oil revenue that was deposited with the Central Bank of Nigeria. Credit to the government, however, increased substantially in the 1980s due to the falling oil revenue. Loans and advances are the most prominent types of banks assets and constitute an important source of credit to the private sector for financing economic activities. The share of credit to the private sector in total assets of the banking system fluctuated depending on the share of credit allocated to the government as Table 2.5 indicates. Moreover the banks are quite conservative in their lending operations as they traditionally show a strong preference for self liquidating commercial transactions and consider short-term credit to distributive sector as more remunerative and easily managed.

2.6 Foreign Trade and Balance of Payments

Nigeria is a very open economy and the importance of foreign trade to the pace of development cannot be overstated. The degree of openness of the economy as measured by the ratio of external trade (imports and exports) to GDP at current market prices has averaged about 43 percent between 1960 and 1983. Export receipts provide the foreign exchange earnings needed to execute industrial

programmes of capital formation. Imports of raw materials and capital goods provide the wherewithall for growth in output and make possible development of local production for several products via import substitution. Foreign trade also provides a large proportion of government revenues which can be used to finance possible government investment.

The composition of exports for selected years is summarised in Table 2.6. The economy's dependence on exports of non-oil primary agricultural products in the 1960s is noteworthy. Primary products accounted for 80.6 percent of total exports in 1960 but only 5.4 percent in 1975 and less than 4 percent in 1983. Nigeria was once the world's largest exporter of groundnuts and palm oil but is now heavily dependent on imports of palm produce in order to meet local needs. Exports of cotton diminished gradually throughout the 1970s. Only cocoa still makes any significant contribution to exports. The decline in exports of agricultural products can be attributed to the world market situation, Nigeria's overvalued exchange rate which reduced the terms of trade for these products, low producer prices paid to the small-scale rural farmers by the marketing boards, and the general neglect of the agricultural sector as a result of the rapid development of the crude petroleum industry in the 1970s.

Crude petroleum oil exports has dominated Nigerian total exports since the early 1970s. The share of oil in total exports increased from 2.6 percent in 1960 to 93 percent and 96 percent in 1975 and 1983, respectively. Indeed oil exports have become the main engine of economic growth for the country. The sharp rise in foreign exchange earnings from crude petroleum exports allowed for increased imports of consumer and capital goods throughout the 1970s. The oil glut of the early 1980s led to a sharp fall in foreign exchange earnings and general economic activity.

Total imports increased tremendously up until the 1980s. The post-war import liberalization in the early 1970s increased the volume and value of imports. Imports by economic categories in Table 2.7 should give a good indication of composition of imports which fluctuates between 1960 and 1983. Imports of food decreased from 14.4 percent of total imports in 1960 to 8.4 percent of total imports in 1970. From 1970 onwards, food imports increased steadily to 15.8 percent in 1981 before falling to 15.2 percent in 1983. Imports of raw materials increased significantly from 19.7 percent in 1960 to 28.3 percent in 1970. It however declined to 23.4 percent in 1978 before remaining steady at 25.6 percent in the 1980s. Capital goods imports increased tremendously from 23.4 percent in 1960 to 42.2 percent in 1970. It however fell sharply to

36.4 percent in 1973. Import of capital goods was less than 33 percent in 1983.

The balance of payments for Nigeria is summarised in Table 2.8. The condition of Nigeria's balance of payments has been determined largely by fluctuations in the current account. The conduct of the civil war, increased efforts at planned development and declining prices of primary exports in world markets led to persistent current account deficit in the 1960s. Increased oil exports improved the current account position in 1974 and 1980 respectively. The exceptionally large surplus of 1974 and 1980 reflected the impacts of the 1973 and 1980 oil price increases. The overall balance of payments deficit in 1978 is attributable to huge development expenditures which necessitated the importation of capital goods. The deficits in the 1980s are due primarily to the weakening of the world oil markets and the rapidly receding revenues from oil exports. To contain the deficits over the years, reliance has been placed on commercial policies consisting of tariffs, licensing, quotas and quantitiative restrictions on various categories of imports. Current account deficits have also been financed by increased public external debt in the capital account. Foreign directive investment, however, has remained very low despite the high growth rate of the economy in the 1970s.

2.7 Development Planning

The role of the government in the economic development of Nigeria with respect to monetary, fiscal, commercial and income policies has been crystallised through the formulation and implementation of National Development Plans (NDPs) since 1945. These plans have generally articulated the objectives and magnitudes of government involvement in the economy by providing a comprehensive outline of its development expenditures over a period of four to five years. The government has also enunciated its attitude towards the level and composition of private gross capital formation and the various social, political and economic parameters within which planned development would be pursued.

Planning for development in Nigeria dates back to 1945 when a "Ten-Year Plan of Development and Welfare for Nigeria: 1945-1955" was launched by the colonial administration. However the plan was subsequently divided into two 5 year plan periods: 1945-1950 and 1951-1956. The plan envisaged capital expenditures of 112 million naira. 43 percent of the total financial requirements was to be provided by the British Government in the form of grants, 27 percent from the Nigerian Treasury; and 30 percent from external loans. The plan did not require any special machinery for co-ordination and lacked any explicit national

objectives. Following the division of the country into Eastern, Northern and Western Regions in 1954 the plan period was extended to 1960.

Between 1960 and 1984, Nigeria had four development plans. The First National Development Plan (1962-1968) was launched in 1962 with a total planned capital outlay of 2.3 billion naira which was to be shared by the public and private sectors in the amount of 1.5 billion naira and 0.7 billion naira respectively. About 50 percent of the total resources required to finance the plan was expected to be derived from external sources. However, the targets were not realised. In the first two years of the plan, the public sector program fell short of the 265 million naira target for 1962 and realised only 180 million naira in 1966. In the last two years of of the plan the country was involved in a civil war. The short fall in public investment, inadequate inflow of foreign capital and the deteriorating political situation coupled with the civil war led to the termination of the plan.

The Second National Development Plan (1970-1974) was aimed at reconstructing war-affected areas as well as the development of the rest of the economy. The plan also emphasised the need to lay adequate foundations for a self-reliant economy. Specifically the objectives of the plan were to establish Nigeria as 1) a united, strong and self-

reliant nation; 2) a great and dynamic economy; 3) a just and egalitarian society; 4) a land of bright and full opportunities for all citizens; 5) a free and democratic society. These coherent and embracing objectives were meant to infuse national purpose into economic planning for development. However these objectives were not amenable to quantitative analysis.

In terms of operational magnitudes, the plan aimed at a 6.6 percent average annual GDP growth rate; an increase in gross fixed capital formation by 20 percent during the plan period; a substantial reduction in the rate of inflation to 1.5 percent per annum or less; a reduction in the dependence of the Nigerian economy on foreign capital and increasing the participation of Nigerians in the ownership and control of industry in Nigeria. Highest orders of priority were accorded agriculture, industry, transportation and manpower development. Planned capital expenditure for the plan was 3.2 billion naira with the public sector absorbing 1.56 billion naira while the private sector would invest 1.64 billion naira representing a 49:51 ratio of public to private investment. The actual plan results show a 42:58 ratio. The financing of the plan ensured the maximum flow of internal resources as opposed to a high dependence on external finance. The plan was revised in 1973 due to inadequate assessment of planned projects, lags in program

implementation and the windfall gains from petroleum oil exports. For instance actual capital investment of 763 million naira and 931 million naira in 1971 and 1972 exceeded their respective plan estimates of 710 million naira and 798 million naira.

The Third National Development Plan (1975-1980) was relatively more detailed and better articulated. The Central Planning Office (CPO), a fully professional planning agency of the Federal Ministry of Economic Development established in 1972, was charged with the responsibility for the third development planning exercise. The plan was formulated at the peak of the oil boom and reflected the economic bouyancy and optimism of the time. The estimated capital program was 30 billion naira, later revised to 43 billion naira of which two-thirds was to be provided by the public sector. It was anticipated that about 80 percent of the total government revenue would be derived from oil exports. The operational magnitudes envisaged in the plan included a GDP growth rate of 9-10 percent. Given the assumed 2.5-3.0 percent population growth rate the per capita income of Nigeria was expected to double by 1990 and put the country among the class of developed countries by the end of the century.

A major shortcoming of the plan was its apparent excessive optimism in plan targets which failed to

incorporate realistic assumptions as a basis for its macroeconomic projections. It failed to incorporate the structural dependence and vulnerability of the Nigerian economy to developments in world oil markets. This fact was borne out by the major actual shortfalls in plan targets resulting largely from the world-wide recession and OPEC-ordered cutbacks of oil supply. The implication on the domestic economy was a high rate of inflation and high budgetary gaps.

The Fourth National Development Plan (1981-1985) was concerned with the aim of reducing the overdependence of the Nigerian economy on the oil sector. It was estimated that oil production would rise from about 2.2 million barrels per day in 1979/80 to 2.48 million barrels per day in 1981/82 from where it was projected to decline to about 2.37 millions barrels per day in 1984/85. GDP at 1973 constant factor cost was expected to grow at the rate of 8.3 percent per annum from 18740 million naira in 1979/80 to 27941 million in 1984/85 with the share of oil sector falling from 16 percent to 11 percent in 1984/85. Gross fixed capital formation during the plan period was estimated at 33.4 billion naira. Agricultural production was accorded first priority in the allocation of planned financial resources followed by the expansion of the economic infrastructure,

with manufacturing also occupying an important place in the nation's scale of priorities.

This plan was plagued from the start by the worsening conditions in the global oil market. The oil glut resulted in a sharp decline of foreign exchange earnings and the country's ability to finance its current import bills was greatly restricted. All development projects not yet begun in 1982 were deferred .

In view of the poor performance in initiating viable projects under the Fourth Plan, the Fifth Plan (1986-1990) does not contain any major new projects. The emphasis will be on pursuing a corrective strategy and any new projects will be of small-scale. The emphasis is on agricultural and rural schemes rather than on industrial projects. Priorities have been set for the completion of projects on the basis of their economic viability and proportionate completion costs. Existing projects were classified into: 1) those with high economic viability to be completed quickly; 2) those of doubtful economic viability to be restructured; 3) those shown to be non-viable to be scrapped.

2.8 Recent Economic Performance and Development Prospects

Although the economy demonstrated a phenomenal growth during the period from 1960 to 1983, the

developments in the last 3 years of the sample period (1981-1983) and thereafter suggest the deteriorating conditions of the economy. The economy had already been contracting sharply and in view of the further slump in oil prices since January 1986 Nigeria's economic outlook does not appear bright when compared to the oil boom era which started in 1973. With oil still accounting for 94 percent of foreign exchange earnings the government budgetary deficit which stood at 6.1 billion naira was expected to remain persistently high.

To deal with the deteriorating economic conditions, the federal government designed with the assistance of the World Bank a structural adjustment program (SAP) to run from June 1986 to July 1988. The SAP aimed at restructuring and diversifying the productive base of the economy to reduce dependence on oil and on imports; laying the basis for sustaining non-inflationary growth; making substantial progress toward fiscal and balance of payments viability; improving the efficiency of the public sector and increasing the contribution of the private sector to economic growth.

TABLE 2.1

SECTORAL DISTRIBUTION OF GDP AT CURRENT FACTOR COST

(Percentage Shares and Total)

	1960	1965	1970	1974	1980	1983
Percentage Shares						
Agriculture	62.9	54.4	48.8	26.5	20.6	28.6
Oil	0.2	3.4	9.3	31.3	29.1	17.2
Other Mining	1.0	1.2	1.0	1.4	1.8	1.3
Manufacturing	4.8	6.9	7.2	3.6	8.4	11.2
Building and Construction	4.8	5.7	5.8	7.2	7.6	6.1
Utilities	0.4	0.6	0.7	0.3	0.1	0.1
Transport and Communication	4.9	4.5	2.8	2.8	3.5	4.5
Distribution	14.4	15.7	15.2	21.9	24.3	25.1
Government	6.6	7.6	9.2	5.0	4.6	5.9
Total GDP	100.0	100.0	100.0	100.0	100.0	100.0
Total GDP (₦ million)	2250.	3110.	5205.	18298.	48538.	53347.

Source: Federal Office of Statistics (various years), National Accounts of Nigeria, Lagos.

Notes: Shares are based on nominal values; levels are in current naira.

TABLE 2.2

FEDERAL GOVERNMENT REVENUE

(Percentage Shares and Total)

	1961	1965	1970	1973	1978	1980	1983
Percentage Shares							
Direct taxes							
Oil	0.0	4.8	15.4	45.4	45.7	56.2	34.7
Non-Oil	4.1	0.7	7.4	4.9	7.3	3.9	5.4
Indirect Taxes							
Import Duties	53.9	57.3	34.0	18.2	19.2	9.2	10.3
Export Duties	12.1	10.8	6.5	0.7	0.0	0.0	0.0
Excise duties	5.7	11.2	17.8	11.6	3.5	2.7	7.8
Non-Tax Revenue							
Oil	3.9	6.7	10.9	14.6	16.6	2.5	32.4
Non-oil	20.3	8.5	8.0	4.6	7.6	3.0	9.5
Total Revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Oil	3.9	11.6	26.3	70.0	62.3	81.1	67.1
Non-oil	96.1	88.4	73.7	40.0	37.7	18.9	32.9
Total Revenue (₦ million)	248	297	633	1695	7470	15234	10812

Source: Central Bank of Nigeria (various years), Economic and Financial Reviews, Lagos.

Note: Shares are based on nominal values; levels are in current naira.

TABLE 2.3

FEDERAL GOVERNMENT EXPENDITURE

(Percentage Shares and Total)

	1961	1965	1970	1973	1978	1980	1983
Administration and Defence	29.5	34.3	72.7	55.2	27.4	26.6	30.3
Economic Services	31.1	30.2	8.1	28.3	37.4	49.2	38.0
Social Services	19.5	11.5	2.4	6.7	19.2	17.0	16.0
Public Debt Charges	6.0	14.4	15.6	8.7	8.6	6.9	9.6
Other Transfers	13.9	9.6	1.2	1.1	7.3	0.3	6.1
Total Expenditure	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Expenditure (₦ million)	172	257	831	1066	8437	12035	12086

Source: Central Bank of Nigeria (various years), Economic and Financial Reviews, Lagos.

Note: Shares are based on nominal values; levels are in current naira.

TABLE 2.4

NIGERIA'S EXTERNAL LONG-TERM DEBT
(US $ millions)

	1970	1975	1980	1981	1982	1983
Debt Outstanding and Disbursed	572.5	1143.5	5334.9	7615.0	9926.1	12936.2
Disbursements	80.5	133.1	1723.2	3090.2	3769.2	4978.2
Principal Repayments	67.1	224.4	240.8	635.7	826.6	1160.7
Net Flows	13.4	- 91.3	1482.4	2454.5	2942.7	3817.6
Interest Payments	27.6	45.4	531.2	671.0	872.2	1012.1
Net Transfers	-14.2	-136.7	951.2	1783.5	2070.5	2805.5
Total Debt Service	94.7	269.8	772.0	1306.7	1698.7	2172.7

Source: World Bank (1986), World Bank Debt Tables, Washington, D.C.

TABLE 2.5

MONEY AND CREDIT

(Percentage Shares and Total)

	1960	1965	1970	1978	1983
Liabilities of Banking System					
Currency	51.2	43.3	35.4	28.0	25.0
Demand Deposits	29.3	26.5	30.5	38.1	33.3
Time and Savings Deposits	19.5	30.2	34.1	33.9	41.7
Total	100.0	100.0	100.0	100.0	100.0
Assets of Banking system					
Foreign Assets (Net)	82.8	31.1	11.6	15.4	2.7
Claims on Government (Net)	-21.0	14.8	52.4	34.1	52.5
Claims on Private Sector	38.2	54.1	36.0	48.8	37.6
Claims on Other Financial Institutions	0.0	0.0	0.0	1.7	7.2
Total	100.0	100.0	100.0	100.0	100.0
Total Money Supply (₦ million)	296	469	979	7521	19034

Sources: 1) World Bank (1974), Nigeria: Options For Long-Term Development, Baltimore: John Hopkins University Press

2) International Monetary Fund (1986), International Financial Statistics

Notes: Shares are in nominal values; levels are in millions naira.

TABLE 2.6

COMPOSITION OF COMMODITY EXPORTS

(Percentage Shares and Total)

	1960	1965	1970	1975	1978	1980	1983
Percentage Shares							
Oil Export							
Crude-Petroleum	2.6	25.4	57.6	92.7	89.1	96.1	96.4
Agricultural Exports							
Cocoa	21.7	15.9	15.0	4.2	6.2	2.2	3.3
Groundnut	16.6	17.8	7.5	0.0	0.0	0.0	0.0
Palm Produce	23.6	15.0	2.7	0.6	0.2	0.1	0.2
Cotton	3.7	1.2	1.5	0.0	0.1	0.0	0.0
Rubber	8.4	4.1	2.0	0.3	0.2	0.1	0.1
Timber	4.1	2.3	0.7	0.1	0.0	0.0	0.0
Hides and Skins	2.5	1.7	0.6	0.1	0.1	0.0	0.0
Other Exports	16.8	16.6	12.4	1.9	4.1	1.5	0.0
Total Exports	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Exports (₦ million)	339	527	877	4915	6065	14077	7613

Source: Central Bank of Nigeria (various years), Annual Report and Statements of Accounts, Lagos.

Note: Shares are based on nominal values; levels are in current naira.

TABLE 2.7

ECONOMIC CLASSIFICATION OF COMMODITY IMPORTS

(Percentage Shares and Total)

	1960	1965	1970	1973	1978	1981	1983
Percentage Shares							
Consumer Goods							
Food	14.4	9.4	8.4	10.8	12.5	15.8	15.2
Others	42.5	31.6	21.1	25.9	16.5	25.8	26.7
Raw Materials	19.7	23.3	28.3	26.9	23.4	25.6	25.6
Capital Goods	23.4	35.7	42.2	36.4	47.6	32.8	32.5
Total Imports	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Imports (₦ million)	430.6	548.4	737.8	1727	8212	9096	9723

Source: Central Bank of Nigeria (various years), Annual Report and Statements of Accounts, Lagos.

Note: Shares are based on nominal values; levels are in current naira.

TABLE 2.8

BALANCE OF PAYMENTS
(₦ million)

	1960	1965	1968	1974	1978	1980	1983
Exports of Goods	330.0	530.0	418.4	6,105.7	6,632.8	12,800.9	7,612.3
Imports of Goods	-418.6	-535.0	-382.2	-1,666.4	-7,374.3	-8,716.4	-8,847.5
Trade Balance	-88.6	- 5.0	36.2	4,439.3	- 741.7	4,084.5	-1,235.6
Services (Net)	-46.6	-216.8	-236.4	-1,314.7	-1,474.6	-2,176.3	-2,013.0
Unrequited Transfers	- 3.4	5.4	34.4	- 62.1	-170.6	-315.2	-188.1
Current Account Balance	-138.6	-216.4	-165.8	3,062.5	-2,286.9	1,593.0	-3,436.8
Direct Investment (Net)	38.0	121.6	91.2	191.6	134.4	185.6	204.3
Other Long Term Capital	11.8	29.2	28.8	14.3	3.6	25.8	17.4
Other Short Term Capital	- 0.4	14.4	36.0	-136.7	96.3	43.9	1,964.0
Official Long Term Capital	16.2	35.8	- 3.0	- 75.1	884.8	519.3	916.3
Capital Account Balance	65.6	201.0	153.0	- 15.9	1,111.9	774.6	3,162.0
Balancing Item	9.4	4.5	33.2	45.6	-18.6	35.0	30.3
Overall Balance	-64.0	-6.2	20.4	3,092.2	-1,293.6	2,402.6	- 244.8

Sources: 1) World Bank (1974), Nigeria: Options For Long Term Development, Baltimore, John Hopkins University Press.

2) Central Bank of Nigeria (various years), Annual Report and Statements of Accounts, Lagos.

FOOTNOTES TO CHAPTER TWO

1. A detailed description of the Nigerian economy can be found in Olaloku, et. al. (1979), World Bank (1974), Kirk-Greene and Rimmer (1981) and Hackett, P. (1986).

2. Hackett (1986), p. 776.

3. Hackett (1986), p. 778.

4. Hackett (1986), p. 778.

5. For details on the structure of Nigerian Fiscal Federalism see Ashwe (1986).

6. Hackett (1986), p. 780.

7. Central Bank of Nigeria (1983), Annual Report and Statements of Accounts, p. 39.

CHAPTER THREE

THEORETICAL MODEL OF THE NIGERIAN ECONOMY

3.1 Introduction

In this chapter a disaggregated macroeconomic and input-output model of the Nigerian economy is developed. The perspective of the model is that of a long-term growth framework which allows for an integration of an input-output model with an econometric model based on national accounts, budgeting, monetary, and balance of payments accounts statistics. Alternative equations have been specified based on economic theory, data availability, institutional and structural features of Nigerian economy and the objectives of the present study. The model is intended for policy analysis and simulations as well as forecasting the growth prospects for the Nigerian economy.

3.2 The Model in Detail

The behavioural equations and identities of the model are presented in general functional notations in Table 3.1 at the end of the chapter. The alphabetical listing of

variables appearing in the model is also presented immediately following the equations. The model is divided into seven blocks.

3.2.1 Domestic Expenditure

Aggregate demand has become one of the centerpieces of macroeconomic analysis. While supply constraints are important, problems arising from inadequate demand should not be assumed away when modeling a developing country. This block investigates domestic demand or expenditures. Other components relating to final demand - government finance, monetary sector and the foreign sector - are examined in subsequent blocks.

Consumption expenditures are divided into private and public components. Private consumption expenditures comprise the major component of final demand. The private consumption function has come under intensive theoretical and empirical investigation since Keynes (1936) made aggregate demand a central part of macroeconomic analysis. Several hypotheses about private consumption behaviour have been suggested in the literature. In the simple Keynesian Absolute Income hypothesis consumption is a stable function of income and the average propensity to consume is greater than the marginal propensity to consume. Furthermore the short-run marginal propensity is less than the long-run

marginal propensity to consume. The implication of this hypotheses for the formulation of development strategies is that a rising income level would generate increased savings and consequently increased gross capital formation and thus contribute to a higher growth rate. The desire to distinguish between the short-run and long-run marginal propensities to consume and the unsatisfactory empirical estimates for United States data obtained by Kuznets (1942) and Davis (1952) have led to the development of alternative theories of consumption. The first of these is the Relative Income Hypotheses proposed by Duesenberry (1949). This hypothesis postulates a ratchet effect. People base their consumption on previous peak income, implying that a fall in income does not reduce consumption whereas a rise might increase consumption in a relatively short period of time. Brown (1952) developed further Duesenburry's original formulation by recognizing that habit persistence gives rise to lags in consumption function. He suggests the inclusion of lagged consumption as an argument in the consumption function to account for the inertia in consumer behaviour as people change their behaviour only slowly and hence that the previous period's consumption affects current consumption. The Life-Cycle Hypothesis proposed by Modiglani-Ando and Brumberg (1954, 1960, 1963) takes into consideration life-span income in the determination of lifetime consumption.

Consumption expenditures depend on lifetime average income, making consumption relatively insensitive to short-term increases in income. However, the long-run effects may be different, depending upon whether people perceive redistribution to be a continuing process through higher taxes and other government policies. The Permanent Income Hypothesis states that permanent consumption is proportional to permanent income. Current consumption is therefore not a function of current disposable income alone but also of income in previous periods. One implication of the Permanent Income Hypothesis would be that redistributions of income would lead to increased savings only if it were perceived to be transitory. It also implies the constancy of the consumption-income ratio in the long-run. For development purposes then, if the long-run ratio is close to unity policies would have to be designed to reduce it so that there would be adequate domestic resources to finance increases in the productive capacity of the economy.

The alternative hypotheses outlined above were formulated on the basis of the experience of developed countries. These hypotheses have been modified giving attention to institutional and structural features affecting private consumption behaviour in a developing economy. In formulating a model of private consumption behaviour for Nigeria in this study, it was expected that income would

have a dominant influence. Some of the modifications include the introduction of real credit available to the private sector or real money supply, and the relative price of consumption as indicated in equation (1). A real monetary variable is included in the equation to take account of the impact of liquidity or a possible wealth effect on private consumption behaviour.

A disaggregation of private consumption expenditure into its various components is important in the empirical analysis and useful also for better forecasting performance and policy evaluation. Ideally, a disaggregation of real private consumption behaviour by income group would also be preferred, but data for private consumption in Nigeria are available only at the aggregative level.

The size of the government sector in the Nigerian economy has increased tremendously since the late 1960s. The influence of the government sector on the rest of the economy results from spending oil-derived revenues on expenditure for current consumption and for capital creation in a wide variety of government policy measures. In the present study general government consumption expenditure is hypothesized to be related to total government revenue in equation (2).

Government investment expenditure is considered exogenous in our model. Government investment expenditure

is an instrument of economic policy. Planned government gross investment expenditure during any year depends upon the availability of internal and external resources, including foreign debt and credit from the Central Bank of Nigeria. By allocating its investment expenditures among the various sectors of the economy to the priorities worked out in the various development plans, the government tries to achieve the objectives of the plan. Within the complete system model and simulation experiments government investment expenditure is considered an exogenous policy instrument.

Private investment expenditure is specified in equation (3). The accumulation of real fixed capital stock and capital formation by the private sector have sometimes been afforded extensive detail in formal models based on the experience of developed countries. The major strands of investment behaviour could be classified as the Accelerator Theory, Liquidity Theory, Expected Profits Theory and Neoclassical Theory.[1] The basic assumption of the accelerator model is that desired capital stock at any time is a constant multiple of expected output at that time. The flexible accelerator version has remained a popular empirical representation of private investment behaviour. The basic premise underlying the Liquidity Theory of investment behaviour is a theory of the cost of capital

which specifies that the supply of funds schedule is horizontal up to the point at which internal funds are exhausted and vertical at that point. The sources of funds for a firm include depreciation allowances, net profits, fixed interest borrowing, preference shares and equity shares. The expected profits theory has desired capital stock depend on a measure of the stock market evaluation of the company. The neoclassical investment models include relative price of capital into the investment function. By applying the tool of comparative dynamics to the neoclassical theory of the firm, Jorgenson (1967) derived a theory of investment which is based on an optimal time path for capital accumulation.

The various investment behaviour hypotheses are based on developed countries where data on capital stock, profits, rental cost of capital are more readily available. In most developing countries data on such relevant variables are not readily available. In considering the various determinants of real private investment expenditures in this model attention is paid not only to the theoretical formulations but also to data availability and relevance for policy analysis and forecasting. In specifying private real investment expenditure, gross domestic product, lagged capital stock, government investment credit to the private sector, and real interest rate have been considered. Gross

domestic product is proxy for output and is expected to have a positive effect on investment. Lagged capital stock may be positive or negative. Increased government oil-derived revenues have led to large government expenditure on infrastructural projects in building and construction and in transportation and communications which would be expected to have a positive stimulating effect on real private investment. On the other hand government investment may actually crowd out private investment. The impact of government investment on private investment may therefore require empirical interpretation. The relationship between the level or changes in bank credit and real private investment theoretically indicate that investors may face constraint of readily available funds. In the absence of well developed capital markets, bank loans for financing business operations should enable private investors to finance a larger amount of capital formation. On the other hand bank credit to the private sector may be diverted to private consumption. Real or nominal interest rate would be expected to have a negative effect on real private investment expenditures. Interest rate is also a monetary policy variable. Equations (4) and (5) are identities for total consumption and total investment respectively.

3.2.2 Public Finance and Money Supply

Government revenue provides an essential link through which the impact of government spending of crude-oil derived revenue is ultimately transmitted throughout the economy. Government total revenue is decomposed into direct and indirect tax components. Total oil revenue depends on current total crude oil exports in equation (6). Direct tax revenue is related to total oil revenue in equation (7). Equation (8) relates other direct tax revenue to national income while import duties are determined in equation (9) by total imports of goods. Other federal government revenue depends on nominal gross domestic product in equation (10). State government revenues would also be expected to relate positively to the general level of activity in the economy, and in this study gross domestic product is used to explain these components of total government revenue as noted in equation (11).

Due to the increasing external debt and debt service payments of the country, interest payments, amortization of external debt and total outstanding debt of Nigeria have been endogenized in the model. Interest payments are hypothesized to depend on foreign interest rate and total outstanding external debt in equation (12). Amortization of external debt is related to the total outstanding external debt lagged by one year in equation (13).

In most developing economies, the asset markets are quite fragmented and dualism prevails since organised and unorganised financial markets co-exist. Markets for government bonds and for private securities are quite small and trade in foreign assets is often illegal. Quantitative restrictions on internal credit are the major instruments of monetary policy. The very small size of the bond market would preclude substantial open-market operations. The nominal money supply would, under such circumstances, not be exogenous but would depend on obligations to finance the government deficit, regulated bank credit to the private sector and foreign exchange reserves movements.

In our complete model the money supply is related in equation (14) to changes in domestic credit to the government as determined by government domestic fiscal operations, changes in credit to the private sector and the foreign exchange reserves movements.

Equations (15) to (25) are identities for the public finance and money supply sector of the model. Total government expenditure is defined in equation (15) while revenue from excise duties is defined in equation (16). Total direct tax revenue is stated in equation (17). Equation (18) is the sum of non-petroleum revenue while equation (19) gives total government revenue. Outstanding external debt in U.S. dollars is stated in equation (20)

which is converted to its naira equivalent in equation (21). Debt service payments in U.S. dollars and naira are indicated in equations (22) and (23) respectively. Debt service ratio is defined in equation (24). Equation (25) states the banking credit to the government.

3.2.3 Foreign Trade and Balance of Payments Sector

Nigeria is a small open economy with external transactions constituting a significant proportion of its aggregate economic activity. Since the early 1970s, due mainly to the tremendous growth of crude oil exports, there has been a considerable increase in the volume and value of external trade. In an economy with a high foreign dependency ratio the attainment of a healthy and sustainable balance of payments position as a macroeconomic policy objective becomes inevitable. In this model, visible exports and imports as well as services payments behavioural relationships are considered.

Nigerian exports are divided into oil, cocoa and other primary non-oil exports. Economic theory would suggest three major determinants of exports. These are relative prices of exports, the level of foreign income, and domestic supply capacity and production. A host of non-price factors such as the equality, design and reliability of goods would

be expected also to affect exports. Other factors are export promotion policies and internal transportation.

Cocoa is singled out in equation (26) as it is the only important non-oil primary export even though its production is declining. Cocoa exports are considered from the supply point of view. It is hypothesized that the supply of cocoa from Nigeria is influenced positively by the ratio of the export price of cocoa to the domestic producer price of cocoa and by domestic production. Exports of other non-oil primary products which include groundnuts, palm kernel, and cotton depends on the total domestic production in equation (27). Service exports are negligible. Exports in national accounts depends on total exports in balance of payments account in equation (28).

Imports are disaggregated by economic use into consumer goods, raw materials and intermediate goods, and capital goods. Two major determinants of demand for imports are usually identified in economic theory. These are national income and the price of imports relative to domestic price. In addition, Klein (1975) has suggested that in the case of less developed countries the capacity of the country to import, as proxied by the availability of foreign exchange be introduced as a constraint in the import function.

Over the period from 1960 to 1983 Nigeria pursued commercial policies to restrict imports via a system of exchange controls, import licensing and import duties. Policies relating to the rationing of foreign exchange are not easily quantified. However, it is expected that the use of such policies will be correlated with the level of foreign exchange reserves, and the latter is thus included in the import equations. The licensing policy has been responsive to the need for imports in the various sectors of the economy, especially imports of raw materials and capital equipment. Generally the restrictions on imports have tended to discriminate selectively against consumer goods relative to raw materials, intermediate and capital goods. The point of emphasis has tended to shift over time, depending upon the investment priorities and the availability of foreign exchange.

Total consumption is used as proxy for real income in the case of consumer goods imports to reflect domestic absorption in equation (29). The ratio of import prices to domestic prices reflects a trade-off between local and imported goods. Total value added in the raw materials import, equation (30), reflects the possible production needs of raw materials imports. Imports of capital goods are related to total investment which reflect investment needs for imports of machinery and equipment in equation

(31). Services imports depend on economic activity level, relative prices and reserves in equation (32). Imports in national accounts depends on total imports in the balance of payments as noted in equation (33).

Equations (34) to (45) are identities for the foreign trade and balance of payments sector. The export of oil in nominal and real terms are defined by identities in equations (34) and (35) respectively. The price and quantity of oil are treated as exogenous in this model. Given the price of oil in dollars, the quantity of oil exported and the exchange rate, total export revenue is determined. In our complete model simulation, the price of oil is varied to measure the impact of developments in the world oil markets on the growth prospects of the Nigerian economy. Equation (36) is the identity for total exports of primary goods and total exports of goods is defined in equation (37) followed by the definition of total exports of goods and services in equation (38). Total imports of goods is defined in equation (39) and equation (40) is the definition of total imports of services. The identity for total imports of goods and services is given in equation (41). Equation (42) states the balance on current account followed by the balance on capital account in equation (43). The sum of balance on current account, balance on capital account and negligible errors is stated as balance of

payments in equation (44). Foreign reserves are determined by the addition of net balance of payments to the outstanding reserves of the previous year in equation (45).

The balance of payments sector is linked with the rest of the economy through a number of relations. First, exports and imports constitute a vital component of the aggregate expenditure or final demand which are linked to the sectoral value added via an input-output relationship. The external sector is also linked to public finance and money supply sector as government revenue depends substantially on oil export earnings and, in turn, affects government spending.

3.2.4 Input-Output (Production) Sector

The various theoretical behavioural relationships described above could be viewed as the final demand components of the model. In this section value added by sector in equations (46) to (50) and their residuals in equations (51) to (54) are considered. Value added in each sector is generated by transformation of an input-output type production process linking final demand with value added by sectors.

The input-output systems takes the form

(3.1) $(I - A) X = F$

where F is the vector of final demand by sector, I is an identity matrix, A is the matrix of technical coefficients, and X is the vector of gross output by sector. The integration of the input-output model based on equation (3.1) with the final demand model based on national income accounting poses three problems immediately.[2] First, the input-output accounting involves gross output concepts while the national account data published for most developing countries deals with value added concepts. Gross output can be transformed into value added by subtracting total intermediate transactions delivered by all sectors to the i^{th} sector.

$$(3.2) \quad V_i = [\, 1 - \sum_{j=1}^{n} a_{ji}] \quad X_i$$

V_i is the value added in sector i. In matrix notation, equation (3.3) becomes

$$(3.3) \quad V = B\,X$$

Where V is a n x 1 vector and B is a n x n diagonal matrix with $b_{ii} = 1 - \sum_{j=1}^{n} a_{ji}$

The second problem in the transformation is the lack of time series data on final demand deliveries by each sector unless input-output tables exist for all years. Such tables do not exist for Nigeria. However time series of final demand by expenditure categories -- consumption, investments, exports and imports -- that do exist can be

converted into final demand deliveries by sector if we assume input-output proportionality and constancy. In matrix form this implies

(3.4) $F = HE$

where H is the n x m matrix of the sectoral distribution of final demand, and E is the 4 x 1 vector of expenditure components. We can express value added as a function of final demand or expenditure components by substituting equations (3.4) and (3.3) into (3.1) to obtain

(3.5) $V = B\ (I - A)^{-1}\ HE$

Defining D as:

(3.6) $D = B(I-A)^{-1}\ H$

Equation (3.5) can be written as

(3.7) $V = DE$

System (3.7) is a set of linear equations translating final demand components to value added by sectors which takes into account the sectoral interdependence of the economy. They can be interpreted as dynamic empirical approximations whose coefficients can be determined by regression analysis.[3] Alternatively these coefficients can be obtained from an existing input-output table. In the present study we have made use of the latter approach by obtaining the coefficients from the 1973 input-output table for Nigeria. All the elements of the E vector -- consumption, investments, exports and imports -- are in

constant 1973 prices to bring them in line with the input-output table.

The links between gross output, final demand and value added by sectors have been established on the assumptions that the input-output technological coefficient matrix A and the sector distribution of final demand H are constant. The question of fixity of input-output coefficients has attracted attention in the literature. In the short-run the assumption of constancy of technology and tastes may be valid. We have used fixed weights while actual weights will vary as technology, tastes and relative prices change in the long run. There exist several alternative techniques by which errors in projections based on input-output models could be handled. Carter (1970) suggested that the input-output coefficients be made explicit functions of time so that forecasts can be made on the basis of how the input-structure and the product-mix of particular sectors have changed or are likely to change in the future. Another suggestion by Klein (1953) is that the matrix A be interpreted as resulting from a Cobb-Douglas production function with the implications that while they stay constant in value terms, they need not stay constant in volume terms. Sectoral capital stock and labour can then be used to explain value added by sectors. Rijckengheim (1969) suggests that, instead of directly forecasting the input-

output ratios, we should state the model in incremental form so that changes in these coefficients are related to marginal changes in output levels. Another method suggested by Stone (1961) and developed by Bacharach (1965), popularly known as the RAS method, attempts through iterative procedures, to find an adjusted matrix of input-output coefficients which is consistent with the given sectors of final demand and value added at each point in time. Thus, adjusted matrixes of coefficients are derived for the time periods for which data on value added and final demand are available, and then the nature of changes in the input-output coefficients over time can be studied. The RAS method requires total intermediate input and output of each commodity for the year for which a new matrix of coefficients is to be estimated. The RAS method for updating input-output matrixes has not been used in the present study, because of a lack of such information in Nigeria's case, and the enormous cost and time involved.

A more feasible approach, proposed by Arrow and Hoffenberg (1959), is to model the differences between the actual value added by sector and the computed values, based on equation (3.5) above. We have constructed a series of residual vectors by comparing the computed (V_t^*) vector based on equations (3.5) and coefficients obtained from the 1973 input-output table with the actual sectoral value added

series (V_t) obtained from the national income data for the sample period. This can be formalized by incorporating time subscripts,

(3.8) $R_t = V_t - V_t^* = V_t - B(I-A)^{-1} HE_t$

Factors that influence changes in $B (I-A)^{-1} H$ are the same as those that affect the observed residuals R_t. These factors would include scarcity of particular resources, social factors, relative prices, tastes, technology and capital stock. By introducing capital stock and a trend variable into the sectoral residual equations we explicitly endogenised supply constraints, changes in technology, and tastes which operate to stimulate changes in the technical coefficients of the input-output matrix and the weights relating sectoral value added to final demand. Capital formation and the growth of capital stock thus have direct roles in influencing the growth prospects of the Nigerian economy in this model.

To complete the linkage of value added by sectors with final demand, we can define sectoral value added in our model as

(3.9) $V_t = B (I-A)^{-1} HE_t + R_t$

or using (3.7)

(3.10) $V_t = DE_t + R_t$

3.2.5 National Income

Gross domestic product at factor cost is defined as the sum of value added by sector in equation (55). Non-oil-value added is the GDPR less value added from the oil sector in equation (56). Output is converted into nominal values by multiplying total gross domestic product by the implicit GDP price deflator in equation (57). Gross national product is the sum of GDP and net factor payments from abroad in equation (58). National income in real and nominal terms are defined by identities in equations (59) and (60) respectively. Real disposable income is defined in equation (61).

3.2.6 Factors of Production

The net private capital stock in the current year is defined as the sum of private net capital stock one period earlier plus private investment less depreciation in equation (62). The net government capital stock is defined as the sum of government capital stock one period earlier plus government investment less depreciation in equation (63). Total capital stock is defined in equation (64). It would have been desirable to use investment and deprecation estimates by sector but the data are not available. Depreciation charges are defined in equations (65) to (67).

One would expect that the depreciation rates would be different for the public and private sectors as public investment is usually in infrastructure and social overhead, whereas most of the private investment would be in capital equipment and other assets related directly to production. The railway system is owned by the government and so is the country's major airline and communications system. Infrastructure such as roads, bridges, railway lines, airport and docks require maintenance. However, in the case of Nigeria, government investment is not limited to the infrastructure. The government has invested heavily in the agricultural sector, the mining sector, and the major industrial complexes such as the steel industry and the Petrochemical industry.

Investment plays a dual role in the model as it has an expenditure impact in the current period and in the long-run it leads to the accumulation of capital stock which influences the residuals.

Most multi-sectoral models of developing economies project labour requirements on the basis of labour-output ratios. The relevant equation is

(3.11) $G = L\ (I - A)^{-1}\ E_{-1}$

Where G is an nx1 vector of labour requirements by sectors; L is an nxm diagonal matrix of labour-gross output ratios by sectors, $(I - A)^{-1}$ is an nxn matrix of direct and

indirect coefficients. E is an nx1 vector of final demand by sector. However lack of information on labour coefficients and labour force by sectors in Nigeria prevents the use of this approach to project the sectoral labour force. We can, however, project aggregate labour requirements rather than sectoral labour requirements. A study focusing on sectoral requirements would no doubt be a useful extension.

Given the aggregate level of output, the sectoral value added necessary to support the vector of final demand, wage and price the aggregate employment level is determined. Total employment is assumed to be positively related aggregate economic activity and negatively related to real wages in equation (68).

3.2.7 Wages and Prices

Whereas the standard short-run demand model relates wages to the gap between labour supply and demand, the long-run model should be designed to incorporate the long-run tendency of wages to rise in response to productivity and price trends. In this model average wage rate for the economy is determined by inflationary trends and average productivity in equation (69). By responding to price changes, wage adjustments follow cost of living changes.

Labour benefits with other factors of production in reaping the benefits of productivity gains.

Price determination in the literature is generally based on the micro-economic principles of supply-demand interactions. The factors operating on the supply side would include sectoral value added or real gross domestic product, increases in production costs and indirect taxes, and the volume and prices of imports and exports. The factors operating on the demand side would include monetary expansion, rising private and public expenditures, wage increases. Transient factors such as bad harvests, production stoppages and social unrest could also cause temporary fluctuations in prices.

Ideally, four major sets of price indexes should be incorporated in a macroeconomic-input-output model. The first price index will be the implicit gross domestic product deflator, representing the general price level in the economy. In the present model this aggregate price level is determined by unit value index of imports, average wage rate, and productivity in equation (70). Price determination can therefore be interpreted as a mark-up-over cost approach. For purposes of estimation we include the wage rate and productivity components of unit labour cost separately.

The second set of price indexes consist of the implicit deflators for output at the sectoral level. These should also be modeled as behavioural equations on the assumptions that firms maximize the expected value of discounted profits based on the production process described well defined production functions and demand curves. Firms will then set their price as a markup over factor input prices. The sectoral prices can then be related to final demand prices. A major obstacle in explaining prices at the sectoral level is the fact that data on wage rates and productivity by sectors are simply not available, and these would be key variables in determining sectoral prices.

The third set of prices are the implicit deflators for the final demand categories. The determination of each of these should be based on what are essentially technical relationships regarding production. Implicit deflators for final demand should be based on the fact that the value of final demand is the sum of value added in the production process. This is the transpose of equation (3.5) where final demand quantities determine output quantities. Based on this relationship the implicit deflator for any category of final demand should be a weighted average of the implicit deflators for value added for the sectors that have contributed to producing the product, with weights determined by the proportion of real output that each

industry contribute. Two problems are associated with adopting the approach. We do not know the value of the weights at each point in time, and since the appropriate deflator for sectoral value added may vary among final expenditure categories, we cannot adopt this approach. More importantly, as alluded to above, we have not been able to explain the sectoral price level. In this model we therefore relate the implicit price deflator for consumption to the implicit price deflator for real gross domestic product in equation (71). The implicit deflator for imports depends on the exchange rate and unit price index of imports in U.S. dollars in equation (72).

TABLE 3.1

Theoretical Model of Nigeria

I Domestic Expenditure

Private consumption expenditure

1) $CPR = CPR\ (NYDR,\ PDC/P,\ HLPC_{-1}/P_{-1})$

Government consumption expenditure

2) $CGR = CGR\ (GTRC/P)$

Private investment expenditure

3) $IPR = IPR\ (GDPR_{-1},\ HDI_{-1})$

Total consumption expenditure

4) $CR = CPR + CGR$

Total investment expenditure

5) $IR = IPR + IGR$

II Public Finance and Money Supply

Total oil revenue

6) $GPORC = GPORC\ (EOC)$

Petroleum profit tax

7) $GDOC = GDOC\ (GPORC)$

Other direct tax revenue

8) GDNC = GDNC (NYC)

Import duties

9) GMTC = GMTC (MTGC)

Other federal government revenue

10) GURC = GURC (GDPC)

State government own revenue

11) GSRT = GSRTC (GDPC)

Interest payments on external debt

12) MIGS = MIGS (FLIBOR * FODS)

Principal payments on external debt

13) FADS = FADS ($FODS_{-1}$)

Money Supply

14) HMSC = HMSC (HLGC - $HLGC_{-1}$, HLPC - $HLPC_{-1}$, BOP)

Total government expenditure

15) GEXPC = P(CGR + IGR) + GTRPR + FDSC

Excise duties

16) GXTC = TGXTC * CPR * PDC

Total direct tax revenue

17) GDTC = GDOC + GDNC

Total government non-petroleum revenue

18) GNORC = GDNC + GMTC + GXTC + GETC + GURC + GSRTC

Total government revenue

19) GTRC = GNORC + GPORC

Outstanding external debt in U.S. dollars

20) $FODS = FODS_{-1} + FIDS - FADS$

Outstanding external debt in naira

21) FODC = FODS * FEXR

Debt service payments in U.S. dollars

22) FDSS = MIGS + FADS

Debt service payments in Naira

23) FDSC = FDSS * FEXR

Debt service ratio

24) FDSR = FDSC / ETGSR * PDE

Banking credit to government

25) HLGC = GEXPC - GNORC - GSDIS

III Foreign Trade and Balance of Payments Sector

Exports of cocoa

26) ECR = ECR (PLNCI * FEXR/PLCOI, QCO)

Exports of other primary products

27) EAOR = EAOR (QGT_{-1})

Exports in national acounts

28) ENAR = ENAR (ETGSR)

Imports of consumer goods

29) MCR = MCR (CR, PDM/P, FRC_{-1}/PDM_{-2})

Imports of raw materials

30) MRR = MRR (GDPR, MRR_{-1}, FRC_{-1}/PDM_{-2}, PDM/P)

Imports of capital goods

31) MKR = MKR (IR, PDM/P)

Imports of services

32) MSOPR = MSOPR (GDPR, FRC/PDM_{-1}, PDM/P)

Imports in national accounts

33) MNAR = MNAR (MTGSR)

Current exports of oil

34) EOC = PWOS * FEXR * EOQ

Real exports of oil

35) EOR = EOC /PDE

Total exports of primary goods

36) ENOR = ECR + EAOR

Total exports of goods

37) ETGR = EOR + ENOR

Total exports of goods and services

38) ETGSR = ETGR + ESFR

Total imports of goods

39) MTGR = MCR + MRR + MKR

Total imports of services

40) MSFR = MSOPR + (MIGS * FEXR) /PDM

Total imports of goods and services

41) MTGSR = MTGR + MSFR

Balance on current account

42) BCUC = ETGSR * PDE + BURTC - MTGSR * PDM

Balance on capital account

43) BCAC = FNFVC + FNLOSC + (FIDS - FADS) * FEXR

Balance of payments

44) BOP = BCAC + BCUC + BOPE

Foreign reserves

45) FRC = FRC_{-1} + BOP

IV Input-Output Sector

Value added by sectors

$$\begin{bmatrix} VNR \\ VAR \\ VMBR \\ VUTR \\ VDSR \end{bmatrix} = \begin{bmatrix} D_{i,1} & & & D_{1,4} \\ & \diagdown & \diagup & \\ & \diagup & \diagdown & \\ D_{5,1} & & & D_{5,4} \end{bmatrix} \begin{bmatrix} CR \\ IR \\ ENAR \\ MNAR \end{bmatrix} + \begin{bmatrix} RNR \\ RAR \\ RMBR \\ RUTR \\ DSR \end{bmatrix}$$

Residual in agriculture

51) $RAR = RAR\ (KR_{-1},\ RAR_{-1},\ TIME)$

Residual in industry

52) $RMBR = RMBR\ (KR_{-1},\ RMBR_{-1},\ TIME)$

Residual in utilities

53) $RUTR = RUTR\ (RUTR_{-1},\ KR_{-1},\ TIME)$

Residual in distribution

54) $RDSR = RDSR\ (KPR_{-1},\ RDSR_{-1})$

V National Income

Real gross domestic product

55) $GDPR = VAR + VMBR + VUTR + VDSR + VNR$

Non-oil value added

56) GDPOR = GDPR - VNR

Nominal gross domestic product

57) GDPC = P * GDPR

Real gross national product

58) GNPR = GDPR + NFPAR

Real national income

59) NYR = GNPR - DEPR

Nominal national income

60) NYC = NYR * P

Real national disposable income

61) NYDR = NYR + GTRPR - GDTC/P

VI Factors of Production

Private capital stock

62) $KPR = (1-D)\ KPR_{-1} + IPR_{-1}$

Public capital stock

63) $KGR = (1-D)\ KGR_{-1} + IGR_{-1}$

Total capital stock

64) KR = KPR + KGR

Private depreciation

65) DPR = D * KPR

Public depreciation

66) DGR = D * KGR

Total depreciation

67) DEPR = DGR + DPR

Total employment

68) LEMP = LEMP (GDPR, LWIR/P, DWAR)

VII Wages and Prices

Wage rate index

69) LWIR = LWIR (P, GDPR/LEMP)

Implicit GDP price deflator

70) P = P ($LWIR_{-1}$, PUMS, FEXR, $GDPR_{-1}/LEMP_{-1}$)

Price deflator for consumption

71) PDC = PDC (PCPI)

Price deflator for import

72) PDM = PDM (PUMS, FEXR)

DEFINITIONS

Alphabetical list of variables (₦ denotes measurement in Nigerian naira, * denotes exogenous variables).

BOPE* Errors and omissions in balance of payments

BOP Balance of payments, millions of ₦

BCAC Balance on capital account, millions of ₦

BCUC Balance on current account, millions of ₦

BURTC* Balance of unrequited transfers, millions ₦

CGR Government consumption expenditure in 1973 prices, millions of ₦

CPR Private consumption expenditure in 1973 prices, millions of ₦

CR Total consumption in 1973 prices, millions of ₦

D Depreciation rate

DEPR Total depreciation charges

DGR Depreciation charges on public investment

DPR Depreciation charges on private investment

DWAR* Dummy variable taking the value 1 for 1967 - 1970, 0 otherwise

EAOR Exports of primary products other than cocoa, 1973 prices, millions of ₦

ECR Exports of cocoa in 1973 prices, millions of ₦

ENAR Exports in national income accounts, 1973 prices, millions of ₦

ENOR Exports of total non-cil merchandise 1973 prices, millions of ₦

EOC Exports of oil in current prices, millions of ₦

EOQ* Exports of oil in thousands of barrels

EOR Exports of oil in 1973 prices, millions of ₦

ESFR* Exports of services in 1973 prices, millions of ₦

ETGR Total exports of goods in 1973 prices, millions of ₦

ETGSR Total exports of goods and services in balance of payments accounts, 1973 prices, millions of ₦

FADS Principal payments (amortization) on public external debt in current prices, millions of US $

FDSC Public external debt service payments in current prices, millions of ₦

FDSS Public external debt service payments in current prices, millions of US $

FDSR Public external debt service ratio

FEXR* Exchange rate, Nigeria naira per US $

FIDS* Public external debt inflow in current prices, millions of US $

FLIBOR*Eurodollar (LIBOR) rate

FNFVC* Net inflow of direct foreign investment in current prices, millions of ₦

FNLOSC Net inflow of other short-term capital in current prices, millions of ₦

FODC Public external debt outstanding in current prices, millions of ₦

FODS Public external debt outstanding in current prices, millions of US $

FRC Foreign reserves in current prices, millions of ₦

GDNC Other direct tax revenue in current prices, millions of ₦

GDOC Direct petroleum profit tax in current prices, millions of ₦

GDPC Gross domestic product in current prices, millions of ₦

GDPOR Gross domestic product in non-oil in 1973 prices, millions of ₦

GDPR Gross domestic product in 1973 prices, millions of ₦

GDTC Total direct tax revenue in current prices, millions of ₦

GETC* Government export duty on non-oil export in current prices, millions of ₦

GEXPC Total government expenditure in current prices, millions of ₦

GMTC Import duties in current prices, millions of ₦

GNORC Total non-petroleum government revenue in current prices, millions of ₦

GNPR Gross national product in 1973 prices, millions of ₦

GPORC Total government oil revenue in current prices, millions of ₦

GSDIS* Treasury cash balance in current prices, millions of ₦

GSRTC State government own-revenue in current prices, millions of ₦

GTRC Total government revenue in current prices, millions of ₦

GTRPR* Government transfers in 1973 prices, millions of ₦

GURC Other government revenue in current prices, millions of ₦

GXTC Government excise duty in current prices, millions of ₦

HDI* Average discount interest rate

HLGC Banking credit to the government in current prices, millions of ₦

HLPC* Banking credit to the private sector in current prices, millions of ₦

HMSC Money supply in current prices, millions of ₦

IGR* Government investment expenditures in 1973 prices, millions of ₦

IPR Private investment expenditures in 1973 prices, millions of ₦

IR Total investment expenditures in 1973 prices, millions of ₦

KGR Government capital stock in 1973 prices, millions of ₦

KPR Private capital stock in 1973 prices, millions of ₦

KR Total capital stock in 1973 prices, millions of ₦

LEMP Employment in millions of persons

LWIR Index of average wage rate (1973 = 1.00)

MCR Imports of consumer goods in 1973 prices, millions of ₦

MIGS Interest payments on public external debt in current prices, millions of US $

MKR Imports of capital goods in 1973 prices, millions of ₦

MNAR Imports of national accounts in 1973 prices, millions of ₦

MRR Imports of raw materials and intermediate goods in 1973 prices, millions of ₦

MSFR Total services payments abroad in 1973 prices, millions of ₦

MSOPR Imports of services in 1973 prices, millions of ₦

MTGR Total imports of goods in 1973 prices, millions of ₦

MTGSR Total imports of goods and services in 1973 prices, millions of ₦

NFPAR* Net factor payments abroad in 1973 prices, millions of ₦

NYC National income in current prices, millions of ₦

NYDR National disposable income in 1973 prices, millions of ₦

NYR National income in 1973 prices, millions of ₦

P Implicit GDP deflator (1973 = 1.00)

PCPI Consumer price index (1973 = 1.00)

PDC Price deflator for consumption (1973 = 1.00)

PDE Price deflator for exports (1973 = 1.00)

PDM Price deflator for imports (1973 = 1.00)

PLNCI* World price of cocoa in US $

PLCOI* Producer price of cocoa in ₦

PUMS* Unit price index of imports in US $ (1973 = 1.00)

PWOS* World price of oil in US $

QCO* Cocoa production, thousands of metric tons

QGT* Other agricultural products, rubber, palm kernel, groundnuts, cotton, thousands of metric tons

RAR Residual, difference between actual and estimated value added in agriculture in 1973 prices

RDSR Residual, difference between actual and estimated value added in commerce and services in 1973 prices

RMBR Residual, difference between actual and estimated value added in industry in 1973 prices

RNR Residual, difference between actual and estimated value added in mining in 1973 prices

RUTR Residual, difference between actual and estimated value added in utilities and transport in 1973 prices

TGXTC* Average rate of excise duty

TIME* Time trend, 1960 = 1

VAR Actual value added in agriculture in 1973 prices, millions of ₦

VDSR Actual value added in commerce and services in 1973 prices, millions of ₦

VMBR Actual value added in industry in 1973 prices, millions of ₦

VNR Actual value added in mining in 1973 prices, millions of ₦

VUTR Actual value added in utilities and transport in 1973 prices, millions of ₦

FOOTNOTES TO CHAPTER THREE

1. For good surveys of investment theories see Jorgenson (1974) and Clark (1979).

2. Klein (1965) provides a good discussion of the problems involved in linking input-output data with national income data.

3. This is the approach adopted by Marzouk (1975).

CHAPTER FOUR

ECONOMETRIC ESTIMATION OF THE MODEL

4.1 Introduction

This chapter presents the estimates of the model of Nigerian economy specified in Chapter Three. To estimate the model annual time series data for Nigeria were used for the period from 1960 to 1983. The nature and sources of the data used and the problems in collecting them are discussed in the data appendix. A brief discussion of the estimation techniques used in estimating the structural parameters is presented in section 4.2 The analysis of the individual estimated equations of the model and the results of tests of alternative hypothesis are presented in Section 4.3. Section 4.4 comments on data constraints used in the model. The complete and final estimated model to be used for simulation and forecasting the time paths of the economy is presented in Table 4.1.

4.2 Estimation Method

The stochastic behavioural equations are estimated by the method of Ordinary Least Squares (OLS) and Two Stage Least Squares using principal components of the predetermined variables (2SLS). Parameters of each equation of the model were first estimated by OLS. Many alternative specifications and functional forms were first tried at this stage of the estimation. Each structural equation was selected for the final model on the basis of theoretical plausibility, goodness of fit, significant t-ratios and Durbin-Watson statistics. By using a specification search approach we hope to obtain in the final model a set of relations that could explain empirically the structure of the Nigerian economy which would lead to a better simulation analysis and forecast of the time paths of key economic variables.

The system of simultaneous equations thus selected were then re-estimated by employing the 2SLS method. There are several methods for estimating simultaneous equation models, such as Indirect Least Squares (ILS), Limited Information Maximum Likelihood (LIML) and Two Stage Least Squares (TSLS). The TSLS method is often used in practice. However, the application of the TSLS method in this study is complicated because the number of predetermined variables exceeds the total number of observations. The principal

components variant of TSLS proposed by Kloek and Mennes (1960) was therefore employed in the present study. The 2SLS method replaces the set of all predetermined variables in the model including lagged endogenous variables by their leading principal components in the first stage. This method involves transforming a set of variables which are linear combinations of the original right hand side variables, but which are orthogonal with each other. The endogenous variables which appear on the right hand side of a given over-identified equation are regressed on the leading principal components. The computed values of the endogenous variables were then used in the second stage of the two-stage procedure.

The Time Series Processor (TSP) software econometric computer package was used for the estimations of all the equations and also in the calculation of a set of 7 principal components based on the predetermined variables in the model including lagged endogenous variables. The 7 components accounted for 97 percent of the total variations among the predetermined variables.

4.3 Analysis of the Estimated Results

The estimation period is 1962 to 1983. The method of estimation used -- OLS or TSLS -- for each equation is indicated directly underneath the dependent variable. The

figures in parentheses below the coefficients are their respective t-statistics. The standard errors of regression is represented by SER. R^2 is the coefficient of determination adjusted for degrees of freedom. D.W. is the Durbin-Watson Statistic. Durbin's h-statistic (H) is reported for the equations with lagged dependent variables. All testing is based on two-tail tests at the 5 percent significance level.

The final estimated model has 72 equations. There are 5 input-output equations, 29 stochastic equations and 38 definitions and identities. The presence of several lagged variables in ratio forms makes the model dynamic and non-linear in structure.

4.3.1 Domestic Expenditure

The coefficients of disposable income, relative price and credit to the private sector are statistically significant in equation (1), the estimated private consumption expenditure equation. The long-run marginal propensity to consume is about 0.6. The low marginal propensity to consume is attributed to the price effect due to the inclusion of a relative price variable which reduces the income effect. The inclusion of the relative price of consumption as an explanatory variable is a notable feature of the model. As is evident from the private consumption

equation, the relative price variable is significant and it affects private consumption expenditure negatively.

Private consumption expenditure is an important component of aggregate expenditure. Alternative equations were estimated for private consumption expenditure so as to obtain both a good statistical fit and good dynamic simulation performance. Some of these equations are reported below.

4.3.1 $CPR = 328.105 + 0.657\ NYDR + 0.177\ CPR_{-1}$
(OLS) (1.233) (6.574) (1.376)

$\bar{R}^2 = 0.967$ D.W. = 1.584 SER = 443.77
H = 1.223

4.3.2 $CPR = 4910.972 + 0.756\ NYDR - 4183.470\ \underline{PDC}_P$
(OLS) (2.991) (25.009) (2.764)

$\bar{R}^2 = 0.974$ D.W. = 0.970 SER = 392.797

4.3.3 $CPR = 8305.622 + 0.558 NYDR - 5871.756\ \underline{PDC}_P$
(OLS) (8.527) (12.085) (7.983)

$+ 0.823\ \underline{HLPC}_P - 0.01337\ CPR_{-1}$
(6.846) (0.208)

$\bar{R}^2 = 0.993$ D.W. = 2.378 SER = 199.431
H = -0.57

$$4.3.4 \quad \underset{(OLS)}{CPR} = \underset{(8.983)}{8256.143} + \underset{(18.160)}{0.5514\ NYDR} - \underset{(8.312)}{6838.068\ \frac{PDC}{P}} + \underset{(7.736)}{0.812\ \frac{HLPC}{P}}$$

$$\bar{R}^2 = 0.994 \qquad D.W. = 2.357 \qquad SER = 194.060$$

Equation (4.3.1) resembles the form appropriate for testing the permanent income hypothesis. The short-run marginal propensity to consume is 0.66 while the long-run marginal propensity to consume is 0.798. The equation however, resulted in structural instability in simultaneous dynamic simulation of the complete model.[1]

To test for the impact of relative price on the private consumption expenditure equation (4.3.2) which includes the ratio of the price deflator for consumption to the aggregate price level as a variable, was estimated. The relative price variable has the expected sign and is also significant. There is, however, autocorrelation.

Equation (4.3.3) was estimated with credit to the private sector and lagged consumption expenditure included as explanatory variables in addition to disposable income and the relative price term. The D.W. statistic improved and all the explanatory variables, with the exception of lagged consumption expenditure, are statistically significant with the expected sign. The lagged consumption

expenditure was dropped in equation (4.3.4) as it was neither with the expected sign nor statistically significant. Equation (4.3.4) indicates the importance of liquidity, relative price and disposable income as major determinants of private consumption expenditure.

The liquidity term has implications for monetary policy, since bank credit to the private sector can be controlled in order to alter private consumption expenditure in Nigeria. Equation (4.3.4) was re-estimated by the 2SLS method and lagged credit variable for inclusion in the final model as equation (1). The lagged real credit variable in equation (1) emphasises the dynamic character of the model.

Equation (2) indicates that government consumption expenditure is related in a statistically signficant way to government revenue. The equation emphasises the important channel through which the government revenues from oil affect the Nigerian economy. The rapid increase in government oil revenue in the 1970s led to the increase in government consumption expenditure. The marginal propensity to consume out of government revenue is 0.35, which is about what was expected since generally 30 to 40 percent of government revenue have gone for government consumption expenditure.

The alternative hypothesis that government

consumption expenditure seems to respond to the level of economic activity is tested in equation (4.3.5) below:

$$4.3.5 \quad CGR = \underset{(OLS)}{-24.549} + \underset{(.228)}{0.046}\ GDPR + \underset{(1.483)}{0.595}\ CGR_{-1} \quad (2.383)$$

$$\bar{R}^2 = 0.893 \qquad D.W. = 1.629 \qquad SER = 175.628$$

$$H = N.A.$$

The short-run marginal propensity to consume out of real gross domestic product is 0.046 while the long-run marginal propensity to consume is 0.114. The coefficient of gross domestic product is, however, not significant. The coefficient of lagged government consumption reflects the inability of the government to cut its consumption expenditure in the short-run.

Total investment expenditure is divided into its private and public components. Public investment expenditure is a government policy variable in the complete model. Private investment expenditure is, however, endogenous. Equation (3) includes real gross domestic product and the nominal interest rate as explanatory variables. Both variables have the expected signs and are statistically significant. Investment plays a dual role in the model as it is both income and output generating. It adds to capital stock in the long-run. Alternative

estimated equations which take into account the effects of economic activity, crowding out, property bank credit, and capital stock on private investment behaviour are presented below:

4.3.6 $IPR = 177.425 + 0.1954\ GDPR_{-1} + 0.1068\ IGR - 0.903\ \frac{HLPC}{P} + 0.049\ KPR_{-1}$
(OLS) (.6856) (2.907) (.733) (2.228) (.523)

$R^{-2} = 0.775$ D.W. = 1.324 SER = 321.780

4.3.7 $IPR = -8.042 + 0.2283\ GDPR_{-1} - 0.1039\ IGR_{-1} - 0.619\ \frac{HLPC}{P} + 0.0305\ KPR_{-1}$
(OLS) (.032) (3.709) (0.604) (1.302) (0.323)

$R^{-2} = 0.773$ D.W. = 1.473 SER = 323.375

4.3.8 $IPR = 156.601 + 0.1293GDPR + 0.424\ (\frac{HLPC}{P} - \frac{HLPC_{-1}}{P_{-1}})$
(OLS) (1.264) (5.381) (.714)

$R^{-2} = 0.763$ D.W. = 0.688 SER = 330.492

The hypothesis that public investment expenditures are complementary to private investment expenditure is tested in equation (4.3.6). The coefficient of public investment expenditure, though of the right sign, was not significant. It was hypothesised in equation (4.3.7) that

public investment expenditures in the preceding period would boost private investment in the current period. The coefficient of the lagged public investment expenditures variable reversed signs to become negative, indicating substitution between the two. However the coefficient of lagged public investment expenditure is not significant and not much confidence can be placed in the result. Further inquiry as to the crowding out property of public investment on private investment needs to be made. Such inquiry may indicate whether public investment is a substitute or complement for private investment in Nigeria.

The lagged private capital stock in the private investment equations is not significant. The hypothesis that real bank credit or changes in bank credit would have a positive impact on real private investment was tested but yielded no satisfactory result. It was found that the coefficient on bank credit yielded a negative sign in both equations (4.3.6) and 4.3.7). We therefore decided to try the change in bank credit as an explanatory variable in equation (4.3.8); the coefficient was positive but not significant.

Gross domestic product remains as the only significant explanatory variable in these alternative equations for private investment expenditures. Equation (3) was therefore included in the complete model with its

positive response of private investment to the general level of economic activity and negative response to interest rate. Private investment activities have been among the most difficult areas for empirical research in the developing countries. The lack of adequate and comprehensive data, prevents us from disaggregating the investment function by sector.[2]

There are 5 equations in the domestic expenditure block: 3 empirical estimated equations and 2 identities. The identities relate to total consumption expenditure, equation (4), and total investment expenditure, equation (5).

4.3.2 Public Finance and Money Supply

Revenues from crude petroleum exports have been the major component of government total revenue since the 1970s. Equation (6) indicates that the marginal tax rate on total revenues from petroleum export is about 90 percent. The proportion of government petroleum revenue from the direct petroleum profits tax is about 67 percent, as equation (7) indicates.

The implied marginal tax rate on current national income in equation (8) is 1.3 percent. This empirical result is consistent with the fact that personal and corporation income tax constitute a small source of total

government revenue. However the declining revenue from crude petroleum exports may shift emphasis towards revenue derived from other sources, such as the income tax.

Customs duties are second only to petroleum export revenues as a source of total government revenue. Equation (9) indicates that the marginal tax rate on the total import of goods is about 15 percent. This marginal tax rate has varied during the sample period with the various quantitative restrictions and import controls imposed by the government. Equation (10) is the miscellaneous federal government revenue equation; it has gross domestic product as the explanatory variable. Internal revenues generated by the state governments are also explained in equation (11) by reference to gross domestic product. The implied elasticity of state government internally generated revenue with respect to gross domestic product is about unity. The current dependence on the federal government statutory allocation, mostly from oil revenue, would constrain expenditure programmes by the state governments. State governments can borrow from external sources to finance their expenditure. However, the procurement of external loans depends not only on a federal government guarantee but also on the performance of the oil sector. External financiers are aware of Nigeria's vulnerability to developments in the world oil market, and state governments

should benefit from efforts to generate more internal revenue of their own.

The external public debt of Nigeria has been medium to long term in nature. Equations (12) and (13) relate to interest payments and principal payments on public external debt, respectively. With high levels of inflation and interest rates in most developed countries in the early 1980s Nigeria's interest payments on external debt increased substantially. The debt service payments worsened as most of the debts obtained during a period of relatively low interest rates in the mid-1970s began to mature at a time when the oil market had weakened and high interest rates prevailed in international financial markets. Some of the long term debts have been rescheduled. It is hoped that the debt service ratio will decline gradually as Nigeria's export earnings improve.

Equation (14) emphasises the dependence of the money supply on credit to the private sector, net credit extended to the government and changes in foreign reserves. All coefficients are statistically highly significant. The coefficient attaching to the government credit variables indicate that the money supply would increase by 168 percent of the increase in credit to the government. Changes in credit to the private sector increase the money supply by about 88 percent. The Central Bank of Nigeria has used

credit to the private sector as a major instrument of monetary policy and money supply control during the sample period. The equation also indicates that money supply would increase by 118 percent of the increase in foreign reserves.

Equation (15) is the identity for total government expenditure and equation (16) for excise duties. Equation (17) is the total direct tax revenue. Equations (18) and (19) define the total non-petroleum revenue and total government revenue from all sources respectively. Equations (20) - (24) are identities for external public debt. Equation (25) is an identity relating domestic banking credit to the government to the total government domestic deficits.

4.3.3 Foreign Trade and Balance of Payments

The exports of oil in current and real terms are determined by identities since both the price of oil and its quantity are exogenous in the model. However, equations are estimated for non-oil exports. Equation (26) for cocoa exports is a supply equation. The plausible assumption is made that since Nigeria is a small exporter of cocoa in the world cocoa market it takes the export price as given and tries to export as much as possible, given the constraints represented by domestic production. The coefficients for the relative price of cocoa and domestic production have

signs as expected. The coefficient on domestic production indicates that virtually all of the cocoa produced was exported. The cocoa marketing board that fixed producer prices for cocoa was the major buyer, and it exported most of its purchases.

Exports of other primary agricultural products in equation (27) depend on domestic production. Domestic production influences exports positively and is statistically significant. About 56 percent of such production is delivered to exports while the remaining 44 percent goes into domestic uses. World prices relative to domestic prices for these products would have been useful in explaining exports. However reliable data on such prices are not available. About 99 percent of total exports in the national income accounts are accounted for in balance of payments accounts as equation (28) indicates. We now move on to the import aspect of foreign trade.

Alternative versions of the equations for imports of consumer goods were tried, and some of the results are presented below:

$$
\begin{array}{llllll}
4.3.9 & MCR = & 351.9796 + & 0.0416\ CR - & 247.7399\ \underline{PDM}_{P} & \\
 & (OLS) & (.8280) & (2.430) & (.8052) & \\
 & & + 0.0911\ FRC_{-1} & & & \\
 & & (4.3805) & & & \\
 & \bar{R}^{-2} = & 0.876 & D.W. = 1.725 & SER = 101.418 &
\end{array}
$$

$$4.3.10 \quad \underset{(OLS)}{MCR} = \underset{(0.901)}{510.729} + \underset{(2.164)}{0.048\ CR} - \underset{(1.22)}{418.407}\ \frac{PDM}{P} + \underset{(2.637)}{0.0629}\ \frac{FRC_{-1}}{PDM_{-2}}$$

$$R^{-2} = 0.817 \qquad D.W. = 1.70 \qquad SER - 123.431$$

$$4.3.11 \quad \underset{(2SLS)}{LOG\ MCR} = \underset{(.174)}{1.418} + \underset{(1.735)}{0.741\ LOG\ CR} - \underset{(1.576)}{0.6394\ LOG\ \frac{PDM}{P}} + \underset{(3.384)}{0.169\ LOG\ \frac{FRC_{-1}}{PDM_{-2}}}$$

$$R^{-2} = 0.909 \qquad D.W. = 1.542 \qquad SER = 0.167$$

The above equations are but a sample of the many attempts to get a good fit and plausible coefficients for the equation for consumer goods imports. Equation (4.3.9) has, as explanatory variables, total consumption expenditure, the ratio price of imports to domestic price level, and nominal foreign exchange reserves. Although all coefficients have the expected signs, the relative price term and constant term are not significant.

Real foreign exchange reserves is introduced in equation (4.3.10). The relative price term improves but the constant term remains non-significant. Total consumption expenditure is used as proxy for real income in the case of consumer goods imports to reflect domestic absorption. The marginal propensity to import out of total consumption

expenditure is about 5 percent. The inclusion of lagged foreign exchange reserves in the equations is to reflect the policy of restricting consumer good imports whenever foreign exchange reserves are stringent.

Equation (4.3.10) was reformulated in logarithmic form and re-estimated. Equation (4.3.11) presents the result. The direct elasticity of consumer goods imports with respect to total consumption expenditure is about 0.75. The elasticity with respect to relative price is 0.64 and elasticity with respect to foreign reserves is 0.17. It should be pointed out that these elasticity estimates have to be interpreted with caution since there have been quantitative controls on consumer good imports over the sample period.

Equation (4.3.10) was also re-estimated by the 2SLS method and selected for forecasting and simulation purposes equation (29).

The imports of intermediate goods and raw materials equation (30) has all the coefficients with the expected signs. The short-run propensity to import raw materials with respect to gross domestic product is 0.019 and 0.038 in the long-run. Approximately 8 percent of foreign exchange reserves are allocated to intermediate and raw materials imports in the short-run and 15 percent are in the long-run. Equation (30) was also estimated in log form in equation

(4.3.12) so as to be able to obtain direct elasticity estimates.

$$4.3.12 \quad \underset{(2SLS)}{LOG\ MRR} = \underset{(2.050)}{0.3289\ LOG\ GDPR} + \underset{(1.273)}{0.398\ LOG\ MRR_{-1}}$$

$$+ \underset{(1.117)}{0.1086\ LOG\ \frac{FRC_{-1}}{PDM_{-2}}} - \underset{(1.518)}{1.406\ LOG\ \frac{PDM}{P}}$$

$$\bar{R}^2 = 0.930 \qquad D.W. = 1.537 \qquad SER = 0.191$$
$$H = N.A.$$

The short-run and long-run elasticity estimates for these imports with respect to gross domestic product are 0.33 and 0.55, respectively, for foreign exchange reserves are 0.109 and 0.181, respectively, and for imports of raw materials are 1.41 and 2.33 respectively. These elasticity estimates should be interpreted with caution since foreign exchange reserves have been included in most of our import specifications as a constraint. Furthermore, the aggregate import price index is used instead of individual import good price indexes due to data constraint.

Equation (31), explains capital good imports with reference to total investment expenditures and relative prices. Both coefficients are significant and of the expected sign. The long-run propensity to import capital goods with respect to total investment expenditure is approximately 0.21. Alternative equations estimated for capital good imports are reported below:

4.3.13 $MKR = 1372.158 + 0.288\ IR - 0.180 VMBR - 1166.583 \frac{PDM}{P}$
(OLS) (2.579) (5.317) (1.616) (2.696)

$R^{-2} = 0.908$ D.W. = 1.6344 SER = 153.711

4.3.14 $LOG\ MKR = -1.179 + 1.447\ LOG\ IR - 0.524\ LOG\ VMBR - 1.571\ LOG \frac{PDM}{P}$
(OLS) (2.479) (7.046) (2.487) (3.713)

$R^{-2} = 0.971$ D.W. = 1.581 SER = 0.1413

4.3.15 $MKR = 836.772 + 0.211\ IR - 727.921 \frac{PDM}{P} - 0.00371 \frac{FRC}{PDM_{-1}}$
(OLS) (1.815) (7.305) (1.939) (0.079)

$R^{-2} = 0.895$ D.W. = 1.287 SER = 164.459

The hypothesis that imports of capital good are substituted by domestic resource was tested in equation (4.3.13) by including value added in industry as an explanatory variable. The coefficient on the value added is 0.18 which indicates low substitution between output of domestic industry and capital goods imports. The propensity to import out of total investment expenditure however increased. The coefficient on relative price term also

increased. Equation (4.3.13) was re-estimated in log form to obtain direct measures of elasticities. This is presented in equation (4.3.14). The elasticity of capital good imports with respect to total investment expenditure is about 1.5, which indicates that capital good imports will be highly affected by cuts in investment expenditure. The elasticity with respect to value added in industry is approximately 0.524 which indicates low substitution.

Foreign exchange reserves is included in equation (4.3.15) to capture the effect of exchange control on capital goods imports. The coefficient on foreign exchange reserves is negative and non-significant. Foreign exchange reserves do not appear to have been a major constraint on capital goods imports. Consumer goods imports have been more influenced by exchange regulation and priority in the use of reserves has been given to capital goods imports.

Equation (32) is the equation for services imports. Import of services are determined by gross domestic product, foreign exchange reserves, and relative prices. Equation (33) indicates that virtually all of the total imports in the balance of payments accounts is accounted for in the national income accounts.

There are 2 stochastic export equations, 5 import equations and 12 identities in the foreign trade and balance of payments block. The identities are equations (34) to

(45). Equations (34) and (35) defines export of oil in real terms. Total exports of non-oil products is defined in equation (36) while equations (37) and (38) define total exports of goods and total exports in the balance of payments accounts. Equations (39), (40) and (41) define total imports of goods, total imports of services and total imports in balance of payments accounts, respectively. The identities showing the balance on current account and on capital account identities are given in equations (42) and (43). Balance of payments and outstanding foreign reserves are defined in equations (44) and (45).

4.3.4 Input-Output Sector

Equations (46) to (50) determine value added in each sector. The explanatory variables are categories of aggregate final demand - consumption, investment, exports and imports - whose empirical estimates were discussed above. However the various parameters in the value added equations are elements of the D matrix calculated from the input-output table of Nigeria as discussed in Chapter 3. As these parameter values were not estimated but based on 1973 input-output table, there would be differences between the actual and computed value added in each sector for other years.

Equation (51) to (54) model the residuals between actual and computed value added for the agricultural, industrial, utility, and distribution sectors. The supply constraints in production are represented by lagged aggregate capital stock, a time trend and a one-period lag of the residual. Aggregate capital stock is statistically significant in explaining the residuals in agricultural, industrial, and utility sectors. These equations fit the data satisfactorily.[3] Lagged private capital stock was used for the distribution and service sectors. Distributive activities are dominated by the private sector while public investment activities are generally concentrated in the infrastructural and large-scale manufacturing sectors.

Efforts to explain the residuals in the mining sector proved unsuccessful and it was therefore made exogenous in the complete model. However, capital stock is significant in explaining the increase in value added in the other sectors and lends additional support to the hypothesis of supply constraints on production in developing countries.

There are 5 value added equations and 4 stochastic residual equations in the input-output block of the final model.

4.3.5 National Income

Equations (55) to (61) are identities; there are no estimated equation for the national income block. Equation (56) is the real gross domestic product defined as the sum of value added for all sectors in the economy. Equation (56) is the total value added in non-oil sectors. Nominal gross domestic product is defined in equation (57) as the product of real gross domestic product multiplied by the implicit price deflator for gross domestic product. Real gross national product and real national income are defined in equations (58) and (59) respectively. Real national income is converted to nominal terms in equation (60). Real disposable income is defined in equation (61).

4.3.6 Factors of Production

Private capital stocks and public capital stock are defined in equations (62) and (63). Total capital stock in equation (64) is the sum of private and public capital stocks. Depreciations on private and public capital stocks are given in equations (65) and (66). Total deprecation value is the sum of private and public depreciation values in equation (67).

Equation for employment (68) is the only estimated equation in this block. Total employment is assumed to be positively related to the level of economic activity as

represented by real gross domestic product, and negatively related to real wages. Both explanatory variables have the right signs and are statistically significant. The coefficient of gross domestic product indicates that an increase of gross domestic product by one million naira would generate employment of about 104 workers. A unit increase in real wages would result in an employment decrease of approximately 17 workers. This result should be interpreted cautiously. A sectoral breakdown of labour employment would give a more detailed picture of employment relationships, but employment data by sector are not available.

4.3.7 Wages and Prices

Average wage rate is determined by the average price level and productivity in equation (69). Labour benefits with other factors of production in reaping the benefits of productivity gains in the long term. However, these gains appear to be small given the non-significance of the coefficient on productivity. As expected a priori price significantly and positively influences wages.

Equation (70) is the equation for the implicit gross domestic price deflator. Price formation is determined by the unit value index of imports, the average wage rate, and productivity. Price determination can therefore be

interpreted as a mark-up-over-cost approach. For purposes of estimation we entered the wage and productivity components of unit labour costs separately. The elasticity of price with respect to the wage rate lagged one period is 0.35. The elasticity with respect to the import price is 0.97 and the elasticity with respect to productivity is 0.14.

Equation (71) determines the implicit price deflator for consumption as a function of the consumer price index. The last equation in the model, equation (72) explains the price deflator for imports in relation to the import unit price index and the exchange rate.

4.4 Comments on Data Constraints

The data base in the model is highly aggregated, especially in the cases of wages, prices, employment and capital formation. The present modeling effort should be regarded as a compromise solution in view of the fact that model building is governed by data availability and reliability.[4] Given longer time series for sectoral variables, the residuals could perhaps be better explained by sectoral capital stocks, sectoral wages could be used to explain prices on a more disaggregated level, and sectoral relative prices could then be linked to prices for final demand components.

The present model, however, still captures many of the characteristics of the Nigerian developing economy. Making an explicit link between a demand side based on econometric estimation and a supply side based on an input-output framework represents an improvement in modeling the structure of the Nigerian economy. The combination of an input-output model and a standard macroeconomic model provides a satisfactory framework for simulating sectoral policy initiatives and assessing growth prospects. The final demand components are important in the development context as consumption reflects the standard of living, investment is important for growth, imports involve foreign exchange costs and exports reflect an ability to earn foreign exchange reserves. The input-output block also allows us to focus attention at the sectoral level and on the inter-industry nature of the economy. The role of capital stock in inducing growth of the residuals is also very important.

The predictive ability of the model is evaluated in the next chapter.

TABLE 4.1

A MACROECONOMETRIC AND INPUT-OUTPUT MODEL OF NIGERIA

The model consists of 72 equations: 5 input-output equations, 29 stochastic equations and 38 identities and definitions. Figures in parentheses are t-values. OLS refers to ordinary least square and 2SLS refers to two-stage least squares. Variables are defined in the appendix to Chapter 3.

I Domestic Expenditure

Private consumption expenditure

1) $CPR = \underset{(2SLS)}{6259.097} + \underset{(4.353)}{0.5894}NYDR - \underset{(16.713)}{5031.342}\frac{PDC}{P} + \underset{(3.842)}{0.7754}\frac{HLPC_{-1}}{P_{-1}}$ $\quad (6.044)$

$R^{-2} = 0.992 \qquad DW = 2.350 \qquad SER = 218.665$

Government consumption expenditure

2) $CGR = \underset{(2SLS)}{207.115} + \underset{(2.495)}{0.3474}\left(\underset{(10.502)}{\frac{GTRC}{P}}\right)$

$R^{-2} = 0.839 \qquad DW = 1.165 \qquad SER = 215.864$

Private investment expenditure

3) $IPR = \underset{(OLS)}{1685.455} + \underset{(5.981)}{0.1431}\,GDPR_{-1} - \underset{(11.445)}{319.037}\,HDR_{-1}$ $\quad (5.538)$

$R^{-2} = 0.868 \qquad DW = 1.685 \qquad SER = 246.261$

Total consumption expenditure

4) $CR = CPR + CGR$

Total investment expenditure

5) IR = IPR + IGR

II Public Finance, External Debt and Money Supply

Total oil revenue

6) GPORC = -178.6393 + 0.9018 EOC
(OLS) (1.610) (40.732)

R^{-2} = 0.983 DW = 1.94 SER = 396.916

Petroleum profit tax

7) GDOC = 0.6678 GPORC
(2SLS) (27.931)

R^{-2} = 0.954 DW = 2.129 SER = 544.788

Other direct tax

8) GDNC = 0.0132 NYC
(2SLS) (8.382)

R^{-2} = 0.631 DW = 1.662 SER = 186.265

Import duties

9) GMTC = 74.1622 + 0.1428 MTGC
(2SLS) (2.452) (24.578)

R^{-2} = 0.967 DW = 2.681 SER = 101.716

Other federal government revenue

10) GURC = 0.01300 GDPC
(2SLS) (9.202)

R^{-2} = 0.695 DW = 1.260 SER = 192.214

State governments own revenue

11) Log GSRTC = -4.220 + 1.0273 log GDPC
(2SLS) (8.2096) (18.739)

R^{-2} = 0.943 DW = 1.945 SER = 0.308

Interest payments on external public debt

12) MIGS = 15.351 + 0.680 (FLIBOR * FODS)
(2SLS) (1.279) (25.732)

R^{-2} = 0.969 DW = 1.3254 SER = 47.662

Principal repayments on external public debt

13) FADS = -12.503 + 0.096 $FODS_{-1}$
(OLS) (.5277) (11.082)

R^{-2} = 0.853 DW = 1.132 SER = 90.794

Money supply

14) $HMSC-HMSC_{-1}$ = 7.6515 + 1.68012 $(HLGC - HLGC_{-1})$ +
(2SLS) (0.072) (20.936)

0.8844 $(HLPC - HLPC_{-1})$ + 1.1835 BOP
(5.666) (15.161)

R^{-2} = 0.978 DW = 1.787 SER = 371.353

Identities for government sector

Total government expenditure

15) GEPC = P (IGR + CGR) + GTRPR + FDSC

Excise duties

16) GXTC = TGXTC * CPR* PDC

Total direct tax revenue

17) GDTC = GDOC + GDNC

Total government non-petroleum revenue

18) GNORC = GDNC + GMTC + GXTC + GETC + GURC + GSRTC

Total government revenue

(19) GTRC = GNORC + GPORC

Outstanding external debt in US dollars

20) FODS = $FODS_{-1}$ + FIDS - FADS

Outstanding external debt in Naira

21) FODC = FODS * FEXR

Debt service payments in US dollars

22) FDSS = MIGS + FADS

Debt service payments in Naira

23) FDSC = FDSS * FEXR

Debt service ratio

24) FDSR = FDSC / ETGSR * PDE

Banking credit to government

25) HLGC = GEXPC - GNORC - GSDIS

III Foreign Trade and Balance of Payments Sector

Exports of cocoa

26) $ECR = -147.079 + 112.741 \frac{PLNCI * FEXR}{PPCOI} + 1.011\ QCO$

(OLS) (2.250) (1.997) (3.708)

$R^{-2} = 0.480$ DW = 1.868 SER = 63.190

Exports of other primary products

27) $EAOR = 121.316 + 0.564\ QCT_{-1}$

(OLS) (3.167) (14.014)

$R^{-2} = 0.969$ DW = 1.984 SER = 87.872

Exports in national accounts

28) $ENAR = 22.907 + 0.989\ ETGSR$

(2SLS) (.229) (22.621)

$R^{-2} = 0.964$ DW = 1.942 SER = 153.469

Imports of consumer goods

29) $MCR = 692.308 + 0.0432\ CR - 559.166\ PDM/P$

(2SLS) (1.275) (1.896) (1.403)

$+ 0.1393\ FRC_{-1}/PDM_{-2}$

(2.803)

$R^{-2} = 0.734$ DW = 1.705 SER = 148.736

Imports of intermediate goods and raw materials

30) $MRR = \underset{(2SLS)}{122.953} + \underset{(.306)}{0.0188}\ GDPR - \underset{(1.219)}{129.874}\ \frac{PDM}{P} + \underset{(1.385)}{0.0763}\ \frac{FRC_{-1}}{PDM_{-2}} + \underset{(.421)}{0.497}\ MRR_{-1}$ $\quad (2.677)$

$R^{-2} = 0.887 \qquad DW = 1.770 \qquad SER = 88.340$

$H = 1.097$

Imports of capital goods

31) $MKR = \underset{(2SLS)}{844.969} + \underset{(1.931)}{0.209}\ IR - \underset{(8.435)}{735.139}\ \frac{PDM}{P}$ $\quad (2.073)$

$R^{-2} = 0.901 \qquad DW = 1.279 \qquad SER = 160.101$

Imports of services

32) $MSOPR = \underset{(2SLS)}{1161.257} + \underset{(1.727)}{0.0161}\ GDPR - \underset{(.851)}{751.481}\ \frac{PDM}{P} + \underset{(1.485)}{0.167}\ \frac{FRC}{PDM_{-1}}$ $\quad (2.512)$

$R^{-2} = 0.597 \qquad DW = 1.051 \qquad SER = 212.431$

Imports in national accounts

33) $MNAR = \underset{(2SLS)}{-242.710} + \underset{(1.789)}{1.002}\ MTGSR$ $\quad (18.786)$

$R^{-2} = 0.969 \qquad DW = 1.608 \qquad SER = 228.728$

Identities for foreign trade

Current exports of oil

34) EOC = PWOS * FEXR * EOQ

Real exports of oil

35) $EOR = \frac{EOC}{PDE}$

Total exports of primary goods

36) ENOR = ECR + EAOR

Total exports of goods

37) ETGR = EOR + EOR

Total exports of goods and services

38) ETGSR = ETGR + ESFR

Total imports of goods

39) MTGR = MCR + MRR + MKR

Total imports of services

40) $MSFR = MSOPR + \frac{MIGS * FEXR}{PDM}$

Total imports of goods and services

41) MTGSR = MTGR + MSFR

Balance on current accounts

42) BCUC = ETGSR * PDE + BURTC - MTGSR * PDM

Balance on capital accounts

43) BCAC = FNFVC + FNLOSC + (FIDS - FADS) * FEXR

Balance of payments

44) BOP = BCAC + BCUC + BOPE

Foreign reserves

45) FRC = FRC_{-1} + BOP

IV Input-Output (Production) Sector

Value added in agriculture

46) VAR = 0.34781 CR + 0.08614 IR + O.10258 ENAR
- 0.03408 MNAR + RAR

Value added in mining

47) VNR = 0.02382 ER + 0.07071 IR + 0.70454 ENAR
- 0.03759 MNAR + RAR

Value added in industry

48) VMBR = 0.09638 CR + 0.40147 IR + 0.02843 ENAR
- 0.06254 MNAR + RMBR

Value added in utilities and transport

49) VUTR = 0.04405 CR + 0.03783 IR + 0.05152 ENAR
- 0.03552 MNAR + RUTR

Value added in commerce and services

50) VDSR = 0.43734 CR + 0.09123 IR + 0.06118 ENAR
- 0.21032 MNAR + RDSR

Residual in agriculture

51) $RAR = 760.9092 + 0.7085\ RAR_{-1} + 0.0163\ KR_{-1}$
(OLS) (1.999) (4.0816) (1.736)

$- 79.8569\ TIME$
(2.641)

$R^{-2} = 0.945$ DW = 2.166 SER = 258.199
H = 0.673

Residual in industry

52) $RMBR = -33.999 + 0.3972\ RMBR_{-1} + 0.0363\ KR_{-1}$
(OLS) (0.2527) (2.0399) (3.0278)

$- 44.4807\ TIME$
(2.1625)

$R^{-2} = 0.719$ DW = 1.685 SER = 185.978
H = 1.813

Residual in utilities

53) $RUTR = 0.0109\ KR_{-1} + 0.2097\ RUTR_{-1} - 14.9551\ TIME$
(OLS) (2.9069) (0.8873) (2.887)

$R^{-2} = 0.625$ DW = 1.649 SER = 54.642
H = N.A.

Residual in commerce and services

54) $RDSR = -535.4912 + 0.0631\ KPR_{-1} + 0.5099\ RDSR_{-1}$
(OLS) (1.6222 (1.895) (2.272)

$R^{-2} = 0.818$ DW = 1.679 SER = 421.492
H = N.A.

V National Income

Real gross domestic product

55) GDPR = VAR + VMBR + VUTR + VDSR + VNR

Non-oil value added

56) GDPOR = GDPR - VNR

Nominal gross domestic product

57) GDPC = P * GDPR

Real gross national product

58) GNPR = GDPR + NFPAR

Real national income

59) NYR = GNPR - DEPR

Nominal national income

60) NYC = NYR * P

Real disposable income

61) $NYDR = NYR + GTRPR - \frac{GDTC}{P}$

VI Factors of Production

Private capital stock

62) $KPR = .95\ KPR_{-1} + IPR_{-1}$

Public capital stock

63) $KGR = .95\ KGR_{-1} + IGR_{-1}$

Total capital stock

64) $KR = KPR + KGR$

Private depreciation

65) $DPR = .05\ KPR$

Public depreciation

66) $DGR = .05\ KGR$

Total depreciation

67) $DEPR = DGR + DPR$

Employment

68)
$$\underset{(2SLS)}{LEMP} = \underset{(4.647)}{23.146} + \underset{(13.835)}{0.00104}\ GDPR - \underset{(2.995)}{17.435}\ \frac{LWIR}{P} + \underset{(4.739)}{4.437}\ DWAR$$

$\bar{R}^2 = 0.930$ DW $= 1.318$ SER $= 0.977$

VII Wages and Prices

Wage rate index

69) $LWIR = -0.1019 + 0.918P + 0.000301 \frac{GDPR}{LEMP}$
(2SLS) (8.480) (25.265) (1.0105)

$R^{-2} = 0.987$ DW = 1.2003 SER = 0.138

Implicit GDP price deflator

70) $LOG\ P = 0.323 + 0.351\ LOG\ LWIR_{-1}$
(2SLS) (0.657) (3.163)

$+ 0.9656\ LOG\ (PUMS * FEXR) - 0.1415\ LOG\ \frac{GDPR_{-1}}{LEMP_{-1}}$
(4.973) (1.927)

$R^{-2} = 0.994$ DW = 1.415 SER = 0.056

Price deflator for consumption

71) $PDC = 0.186 + 0.889PCPI$
(OLS) (1.838) (18.907)

Price deflator for imports

72) $PDM = 0.575 + 1.885\ (PUMS * FEXR)$
(OLS) (6.951) (30.524)

$R^{-2} = 0.978$ DW = 1.355 SER = 0.209

FOOTNOTES TO CHAPTER FOUR

1. This equation produced a structural instability in the simultaneous dynamic simulation of the complete model. The characeristic roots of a simultaneous model determine the solution properties of the model. (a) The solution may be stable, converging without oscillation. This requires that the characteristic roots be less than 1 in magnitude and have no imaginary component. (b) The solution may be stable, converging with damped oscillations. This occurs if the solutions to the characeristic equation are both less than 1 in magnitude but have imaginary components. (c) The solution may be unstable and nonoscillatory. This results if either solution to the characertistic equation is greater than 1 in magnitude but have no imaginary component. (d) The solution may be unstable and exhibits ever-diverging oscillations. This occurs if one or more of the characteristic roots are greater than 1 in magnitude and there is an imaginary component. The heavy dependence of consumption on income, together with the fact that consumption is itself a large proportion of income and related to sectoral value added through the input-output coefficients implies that an overprediction of consumption would result in an overprediction of income which would result in still larger an overprediction of consumption. See Pindyck and Rubinfeld (1981, pp. 416-419) for more details on structural instability.

2. Wai and Wong (1982) have observed that from the viewpoints of both development planning and demand management, the question of what determines investment behaviour in a developing country is an important one. However, when one tries to establish an empirical investment function for a developing country, one often finds that the lack of data on capital stock makes it difficult to observe the stock adjustment mechanism, upon which almost all investment theories are based.

3. These results are also consistent with other empirical findings on modelling input-output residuals. See for example Khilji (1982).

4. The sources and complete list of data used in the study are presented in Appendix A.

CHAPTER FIVE

SIMULATION WITH THE MODEL

5.1 Introduction

A macroeconometric and input-output model of Nigeria was specified in Chapter Three. In Chapter Four, the estimated model was presented and each behavioural equation was evaluated in terms of the theoretical plausibility of the estimated coefficients. The outcome suggests that most of the equations performed well. However, even if all individual equations fit the data well and are statistically significant, there is no guarantee that the complete model when used in simulation will reproduce the data series closely. The model as a whole will have a dynamic structure which is more complex than that of any of the individual equations of which it is composed.

It is typical that in large econometric model simulated values of some endogenous variables will track the original series closely while others will not. It is also important that the model exhibit stable properties as well as predicting turning points. In practice, it may be necessary to use specifications for some of the equations in

the model that, while less desirable from a statistical point of view, may improve the simulation ability of the model. Thus the applied econometrician is constrained to make compromises, accepting some equations which do not have good statistical fits in order to build a complete structural model which is useful for simulation purposes.

Simulation is simply a method of solving the system of simultaneous equations that have been put together to characterize the structure of an economy. Simulation can be ex-post meaning that the solutions for endogenous variables are computed over the sample period. By simulating the model over the historical data period a comparison of the original data series with the simulated series for each endogenous variable can provide a useful test of the validity of the model. In this study, ex-post simulation and historical simulation are used interchangeably. Ex-ante simulation involves solving for values of endogenous variables beyond the sample period. Ex-ante simulation and forecasting are used interchangeably.

5.2 Summary Statistics

The predictive accuracy of a model is tested by comparing the actual and simulated values of the endogenous variables. The deviation of the historical simulated values from the actual observed values can be evaluated on the basis of various summary statistics. The standard criteria include: Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE), Root Mean Squared Percentage Error (RMSPE), and Theil's Inequality Coefficient (U).

Theil's Inequality Coefficient (U) has been used to assess the predictive accuracy of the present model.[1] The coefficient is defined as

5.1)
$$U_i = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^{z} - Y_{it}^{A}\right)^2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^{A}\right)^2}}$$

Where T = the length of the simulation period

Y_{it}^{A} = actual value of the i^{th} variable for period t

Y_{it}^{z} = simulated value of the i^{th} variable for period t

The value of U_i is equal to or greater than zero but it has no finite upper bound. If $U_i = 0$, this implies $Y_{it}^{z} = Y_{it}^{A}$ for all i indicating a perfect forecast. At the other

extreme a large value of U_i implies poor predictive ability of the model. Values of U_i less than 0.3 or 0.4 are considered not to be unduly large[2].

The Theil inequality coefficient can be decomposed into three main components. The numerator of the coefficient, which is equivalent to root-mean square error (RMSE), can be decomposed as follows:

5.2) $$\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^{z}-Y_{it}^{A}\right)^2=\left(\overline{Y}_i^{z}-\overline{Y}_i^{A}\right)^2+\left(\sigma_{iz}-\sigma_{iA}\right)^2+2\left(1-\gamma_i\right)\sigma_{iz}\sigma_{iA}\,.$$

Where $\overline{Y}_i^{z}$ and $\overline{Y}_i^{A}$ are the means of Y_{it}^{z} and Y_{it}^{A} respectively and σ_{iz}, σ_{iA} are their respective standard deviations. γ_i is their correlation coefficient. We can then define the proportions of inequality as:

Bias Proportion

5.3) $$U_i^{m}=\frac{\left(\overline{Y}_i^{z}-\overline{Y}_i^{A}\right)^2}{\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^{z}-Y_{it}^{A}\right)^2};$$

Variance Proportion

5.4) $$U_i^{s}=\frac{\left(\sigma_{iz}-\sigma_{iA}\right)^2}{\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^{z}-Y_{it}^{A}\right)^2};$$

Covariance Proportion

5.5) $$U_i^c = \frac{2(1-\gamma_i)\sigma_{iz}\sigma_{iA}}{\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^z - Y_{it}^A\right)^2}.$$

The bias proportion (U_1^m) of the error measures the extent to which the average simulated values diverge from the actual values. It is an indicator of systematic error. Values of V_1^m above 0.3 may be considered large, indicating the presence of systematic bias in the model. The variance proportion (U_1^s) is an indicator of the ability of the model to replicate the degree of variability in the actual data series with respect to each endogenous variable. This index also indicates the ability of the model to capture turning points or sharp variations in the value of the endogenous variables. If U_1^s is large, it implies that the predicted value Y_1^z fluctuates considerably, while the actual series does not and vice versa. Finally the covariance proportion (U^c) indicates unsystematic error. The sum of these components must sum to unity. For any values of U>0, the ideal distribution of the inequality coefficients over the three error proportion is $U^m = U^s = 0$, and $U^c = 1$.

An alternative decomposition of Theil's inequality coefficient are the bias proportion, regression proportion and disturbance proportion.

Bias Proportion

$$U_i^m = \frac{\left(\overline{Y}_i^s - \overline{Y}_i^A\right)^2}{\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^s - Y_{it}^A\right)^2}; \tag{5.6}$$

Regression Proportion

$$U_i^r = \frac{\left(\sigma_{is} - \gamma_i \sigma_{iA}\right)^2}{\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^s - Y_{it}^A\right)^2}; \tag{5.7}$$

Disturbance Proportion

$$U_i^d = \frac{\left(1-\gamma_i^2\right)\sigma_{iA}^2}{\frac{1}{T}\sum_{t=1}^{T}\left(Y_{it}^s - Y_{it}^A\right)^2}. \tag{5.8}$$

The sum of these proportions is also unity and the ideal result would be $U_i^m = U_i^r = 0$ and $U_i^d = 1$.

The model has been solved by using SIML in the Time Series Processor (TSP) computer programme written by B. H. Hall and R. E. Hall. This programme has been implemented on the VAX system at McMaster University. SIML uses Newton's method applied to non-linear equation solutions. SIML does not require normalized equations or that the model be ordered in a particular way. For linear models SIML will

converge in one iteration. Many equations in the model had lagged endogenous variables as explanatory variables. Dynamic simulation was therefore preferred to static simulation. Static simulation using actual lagged endogenous variables, may be more suitable for assessing the year-to-year forecasting ability, but dynamic simulation as opposed to static simulation provides a more stringent test of a model and is clearly the exercise most like forecasting. It can be used to evaluate the contemporaneous relationships within a model and also the dynamic characteristics of the model. The historical simulation was started in 1964. The estimated coefficients, parameters, actual exogenous variables over the sample period and the observed values prior to 1963 were used as input to the historical simulation experiments.

5.3 Historical Simulation Results

The historical solution values for all the endogenous variables are presented in Appendix B. Actual values of the variables are given in the appendix on data. The symbols for the variables are defined in Chapter Three. The comparison between simulated and observed values show that the model's predictive performance is quite good for most of the endogenous variables.

Table 5.1 gives a summary of the sources of simulation errors for all the endogenous variables. The overall tracking ability of the model is evaluated in terms of these measures for each variable. In order to provide a general interpretation of the predictive ability of the model, the results are presented in a more condensed form in Table 5.2 which give the percentage distribution of these measures.

Based on Theil's Inequality Coefficient, U, most variables track the historical data very well. For good predictive performance it is desirable that this coefficient be as close to zero as possible. As Table 5.2 indicates U is less than 0.1 for 84.7 percent of the total 72 endogenous variables. Indeed only one variable, residual in distribution, has a U which is above 0.3.

The bias proportion, U^m, is an indicator of systematic error. It is also desirable, for good model performance, that U^m be low and close to zero. In the present model U^m is less than 0.1 for 97.2 percent of the total endogenous variables.

The variance proportions, U^s, for most endogenous variables indicate that the model approximately replicates the degree of variability in the actual data series. U^s is less than 0.1 for 73.5 percent of the total endogenous variables and greater than 0.3 for 8.4 percent of the total

72 variables. These variables are balance on capital accounts (0.31), total depreciation (0.47), outstanding external debt (0.42), Foreign reserves (0.31), Private capital stock (0.47) and total capital stock. This, however, not was surprising given the volatile nature of these variables.

The tracking ability of the present model compares favorably with the Olofin, et. al. (1985) model for Nigeria. In this previous model U was above 0.3 for 7 percent of total 103 endogenous variables. The bias proportion, U^m, was above 0.3 for 10 percent of total variables and the variance proportion, U^s, was above 0.3 for 40 percent of total variables. The variance proportion was unduly large which is not good for a forecasting model. The authors of this model attributed this major shortcoming to data limitations and the large number of equations in the supply sector which are pure trend equations. (Olofin, et. al., 1985, p. 251).

The present model represents a considerable improvement in modeling the structure of Nigerian economy. Major characteristics of this developing economy are captured by integrating a demand side based on econometric estimation and a supply side based on an input-output framework in this model.

The historical simulation results can be investigated more thoroughly by examining the plots of selected major endogenous variables provided in Figures 5.1 to 5.16. The plots for these variables indicate that the simulated values follow closely the actual values for most of the historical simulation period. The exception to this general observation is the period from 1966 to 1971. The relatively poor performance in this period is due to the civil war which resulted in disruption of economic activity in several parts of the country. The deficiency in the data base during the civil war was reflected in the predictive performance of the model for this period.

The simulated real gross domestic product captures most of the turning points in the actual data series as shown in Figure 5.1. The simulated nominal gross domestic product in Figure 5.2 did well in reproducing the historical values. The plot of value added in agriculture in Figure 5.3 indicates the relative stagnation in this important sector. Simulated value added in mining in Figure 5.4 follows closely the actual values and also captures the major turning points due to volatility in the world oil market. Figures 5.5 and 5.6 indicate that the actual values for value added in industry and utilities were fairly tracked by the model.

On the expenditure side, simulated total investment in Figure 5.8, seems to perform better than simulated total consumption, in Figure 5.7. Simulated total investment tracks closely the actual values. The simulated values of exports follow closely the actual series in Figure 5.9. The sharp increase in total exports, following the sudden increase in world price of oil in 1980, were predicted accurately in the form of turning points. The simulation of total imports in Figure 5.10 is less satisfactory. However the simulated values of imports reproduce the major cycles that occurred in the economy. Our simulation of current account balance and balance of payments in Figures 5.11 and 5.12 perform reasonably well which is quite satisfactory given the extreme volatility of these variables.

Money supply and government revenue reproduce very well their historical values in Figures 5.13 and 5.14 respectively. The huge government revenue accumulated from oil export earnings in 1980 and the subsequent fall in revenue due to the downturn in world oil market were well predicted. Simulated values of GDP price deflator and wage rate in Figures 5.15 and 5.16 follow closely their actual values.

The results of the historical dynamic simulation indicate that the model replicate the time paths of most of the endogenous variable reasonably well and its overall

performance in predicting major variables at the aggregated level is also good. It can also be asserted that the model's tracking ability is satisfactory on the whole. Having completed the evaluation of the tracking ability of our model, the next step is to carry out some selected policy simulation experiments.

5.4 Policy Simulation Experiments

Policy implications in econometric models are often studied by varying certain policy variables in a controlled way in order to analyse the reaction of the whole system.[3] For multiplier analysis two basic simulations are required: a controlled solution and a disturbed solution that involves a change in a policy variable. Policy simulation results can be presented in terms of the ratio of the difference between the endogenous variables in the disturbed and controlled solution to the endogenous variables in the controlled solutions.

In the present study we are concerned with the dynamic response of the system to different policy actions. Obtaining multipliers for linear models involve a straightforward procedure. However, given the non-linear nature of the model and the presence of lagged variables, we have to allow many periods to pass to obtain the long-run multiplier values. Hence a sequence of multipliers will be

generated. The first period multiplier is called the impact multiplier, and the sequence of multipliers are known as dynamic long-run multipliers.

5.4.1 Fiscal Policy Simulation

The purpose of implementing this policy simulation is to investigate the behavioural response of the model to sustained annual increases in government investment expenditure. Investment is income generating in the short-run and output creating in the long-run. In this experiment annual government investment expenditure is increased by 10 percent above the control solution from 1974 to 1983. That is, government investment expenditure is 10 percent greater than government investment expenditure in each of these control years. The year 1974 is chosen for this purpose because the actual total government investment expenditure was doubled in that year, due to the rise in government revenues from oil.

One immediate effect of this policy is an increase in gross investment which would increase value added in the various sectors. The increase in gross investment also has a dynamic effect by increasing total capital stock which will result in further increase in the value added by various sectors. Gross domestic product and disposable income then increase, leading to an increase in real private

consumption and private investment. This strengthens the income-creating impulses from total investment. Higher income leads to imports, thus dampening the expansion and increasing the foreign exchange gap. Higher incomes and imports increase government tax and non-tax revenues, thereby stimulating public consumption expenditures. Employment expansion is stimulated through increase in total economic activity.

The outcome of the experiment is reflected in Table 5.3. The immediate effect of this policy is an increase in total investment by 3.28 percent in 1974. Investment expanded steadily to 11.65 percent in 1983 above the control solution. The increased investment results in an increase in value added in the various sectors. This increase occurs in two ways: in the short-run, sectoral value added increases through the input-output relations and in the long-run investment is added to the capital stock which increases the residuals in most sectors and thereby results in higher sectoral value added output. The value added output in the industrial sector benefits from the increase in government expenditure -- its output increases by 2.28 percent in 1974 and 13.45 percent in 1983. Output in the agricultural sector, VAR, increases by 0.24 percent in 1974 and 15.56 percent in 1983 above the control solution. The increase in sectoral value added increases gross domestic

product, GDPR. GDPR rises above the control solution by 0.47 percent in 1974 and remains higher throughout the period 1974 to 1983. By 1983 GDPR is 9.56 percent higher than in the control solution. The increase in gross domestic product results in general increase in domestic expenditure. Total consumption expenditure, CR, in 1983 is 6.91 percent higher than the control solution. Higher domestic expenditure and output stimulate total imports, MNAR. Imports are 1.09 percent higher in 1983 above the control solution. Increased expenditure results in an expansion of the money supply, HMSC, which in 1983 is 0.75 percent higher than the control solution. The expansion in the money supply is, however, moderate due to an increase in government revenue, GTRC, which is 3.41 percent higher in 1983 above the control solution. The effect on employment, LEMP, is positive as a result of the increased government investment. The impact of this policy on general price level, P, is moderate due to the expansion of output and productivity.

It is seen from this experiment that an increase in government investment expenditure results in higher gross investment, consumption, sectoral output, total output, employment and imports.

5.4.2 Monetary Policy Simulation

The Central Bank of Nigeria has used credit to the private sector to regulate total money supply and general economic activity in the country. The purpose of implementing this policy simulation is to investigate the behavioural response of the model to sustained annual increase in credit to the private sector. In this experiment the annual increase in credit to the private sector is increased by 10 percent above the control solution from 1974 to 1983. That is credit to the private sector is 10 percent greater than credit to the private sector in each of these control years. The channels through which bank credit to the private sector affects the entire system are private consumption expenditure and money supply equations. An expansion of credit to the private sector results in immediate increase in money supply. The real sector of the economy is however affected after a one year period, see Table 5.4. The private consumption expenditure increases from 1975 and by 1983 it is 6.48 percent above the control solution. The increase in private consumption expenditure feeds back into the input-output block of the model as sectoral value added are linked to final demand through the input-output coefficients. The value added in agriculture, VAR, is 10.13 percent higher than the control solution in 1983. In the same year, value added in industry, VMBR, and

commerce, VDSR, are 3.54 percent and 5.37 percent above the control solution. The increase in value added in petroleum mining, VNR, is however low at 1.58 percent above the control solution which indicate that this sector is affected mostly by developments in the world oil market. Total output, GDPR, is 5.4 percent higher than the control solution in 1983. The expansion of the economy has positive impact on employment, LEMP, which is 3.36 percent higher than the control solution in 1983.

5.5 Summary of Tracking Performance

Historical simulations are usually considered an integral part of the construction and validation of dynamic macroeconomic models. This chapter has been devoted to performing such historical simulations. From these simulations valuable information has been obtained about the model's tracking performance and dynamic properties. Also the final decision on which equations to include among several competing specifications has to some extent, been based on the outcome of such experiments. The simulation results and statistical measures based on Theil's inequality coefficients and its various components suggest that the overall performance of the model is very good. The model also exhibits satisfactory behavioural response and dynamic properties when subjected to exogenous shocks in main policy

variables. Fiscal policy and monetary policy interventions were analysed.

The next chapter is devoted to discussing the forecasts for the period 1984 to 2000 as generated by the model. Simulation experiments concerning institutional and structural changes will also be discussed.

TABLE 5.1

SOURCES OF HISTORICAL SIMULATION ERRORS

VARIABLES	U	U^M	U^S	U^C	U^R	U^D
BOP	0.2867	0.0177	0.0036	0.9786	0.0987	0.8835
BCAC	0.0087	0.0338	0.3088	0.6575	0.3460	0.6203
BCUC	0.1570	0.0215	0.1742	0.8043	0.3131	0.6654
CGR	0.0688	0.0043	0.0013	0.9945	0.0682	0.9275
CPR	0.0229	0.0016	0.0069	0.9915	0.0903	0.9081
CR	0.0241	0.0024	0.0037	0.9938	0.0777	0.9199
DEPR	0.0011	0.0737	0.3825	0.5438	0.3633	0.5630
DGR	0.0000	0.0000	0.0000	1.0000	0.0000	1.0000
DPR	0.0035	0.0737	0.4716	0.4547	0.4336	0.4926
EAOR	0.0394	0.0044	0.0776	0.9180	0.0158	0.9798
ECR	0.1263	0.0004	0.1690	0.8305	0.0005	0.9990
ENAR	0.0072	0.0030	0.0182	0.9788	0.0689	0.9282
ENOR	0.0470	0.0012	0.1247	0.8742	0.0290	0.9699
EOC	0.0000	0.0000	0.0000	1.0000	0.0000	1.0000
EOR	0.0001	0.0001	0.0000	1.0000	0.0000	1.0000
ETGR	0.0033	0.0011	0.0578	0.9411	0.1023	0.8966
ETGSR	0.0029	0.0015	0.0647	0.9342	0.1097	0.8892
FADS	0.1042	0.0000	0.0412	0.9588	0.0000	0.9999

TABLE 5.1 (CONTINUED)

SOURCES OF HISTORICAL SIMULATION ERRORS

VARIABLES	U	U^M	U^S	U^C	U^R	U^D
FDSC	0.0253	0.0000	0.0165	0.9834	0.0012	0.9987
FDSS	0.0304	0.0014	0.0034	0.9952	0.0021	0.9965
FDSR	0.0918	0.1471	0.0113	0.8416	0.0808	0.7721
FODC	0.0063	0.0405	0.4227	0.5368	0.4549	0.5046
FODS	0.0065	0.0261	0.2867	0.6873	0.3225	0.6515
FRC	0.1371	0.0655	0.3130	0.6215	0.4631	0.4714
GDNC	0.2234	0.0000	0.1809	0.8191	0.0069	0.9930
GDOC	0.0043	0.0016	0.0385	0.9598	0.0231	0.9752
GDPC	0.0017	0.0811	0.2027	0.7161	0.1826	0.7362
GDPOR	0.0144	0.0297	0.0152	0.9550	0.0012	0.9690
GDPR	0.0117	0.0302	0.0177	0.9521	0.0000	0.9698
GDTC	0.0077	0.0008	0.1079	0.8912	0.0742	0.9249
GEXPC	0.0029	0.0100	0.0756	0.9142	0.0580	0.9318
GMTC	0.0284	0.0065	0.0006	0.9929	0.0107	0.9828
GNORC	0.0184	0.0145	0.1035	0.8819	0.0516	0.9339
GNPR	0.0121	0.0302	0.0140	0.9558	0.0003	0.9695
GPORC	0.0056	0.0020	0.0094	0.9886	0.0021	0.9959
GSRTC	0.1380	0.0354	0.2966	0.6680	0.1007	0.8639
GTRC	0.0056	0.0018	0.0752	0.9229	0.0498	0.9483
GURC	0.2068	0.0000	0.1371	0.8629	0.0032	0.9968
GXTC	0.0049	0.0155	0.0072	0.9774	0.0181	0.9665

TABLE 5.1 (CONTINUED)

SOURCES OF HISTORICAL SIMULATION ERRORS

VARIABLES	U	U^M	U^S	U^C	U^R	U^D
HLGC	0.0142	0.0007	0.0007	0.9986	0.0018	0.9975
HMSC	0.0054	0.0791	0.0495	0.8715	0.0325	0.8885
IPR	0.0405	0.0105	0.0342	0.9554	0.0088	0.9807
IR	0.0084	0.0105	0.0007	0.9888	0.0129	0.9766
KGR	0.0000	0.0000	0.0000	1.0000	0.000	0.000
KPR	0.0035	0.0737	0.4716	0.4547	0.4337	0.4926
KR	0.0011	0.0737	0.3825	0.5438	0.3633	0.5631
LWIR	0.0037	0.0485	0.0038	0.9477	0.0001	0.9514
LEMP	0.0115	0.2813	0.0000	0.7187	0.0415	0.6733
MCR	0.0635	0.0174	0.0011	0.9816	0.0829	0.8998
MIGS	0.0303	0.0038	0.0087	0.9875	0.0365	0.9597
MICR	0.0516	0.0028	0.0346	0.9626	0.0004	0.9967
MNAR	0.0365	0.0073	0.0060	0.9867	0.0663	0.9264
MRR	0.0343	0.0000	0.0244	0.9756	0.1017	0.8983
MSFR	0.0557	0.0011	0.0003	0.9987	0.0906	0.9083
MSOPR	0.0624	0.0003	0.0129	0.9868	0.0539	0.9957
MTGR	0.0318	0.0075	0.0001	0.9924	0.0252	0.9673
MTGSR	0.0211	0.0039	0.0413	0.9548	0.1202	0.8758
NYC	0.0024	0.0736	0.1718	0.7545	0.1491	0.7773
NYDR	0.0199	0.0302	0.0082	0.9617	0.0128	0.9571

TABLE 5.1 (CONTINUED)

SOURCES OF HISTORICAL SIMULATION ERRORS

VARIABLES	U	U^M	U^S	U^C	U^R	U^D
NYR	0.0149	0.0272	0.0067	0.9662	0.0058	0.9671
P	0.0041	0.0418	0.0001	0.9581	0.0018	0.9564
PDC	0.0186	0.0027	0.0039	0.9934	0.0033	0.9941
PDM	0.0061	0.0005	0.0096	0.9899	0.0005	0.9990
RAR	0.0663	0.0052	0.0450	0.9498	0.0067	0.9881
RDSR	0.308	0.0105	0.2455	0.7439	0.0440	0.0454
RMBR	0.1963	0.0085	0.1408	0.8507	0.0126	0.9788
RUTR	0.2948	0.0036	0.2022	0.7942	0.0098	0.9866
VAR	0.0347	0.0070	0.0786	0.9143	0.6868	0.3061
VDSR	0.0235	0.0243	0.1807	0.7951	0.0852	0.8905
VMBR	0.0142	0.0257	0.0058	0.9685	0.0328	0.9414
VNR	0.0082	0.0073	0.0367	0.9561	0.0757	0.9171
VUTR	0.0163	0.0227	0.0764	0.9008	0.0198	0.9575

TABLE 5.2

SOURCES OF HISTORICAL SIMULATION ERRORS

(Percentage Distribution

	U	U^m	U^s	U^c	U^r	U^d
	Relative Frequency					
0.0 <0.1	84.7	97.2	73.5	--	79.0	--
0.1 <0.2	8.3	1.4	12.5	--	8.4	--
0.2 <0.3	5.6	1.4	5.6	--	--	--
0.3 <0.4	1.4	--	5.6	--	7.0	1.4
0.4 <0.5	--	--	2.8	2.8	4.2	2.8
0.5 <0.6	--	--	--	2.8	--	4.2
0.6 <0.7	--	--	--	4.2	1.4	4.2
0.7 <0.8	--	--	--	8.3	--	4.2
0.8 <0.9	--	--	--	12.5	--	12.5
0.9 <1.0	--	--	--	69.4	--	66.9

TABLE 5.3

FISCAL POLICY SIMULATION: PERCENTAGE DIFFERENCE IN MAJOR ENDOGENOUS VARIABLES

	GDPR	VCAR	VNR	VHBR	VDSR	VUTR	LEMP	CR	IR	MHAR	HHSC	GTRC	P
1974	0.47	0.24	0.21	2.28	0.18	0.63	0.26	0.06	3.28	0.47	2.26	0.09	-0.23
1975	1.04	0.56	0.54	3.87	0.39	1.41	0.56	0.09	4.72	0.67	3.22	0.21	-0.27
1976	1.66	1.03	0.80	5.15	0.65	2.33	0.96	0.18	5.96	0.97	1.61	0.26	-0.61
1977	3.90	4.34	1.22	6.56	3.33	4.69	2.49	3.06	6.36	1.97	2.54	1.02	-0.23
1978	4.86	5.84	1.59	7.58	3.95	6.28	3.04	3.75	6.99	1.85	2.41	1.53	0.19
1979	4.66	5.87	1.24	8.06	3.73	5.96	3.05	3.62	7.70	1.40	1.53	1.17	0.38
1980	5.26	6.74	1.48	8.30	4.21	6.29	3.55	4.16	7.73	1.37	1.31	1.15	0.41
1981	7.65	10.29	3.08	9.77	6.01	8.71	5.08	6.09	8.72	2.02	1.74	2.11	0.43
1982	8.33	11.62	4.01	10.60	6.10	9.77	5.42	6.11	9.50	1.52	1.27	2.80	0.56
1983	9.56	15.56	3.57	12.45	6.71	11.26	5.90	6.91	11.65	1.09	0.75	3.41	0.65

TABLE 5.4

MONETARY POLICY SIMULATION: PERCENTAGE DIFFERENCE IN MAJOR ENDOGENOUS VARIABLES

	GDPR	VAR	VNR	VMBR	VDSR	VUTR	CR	IR	LEMP	MNAR	MMSC	GTRC	P
1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.53	0.00	0.00
1975	0.07	0.06	0.02	0.06	0.10	0.12	0.05	0.00	0.05	-0.30	7.80	-0.10	-0.55
1976	0.10	0.11	0.03	0.08	0.15	0.16	0.09	0.03	0.05	-0.29	9.22	-0.15	-0.87
1977	1.42	2.22	0.18	0.72	1.90	1.53	2.07	0.04	0.90	0.47	8.18	0.32	-0.26
1978	2.34	3.73	0.40	1.45	2.83	2.48	3.15	0.52	1.46	0.85	6.39	0.72	0.02
1979	2.52	4.06	0.41	1.89	2.98	2.50	3.38	0.95	1.65	0.87	3.56	0.66	0.16
1980	2.52	4.00	0.47	1.81	2.95	2.33	3.39	1.02	1.74	0.65	2.91	0.60	0.21
1981	3.27	5.39	0.85	1.88	3.76	2.99	4.38	0.87	2.16	0.57	5.63	0.94	0.22
1982	4.27	7.14	1.41	2.55	4.51	3.93	5.27	1.31	2.77	0.74	2.63	1.52	0.26
1983	5.40	10.13	1.58	3.54	5.37	4.82	6.48	2.31	3.36	0.97	1.68	2.20	0.34

FIGURE 5.1

Historical Simulation of Gross Domestic Product

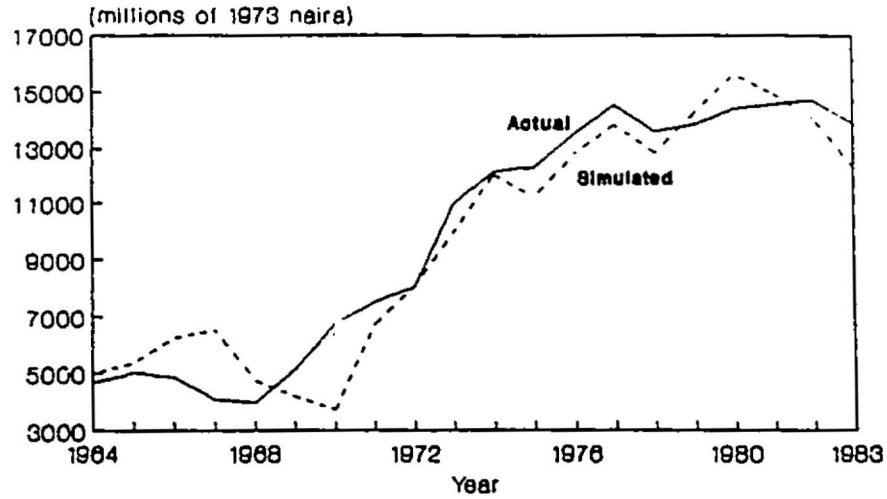


FIGURE 5.2

Historical Simulation of Nominal Gross Domestic Product

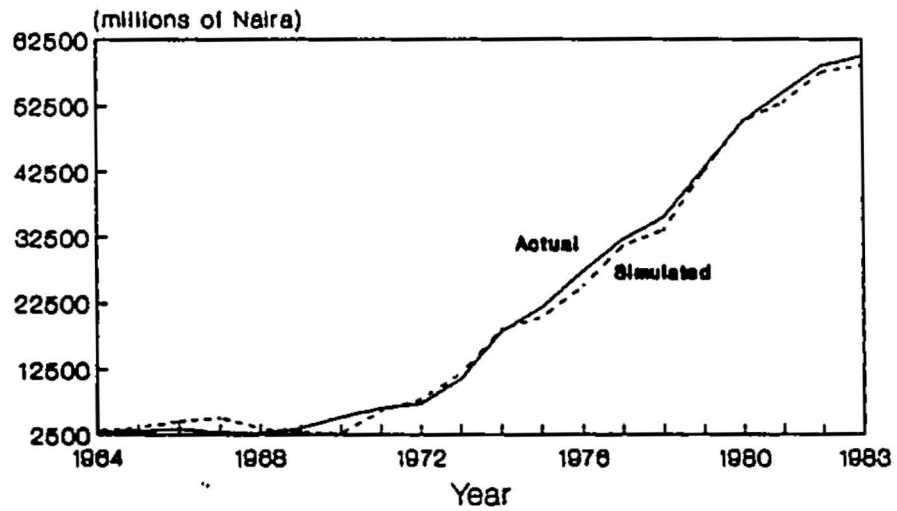


FIGURE 5.3

Historical Simulation of Value Added in Agriculture

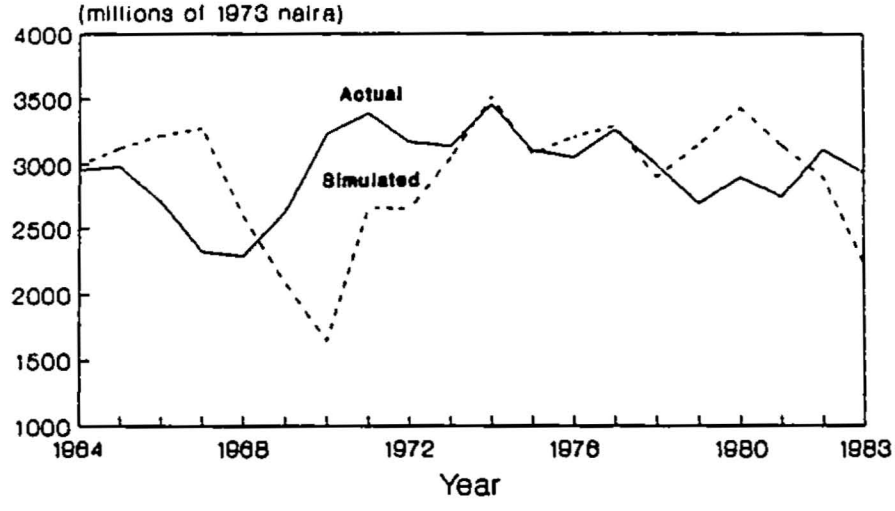


FIGURE 5.4

Historical Simulation of Value Added in Mining

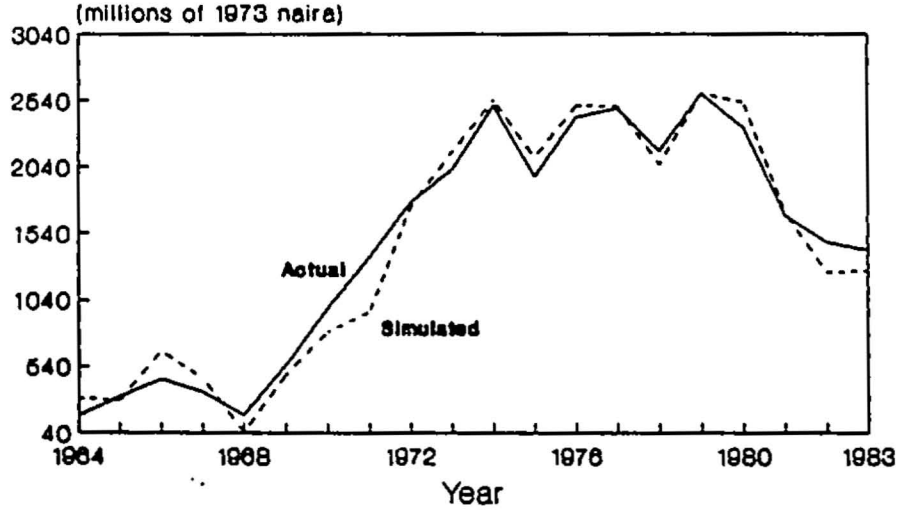


FIGURE 5.5
Historical Simulation
of Value Added in Industry

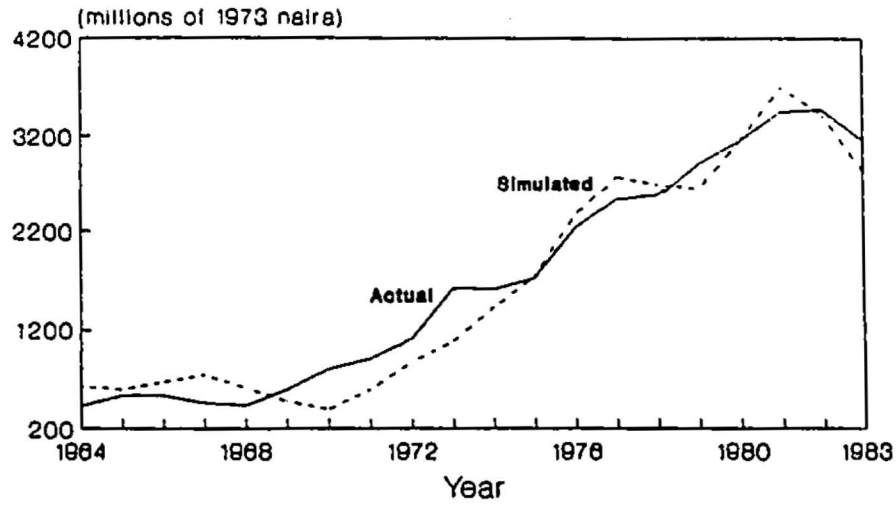


FIGURE 5.6
Historical Simulation
of Value Added in Utilities

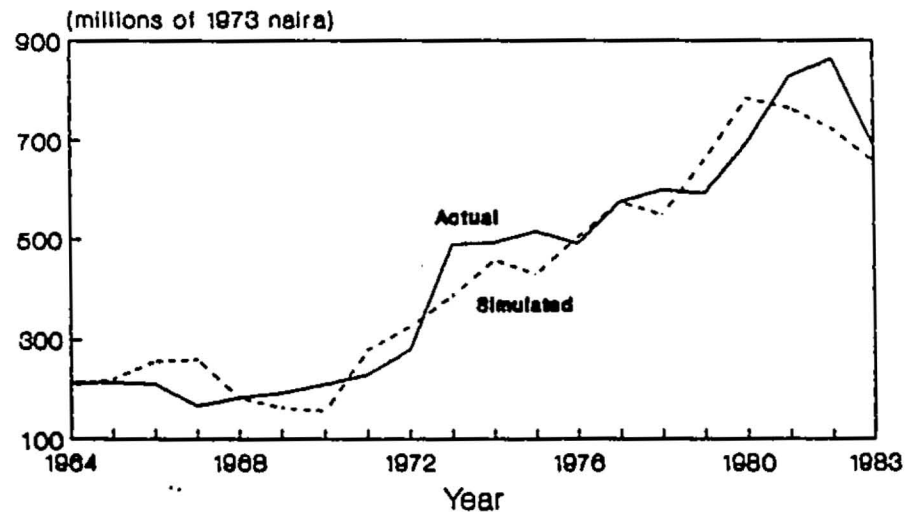


FIGURE 5.7
Historical Simulation
of Total Consumption

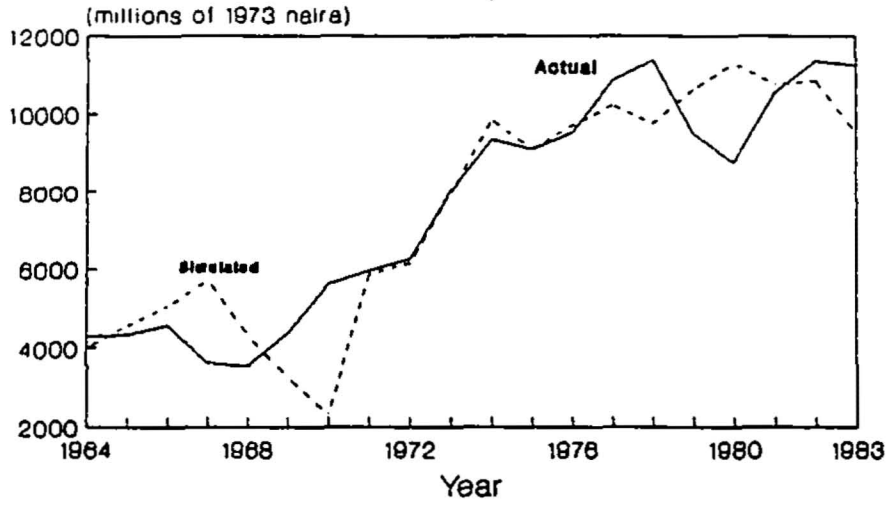


FIGURE 5.8

Historical Simulation
of Total Investment

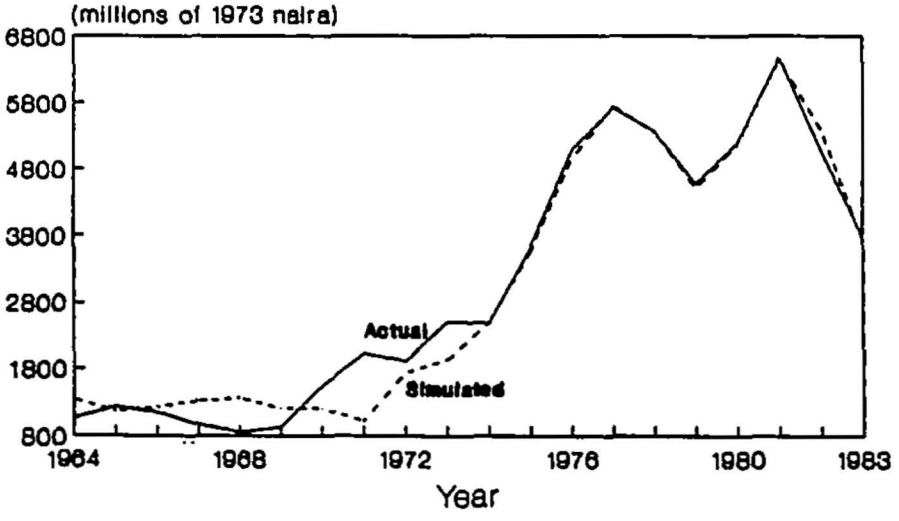


FIGURE 5.9

Historical Simulation
of Total Export

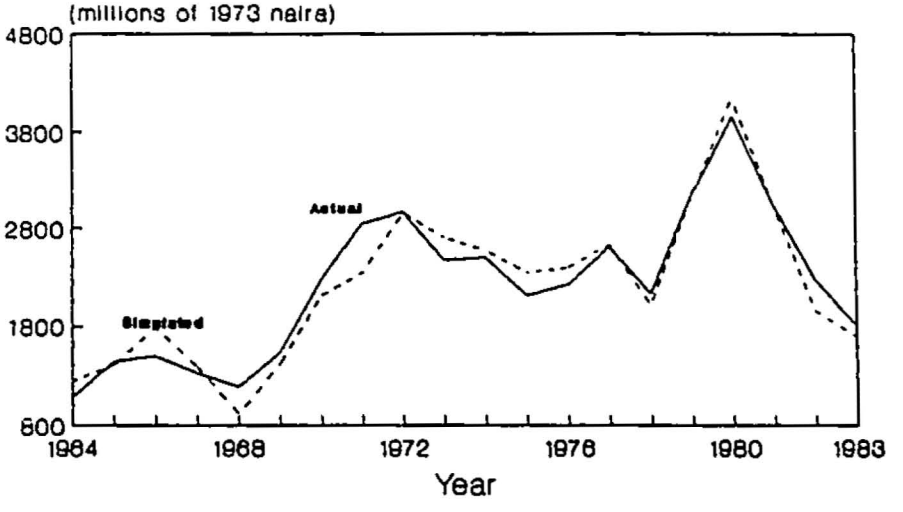


FIGURE 5.10

Historical Simulation
of Total Imports

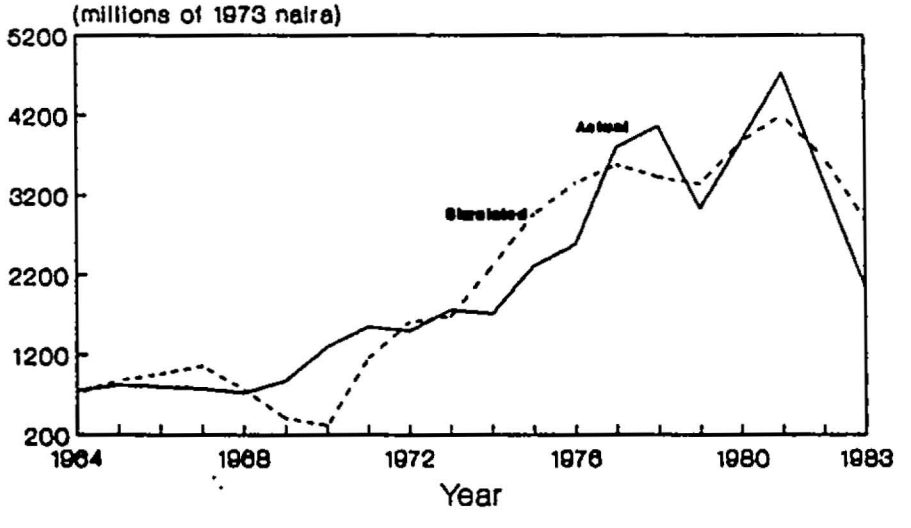


FIGURE 5.11

Historical Simulation
of Current Account Balance

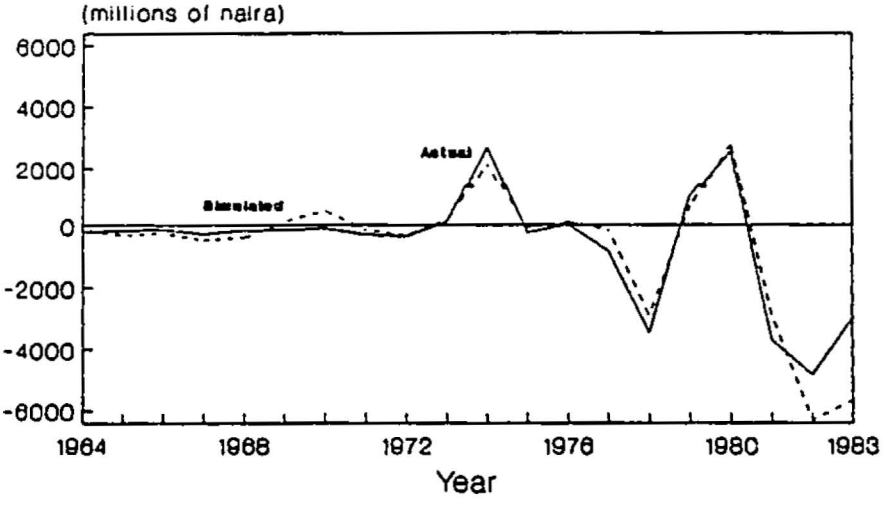


FIGURE 5.12

Historical Simulation
of Balance of Payments

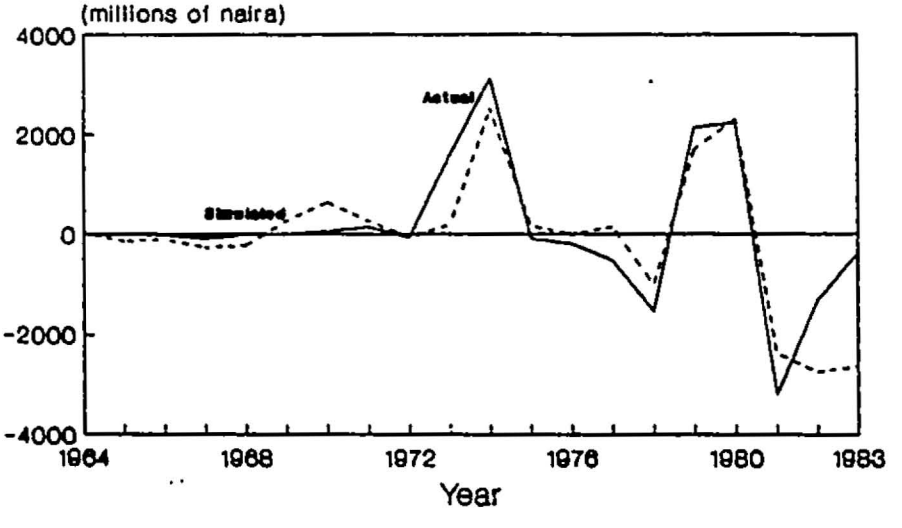


FIGURE 5.13
Historical Simulation of Money Supply

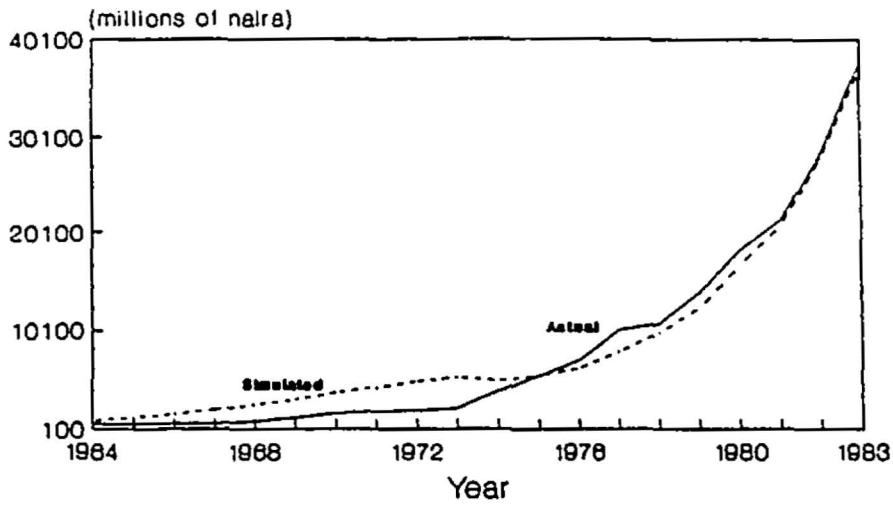


FIGURE 5.14
Historical Simulation of Total Government Revenue

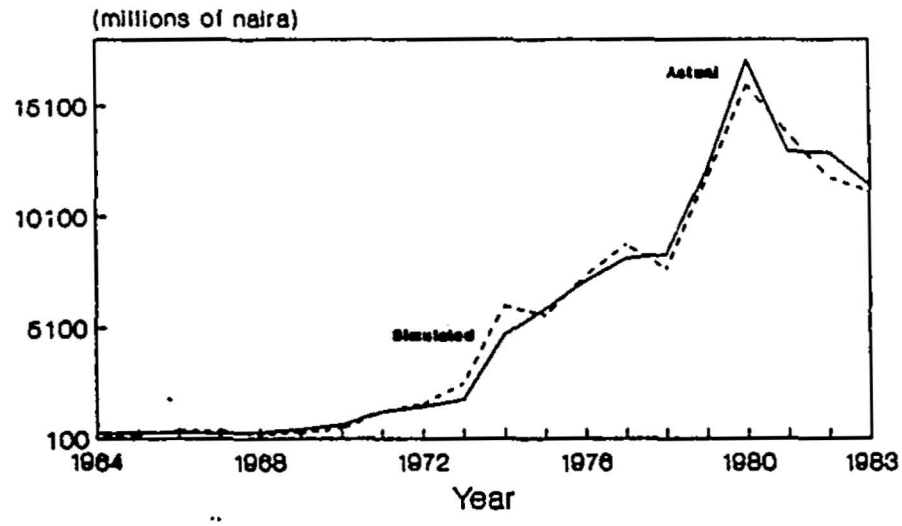


FIGURE 5.15

Historical Simulation
of GDP Price Deflator

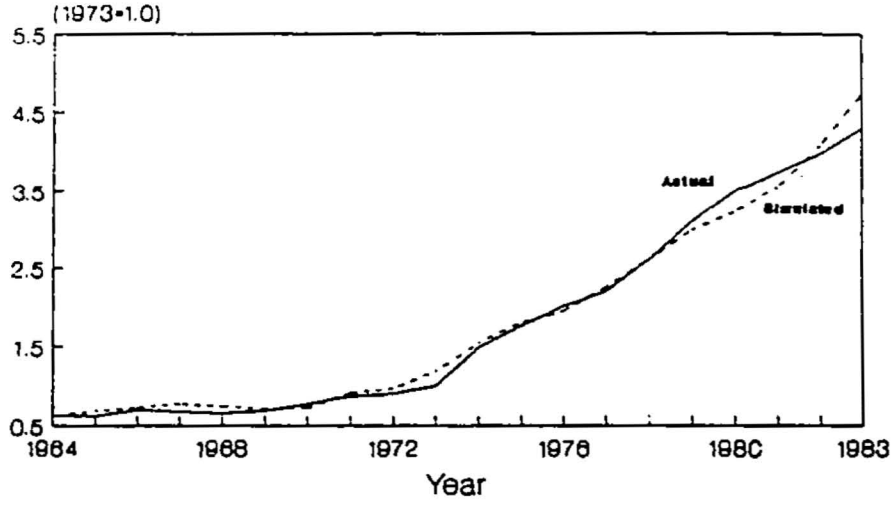
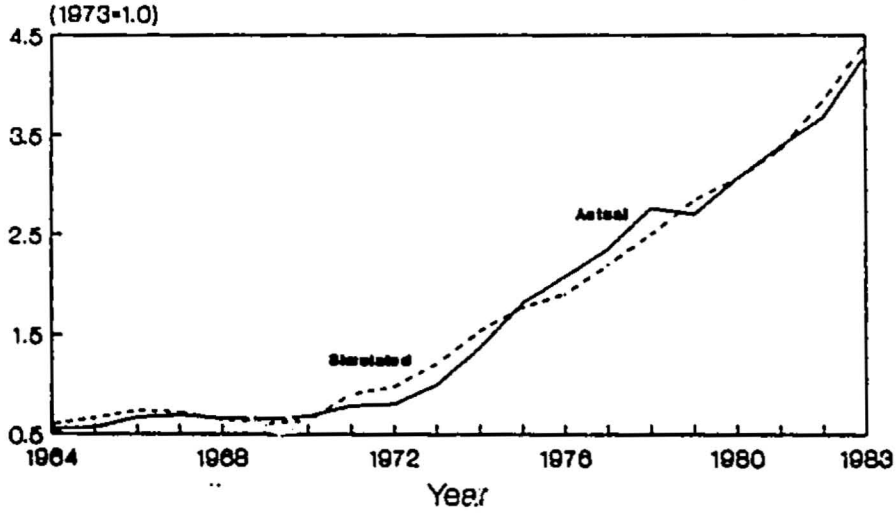


FIGURE 5.16

Historical Simulation
of Wage Rate



FOOTNOTES TO CHAPTER FIVE

1. See Theil (1966) for a detailed discussion of the decomposition of Theil's inequality coefficient.

2. See Theil (1961) pp. 30-39.

3. For more details on policy simulations see Fromm and Taubman (1968).

CHAPTER SIX

FORECASTING EXPERIMENTS WITH THE MODEL

6.1 Introduction

The model has been used in the previous chapters first as an empirical description of the major structural features of Nigerian economy and then to assess the impact and long-run multipliers of alternative policies in a historical simulation context. However a more positive role for an integrated macroeconometric model of this nature is in forecasting growth patterns. As Klein, and Young (1980) succinctly put it:

> "As a first step in validating a model, simulation and multiplier analysis over the sample period are necessary, but they are not sufficient to guarantee that a model will be a useful forecasting tool. While no model should be accepted if it does not pass certain criteria regarding its ability to reproduce the historical path of the economy or if it fails to generate multiplier responses akin to those suggested by economic theory and past experience, the final validation of any econometric model is its ability to produce 'sensible' forecasts, or at a minimum, be able to simulate with some degree of accuracy, the path of economic phenomena outside the sample period" (p.67).

This chapter is devoted to discussing the forecasts for the period 1984 to 2000 as generated by the model. Questions concerning the ways in which the structure of the

economy might be altered, or which sectors of the economy should be emphasized in order to facilitate higher and sustained economic growth in the future are analysed with the model. Section 6.2 presents and assesses the benchmark forecast values of the major endogenous variables as generated by the model. In sections 6.3 and 6.4, the effects on the growth path of the economy of alternative assumptions about the world price of oil are discussed. In section 6.5, the impact of an agricultural exports drive development strategy is examined. The forecasts obtained by changing the composition of total consumption in favour of agricultural goods sector is discussed in section 6.6. Section 6.7 examines the impact on the economy of increased capital stock coefficients in the agricultural sector. The major conclusions that emerge from these forecasting experiments are summarized in section 6.8.

6.2 Base Case Forecasts

Initial "benchmark" forecasts have been made for the period 1984 to 2000, given the initial values of 1983, the last year of the sample period and the exogenous variables.[1] The forecasts thus span a period of seventeen years which is sufficient to evaluate the medium-to-long-term prospects and implications of developments for Nigeria. The benchmark forecasts is divided into two sub-periods, 1984-1987 and

1988-2000 and the results are presented in Table 6.1 where the variables most significant in reflecting growth patterns are listed. In Table 6.2, their forecasted annual growth rates are given. We analyse the period 1984 to 1987 first. In the short-run the most striking results are the following:

1. A sharp deceleration of economic activity between 1984 and 1987 can be noted. The average annual growth rate real gross domestic product, (GDPR), is negative 3.8 percent in this period.
2. The GDPR deflator, a proxy for the general price level, growth rate is about 18 percent per annum for the same period.
3. The balance on current account worsens; the annual average growth rate of exports is negative 16 percent.
4. Government total revenue in this period declined by about 40 percent per annum.

These basic results are, of course, closely interrelated. The 1984-1987 recession is, in part, an expected consequence of the already sharp decline in economic activity over the period 1980-1983, following the 1981 collapse of the oil boom. Due to the austerity measures adopted in 1984 and the noticeable improvements in the performance of the petroleum sector, GDPR increased in

1985. However, the dramatic slump in world oil prices during the first half of 1986 kept the economy in the depths of recession. The short-run forecasts indicate that the Nigerian economy is highly vulnerable to the performance of the petroleum sector.

After 1988 the forecasting results under the base case scenario indicate that GDPR will grow at an annual rate of 4.5 percent between 1988 and 2000. Total output is 12855 million naira in 1988; it increases to 15523 million in 1992 to and 23007 million by the year 2000.

The sectoral composition of total output can also be gauged. Value added in petroleum sector, VNR, increases at an annual average rate of 7 percent and its share in total output is about 14 percent in 2000. Value added in the agricultural sector, VAR, grows at an annual rate of 4.1 percent between 1988 and 2000 while its share declines from 17.2 percent in 1988 to 16.7% in 2000.

The industry sector value added, VMBR, is expected to grow at an annual rate of 4.3 percent and its share in total output is 23 percent in 2000 compared to 20 percent in 1984. Heavy industry is usually thought of as a key element in the development process. It is common to find a great deal of effort on the part of governments in developing economies directed towards the promotion of heavy industries, sometimes to the detriment of agriculture.

While it is essential to build a solid base in industry, a more balanced future development strategy which is conducive to sustained growth is important.

The distribution and services sector value added, VDSR, is projected to grow at an annual rate of 3.9 percent between 1988 and 2000. Its share in total output is projected to decline from 45 percent in 1988 to 41 percent in 2000. Infrastructure value added, VUTR, which includes electricity, transportation and communications is projected to grow at an annual rate of 4.7 percent.

On the domestic expenditure side real private consumption expenditure, CPR, grows at an annual rate of 4.6 percent between 1988 and 2000 resulting in a private consumption to disposable income ratio will be 0.83 in 2000. Aggregate consumption, CR, is projected to grow at 4.4 percent and public consumption expenditures, CGR, grows at 2.6 percent. Aggregate gross real investment is projected to grow at an average annual rate of 4.9 percent. Real public investment grows at 4.1 percent while private investment is projected to grow at a rate of 6.9 percent. The share of public investment in total investment increased sharply during the period 1970 and 1983 while real private investment actually fell from 2408 million naira in 1977 to 1151 million naira in 1983. In the forecast, however, private investment's share in total investment

increases from 26 percent in 1988 to 34 percent in 2000. Since private investment is dynamically related to output and is also an income generating force in all sectors, it can be expected that it will play a significant role in the future growth of the Nigerian economy.

The picture that emerges for the public sector of the economy is not very encouraging. Total government revenue, GTRC, is projected to grow at an average rate of 7.7 percent between 1988 and 2000. Total government expenditures grow at the rate of 8.5 percent. This results in large deficits most of which are monetized through credit from the domestic banking system, with the implication that the money supply grows at the rate of 7.7 percent. The expansion of the money supply is, however, constrained by the increasing balance of payment deficits that results in decreasing net foreign asset holdings of the banking system. The general price level is projected to increase at an annual rate of 4.2 percent.

According to the projections the external trade sector and the associated balance of payments accounts will be a source of continuing anxiety for Nigeria, as it was in the early 1980s. Total exports are projected to grow at an average rate of 6.5 percent. The share of oil in total exports is 87 percent in 2000. The composition of total imports is projected to change dramatically by 2000 with

imports of capital goods increasing to about 67 percent while imports of consumer goods will be 17 percent. There is still a considerable trade gap.

Employment is projected to grow at the rate of 3 percent. The expansion of employment is constrained as the oil industry employs relatively few. The industrial and agricultural sectors would thus need to develop faster to absorb the growing labour force. The problem is all the more serious as a consequence of the high volume of unemployment that resulted from the 1984-1987 recession.

Our benchmark forecasts highlight, among other factors, the vulnerability of the Nigerian economy to developments in the oil sector. In the next section we consider the sensitivity of growth in the economy to increase in the price of oil.

6.3 Effect of Higher Oil Price

Given the uncertainties of the world oil market and the crucial role that the price of oil plays in Nigeria's growth an alternative forecast based on an assumed higher oil price is considered. In the alternative projection the price of oil is assumed to grow at 10 percent per annum, rather than 6 percent in the benchmark forecasts from 1990 to 2000. The values of all other exogenous variables are kept at their benchmark levels.

The forecasting results as reported in Tables 6.3 and 6.4 indicate a dramatic increase in economic activity as real gross domestic product, GDPR, grows at 6 percent from 1988 to 2000 compared to 4.5 percent in the benchmark forecasts. GDPR is 4252 million naira higher in 2000 or about 18.5 percent above the benchmark values. Value added in petroleum-mining sector, VNR, grows at the rate of 10 percent compared to 7 percent in the benchmark solution. Value added in the agriculture sector, VAR, grows at an average annual rate of 6.2 percent while industry sector, VMBR, grows at 5.1 percent. Value added in distribution and services sector grows at 4.9 percent. Infrastructure is projected to grow at 6 percent rather than 4.7 percent in the benchmark forecast.

Total investment grows at the rate of 5.6 percent as opposed to 4.4 percent in the initial forecasts with private investment at 8.8 percent rather than 7 percent. Exports of oil grow at the rate of 10 percent by assumption while total exports grows at the rate of 9.6 percent. Current account deficits decline from 7506 million naira in the benchmark forecast to 5263 million naira in 2000. This represents about 25 percent savings in the current account in 2000. Finally, total government revenue is projected to grow at an average annual rate of 10 percent rather than 7.7 percent, which reduces government deficits by 16 percent in 2000.

Overall, the results of this experiment suggest that an increase in the price of oil would induce a higher growth rate of the economy, and increase output, investment, exports and imports. The current account deficit is reduced considerably. In the next section the consequence of lower oil price is explored as well.

6.4 Effect of Lower Oil Price

In this alternative projection the price of oil is assumed to grow at 2 percent per annum, rather than 6 percent in the benchmark forecast from 1990 to 2000. The values of all other exogenous variables are kept at their benchmark levels. The forecasting results as reported in Tables 6.5 and 6.6 indicate a substantial decline in economic activity as real gross domestic product, GDPR, grows at 3.2 percent from 1988 to 2000 compared to 4.5 percent in the benchmark forecasts. GDPR is 3098 million naira lower in 2000 or about 13.5 percent below the benchmark values. Value added in petroleum-mining sector, VNR grows at the average annual rate of 4.1 percent, agriculture, VAR, at 2 percent, industry, VMBR, at 3.6 percent distribution, VDSR, at 3 percent and infrastructure, VUTR, at 3.5 percent.

Total investment grows at the average annual rate of 4.3 percent with private investment at 5.2 percent. Total

exports grows at 3.2 percent compared to 6.5 percent in the benchmark forecasts. Current account deficits worsens from 7506 million naira in the benchmark forecasts to 8540 million naira in 2000. Total government revenue is projected to grow at an average annual rate of 5.4 percent compared to 7.7 percent in the benchmark forecasts.

The results of this experiment suggest that a decrease in the price of oil would induce a lower growth rate of the economy and reduce output, investment, employment, and exports. The current account deficit is worsened.

The economy of Nigeria is clearly vulnerable to developments in the world oil market. Given the uncertainties associated with the world price of oil, there is reason to diversify the economic base. In subsequent sections we focus on the interindustry linkages inherent in the economy through the input-output block and explore ways in which the structure of the economy can be diversified.

6.5 Effects of Agricultural Export Promotion

Agricultural exports declined substantially between 1960 and 1983. A forecasting experiment focusing on agricultural export promotion is analysed in this section. Agricultural export promotion strategy is aimed at diversifying export earnings, reducing dependence on oil

exports and shifting production and exports toward agriculture. The strategy will involve improved production incentives to farmers, improvements in input delivery system, overhaul of institutional marketing board system and establishment of export promotion council. Impacts of institutional and structural policy changes are frequently evaluated with input-output models by changing structural coefficients and input and final demands. In this experiment primary agricultural production is increased by 10 percent; the proportion of agriculture in total exports is increased by 10 percent while of oil is simultaneously reduced. This experiment involves recalculating structural coefficients in the input-output block and simulating the model.[2]

The forecast results generated in this experiment are presented in Table 6.7 and 6.8 in absolute deviations and percentage deviations from the benchmark solutions respectively. An integrated macroeconometric and input-output model holds the possibility for viewing agricultural export policy outcomes more broadly, in terms of impacts on other industries and national aggregates. This cultural export promotion strategy increases agricultural value added, VAR more than it reduces output from the petroleum-mining sector, VNR, and consequently there is an increase in the real gross domestic product. VAR increases by 5.8

percent in 1984, by 8.05 percent in 1990 and 9.53 percent in 2000. In the same period, VNR declines by 9 percent, 8.1 percent and 7.7 percent respectively. The increase in VAR, however, outweigh the decline in VNR leading to GDPR increase of 260 million naira above the benchmark levels. Government revenue increases by 275 million naira above the control solution in 2000. Total agricultural exports increase by 33 million naira above the control solution in 2000.

The results of this experiment indicate that promotion of agricultural exports will increase output in the sector, and aggregate output, which induces increases in the level of economic activity.

6.6 Effects of a Change in the Composition of Consumption

The allocation of consumption expenditures between different sectors affect the development of sectoral productive structure and the overall economic performance. The services and distribution sector increased tremendously between 1960 and 1983 due to expansion in government expenditures. This experiment focuses on the impact of shifting total consumption expenditures in favour of food and agricultural components. The linkage of the input-output block with the econometric model provides a useful analytical tool to consider intersectoral flows of final

demand and output through changes in structural coefficients. In this experiment the proportion of services in total consumption expenditure is reduced by 10 percent and that of agriculture is increased simultaneously. In terms of the H matrix in the input-output block, this means that the deliveries of agriculture, VAR, would represent a higher proportion of total consumption deliveries while the services sector, VDSR, represent a smaller proportion.

Tables 6.9 and 6.10 present the results based on this simulation experiment. The outcome of the experiment is a decline in sectoral value added in services by 6.2 percent and a rise in agriculture by 20.5 percent in 2000. The overall effect is an increase in total production -- the change in the demand pattern produces a positive effect on aggregate output, GDPR, which is 257 million naira above the benchmark scenario in 2000. Government revenue, employment and imports are also increased due to the expansion of domestic economic activity.

6.7 Effects of Change in Allocation of Capital Stock

The allocation of investments and capital stock is essential for the growth strategy for Nigeria. Strong priority has been given to capital-intensive manufacturing and construction industries in the past as the basis for growth. From 1960 to 1983, the industry sector expanded

relatively faster than the agriculture sector due to government investment policy which favoured rapid industrialization and consequently urbanization. In recent years rapid industrialization have been constrained by over reliance on imported capital goods, lack of adequate raw materials from the agriculture sector, and inadequate food production to meet the growing urban requirements.

In this experiment a shift in the allocation of capital stock is analysed by assuming that the coefficient on capital stock in the residual value added in agriculture is increased by 50 percent while that of the industry is reduced simultaneously.[2] The effects of this experiment are summarized in Tables 6.11 and 6.12. The industry sector declines and agriculture increases by the same absolute amount and the two production effects neutralize each other as the total output is unaffected in the first year. The macroeconomic consequences of a reallocation of capital stock from the industry sector towards agriculture will show up in the subsequent years. Agricultural value added is higher by 35 percent in 2000 above the benchmark scenario and this compares favourably to a 15 percent decline in industry in the same period. The increase in agriculture stimulates expansion in sectoral value added in services, utilities and total output. Total output, GDPR, is higher by 4 percent in 2000 above the benchmark level. Employment,

consumption and government revenue benefit from higher overall economic activity.

6.8 Summary of Forecasting Experiments

It is generally recognised that one of the most useful application of macromodels in developing economies is in evaluating the sectoral and macroeconomic implications of long-term growth patterns. In order to assess the consequences of various exogenous changes, however, it is necessary to draw a reference path of the economy which these changes would alter. The benchmark growth path of the Nigerian economy generated within the model framework suggest a moderate rate for the period between 1988 and 2000 following the major economic recession from 1983 to 1987.

Developments in the world oil market are crucial to the future evolution of economic growth in Nigeria. Alternative simulations based on the assumptions of higher and lower prices of oil were analysed. The higher oil price simulation raises the level of aggregate economic activity, and its growth rate increases from about 4.5 percent in the benchmark solution to 6 percent. This result contrasts sharply with the outcome from the lower oil price simulation experiment which indicates a growth rate of 3.2 percent.

These simulation experiments have policy implications for the government. Oil prices and revenues may increase in

the future but such increases will not be permanent. Revenues from oil exports accrue to the federal government and deposited into a Federation Account. In the medium term it would be prudent for the federal government not to spend all revenues from oil exports immediately as they accrue but to establish a stabilization fund that would smooth out the cyclical pattern of export earnings and its impacts on the Nigerian economy.

Given the uncertainties in the world oil market and Nigeria's vulnerability to what happens, it is essential to encourage and promote agricultural production and exports in the long-term. Agricultural production declined substantially in the past due to unfavourable incentive structure, institutional and technological limitations, and lack of long-term sectoral policy priority. Alleviating these constraints will involve institutional and structural policy changes. Impacts of structural policy changes are frequently evaluated with input-output models by changing structural coefficients and inputs and final demands. Simulation experiments involving agricultural export promotion, increased consumption expenditures in agriculture and a shift in total capital stock towards agriculture indicate higher sectoral and aggregate output.

This agricultural promotion strategy requires improving the institutional and physical infrastructure of

agriculture in order to effect shifts in the agricultural production functions. Higher investment share in agriculture is required to develop and strengthen institutions for the effective creation and dissemination of knowledge through research and extension services. Strengthening of agricultural co-operatives improvement of land tenure system and rural credit infrastructure are equally important. Improving the management, maintenance and design of existing irrigation systems as well as encouraging small-scale irrigation in the form of tube wells, could play a role.

Improving agricultural productivity, especially small- and medium-scale agriculture, represent a logically attractive option for policymakers to promote Nigerian economic growth. It will generate increased demand not only for food and other agricultural products but also for industrial goods and services through intermediate and final demand linkages (Adelman, 1984). Increased agricultural productivity will also boost foreign exchange earnings from exports while the lower import requirements of agricultural production implies a foreign exchange savings relative to the encouragement of the more import dependent non-agricultural sectors. This is of significant interest for Nigeria which is currently facing severe balance of payments

adjustment problems due to heavy reliance on oil exports and imported goods.

TABLE 6.1

BENCHMARK FORECAST: VALUES OF MAJOR ENDOGENOUS VARIABLES

	GDPR	P	VAR	VNR	VMBR	VDSR	VUTR	LEMP	CR	IR	EMAR	MMAR	MMSC	GTRC
1984	13609	5.34	2799	1456	3019	5616	719	20.24	10399	3438	1945	2794	38535	13448
1985	14596	6.66	2957	1860	3020	5983	776	21.26	10598	3189	2528	2648	39898	17605
1986	12650	8.26	2362	1046	3061	5502	680	19.45	9215	3640	1368	2501	38340	12706
1987	12574	9.04	2262	1055	2994	5588	675	19.39	9195	3459	1386	2271	33159	13102
1988	12855	9.55	2216	1177	3051	5719	694	19.67	9278	3554	1538	2101	29204	14096
1989	14123	9.99	2432	1624	3191	6117	759	20.90	10020	3702	2129	2039	29900	17858
1990	14665	10.47	2483	1737	3339	6318	789	21.43	10410	3997	2247	2037	30484	19142
1991	15025	10.92	2483	1832	3440	6459	811	22.27	10689	4193	2352	2017	31853	20247
1992	15524	11.38	2522	1963	3551	6648	841	22.27	11059	4368	2508	2015	34124	21692
1993	16082	11.85	2579	2085	3683	6861	874	22.81	11473	4567	2647	2036	36984	23190
1994	16733	12.35	2664	2217	3833	7100	912	23.45	11950	4781	2799	2075	40410	24863
1995	17483	12.86	2776	2358	4004	7389	956	24.18	12490	5013	2960	2129	44340	26731
1996	18332	13.40	2918	2508	4195	7708	1004	25.00	13096	5265	3131	2197	48712	28812
1997	19292	13.97	3091	2667	4410	8066	1059	25.94	13775	5538	3311	2276	53475	31133
1998	20385	14.56	3302	2841	4650	8473	1120	27.00	14538	5832	3507	2365	58598	33730
1999	21614	15.17	3551	3027	4918	8930	1189	28.20	15389	6152	3715	2465	64048	36634
2000	23007	15.81	3847	3226	5222	9447	1267	29.55	16345	6511	3936	2578	69487	39885

TABLE 6.2

BENCHMARK FORECAST: ANNUAL PERCENTAGE GROWTH RATE OF MAJOR ENDOGENOUS VARIABLES

	GDFR	P	VAR	VNR	VMBR	VDSR	VUTR	LEMP	CR	IR	ENAR	MHAR	HHSC	GTRC
1983/1984	-2.31	23.91	4.79	3.11	-4.73	-1.83	4.05	0.28	-7.58	-10.18	10.00	-3.42	1.99	16.92
1984/1985	7.25	24.92	5.63	27.74	0.06	6.53	7.94	5.01	1.91	-7.23	29.98	-5.23	3.54	30.91
1985/1986	-13.33	23.86	-20.13	-43.74	1.35	-8.04	-12.46	-8.49	-13.05	14.06	-45.91	-5.54	-3.90	-27.83
1986/1987	-0.60	9.42	-4.21	0.81	-2.19	1.57	-0.64	-0.27	-0.22	-4.89	1.34	-9.21	-13.51	3.12
1987/1988	2.24	5.71	-2.03	11.61	1.89	2.33	2.68	1.44	0.90	2.74	10.99	-7.48	-11.93	7.59
1988/1989	9.86	4.64	9.76	37.96	4.60	6.96	9.51	6.22	8.00	4.17	38.41	-2.95	2.39	26.69
1989/1990	3.84	4.68	2.07	7.00	4.62	3.29	3.90	2.53	3.89	7.97	5.55	-0.09	1.95	7.18
1990/1991	2.45	4.36	0.02	5.47	3.01	2.24	2.78	1.65	2.67	4.90	4.66	-0.96	4.49	5.77
1991/1992	3.32	4.18	1.55	7.14	3.23	2.91	3.70	2.24	3.46	4.16	6.62	-0.11	7.13	7.13
1992/1993	3.60	4.16	2.28	6.18	3.73	3.21	3.96	2.44	3.75	4.57	5.55	1.05	8.38	6.90
1993/1994	4.05	4.16	3.27	6.34	4.07	3.60	4.36	2.78	4.15	4.67	5.75	2.00	9.27	7.21
1994/1995	4.47	4.18	4.22	6.36	4.44	4.00	4.73	3.10	4.52	4.86	5.76	2.62	9.72	7.53
1995/1996	4.86	4.20	5.10	6.30	4.79	4.31	5.09	3.42	4.86	5.03	5.77	3.17	9.86	7.79
1996/1997	5.24	4.21	5.94	6.36	5.11	4.65	5.44	3.73	5.18	5.18	5.76	3.58	9.78	8.05
1997/1998	5.66	4.25	6.82	6.51	5.45	5.04	5.83	4.09	5.54	5.32	5.91	3.94	9.58	8.34
1998/1999	6.03	4.25	7.56	6.53	5.76	5.40	6.16	4.42	5.86	5.49	5.92	4.23	9.30	8.61
1999/2000	6.44	4.18	8.32	6.60	6.17	5.79	6.54	4.80	6.21	5.83	5.94	4.59	8.94	8.87
1983-1987	-3.80	17.94	-8.64	-15.43	-0.10	-0.99	-3.22	-2.17	-5.09	1.5	-16.31	-6.79	-2.11	-4.04
1988/2000	4.45	4.16	4.05	7.07	4.32	3.91	4.67	3.12	4.43	4.94	6.47	2.00	7.73	7.75

TABLE 6.3

HIGHER PRICE OF OIL: VALUES OF MAJOR ENDOGENOUS VARIABLES

	GDPR	P	VAR	VNR	VMBR	VDSR	VUTR	LEMP	CR	IR	ENAR	HWAR	HWSC	GTRC
1984	13609	5.34	2799	1456	3019	5616	719	20.24	10399	3438	1945	2794	38535	13448
1985	14596	6.66	2958	1860	3020	5983	776	21.26	10598	3189	2528	2648	39898	17605
1986	12650	8.26	2362	1046	3061	5502	680	19.45	9215	3640	1368	2501	38340	12706
1987	12574	9.04	2262	1055	2994	5588	675	19.39	9195	3459	1386	2271	33159	13102
1988	12855	9.55	2216	1177	3051	5719	694	19.67	9278	3554	1538	2101	29204	14096
1989	14123	9.99	2432	1624	3191	6117	759	20.90	10020	3702	2129	2039	29900	17858
1990	14808	10.47	2519	1789	3348	6357	796	21.57	10495	3997	2318	2049	30880	19559
1991	15395	10.93	2578	1960	3471	6559	829	22.14	10908	4214	2525	2060	32999	21307
1992	16075	11.39	2663	2147	3605	6793	867	22.80	11384	4421	2756	2095	36088	23266
1993	16872	11.88	2781	2349	3763	7069	912	23.58	11938	4646	3004	2160	40013	25488
1994	17817	12.88	2940	2574	3946	7394	964	24.50	12586	4894	3283	2252	44695	28029
1995	18910	12.38	3140	2822	4156	7770	1024	25.56	13327	5168	3588	2369	50049	30919
1996	20165	13.47	3385	3093	4396	8200	1092	26.78	14169	5469	3922	2508	55996	34201
1997	21600	14.04	3679	3392	4667	8694	1170	28.17	15124	5800	4288	2668	62464	37927
1998	23245	14.66	4031	3722	4976	9259	1258	29.77	16208	6163	4694	2849	69391	42162
1999	25119	15.29	4445	4087	5324	9905	1358	31.59	17435	6562	5141	3051	76724	46987
2000	27259	15.94	4931	4489	5723	10644	1472	33.66	18825	7013	5632	3277	84094	52470

TABLE 6.4

HIGHER PRICE OF OIL: ANNUAL PERCENTAGE GROWTH RATE OF MAJOR ENDOGENOUS VARIABLES

	GDPR	P	VAR	VNR	VMBR	VDSR	VUTR	LEMP	CR	IR	ENAR	MWAR	MMSC	GTRC
1984	-2.31	23.91	4.79	3.11	-4.73	-1.83	4.05	0.28	-7.58	-10.18	10.00	-3.42	1.99	16.92
1985	7.25	24.92	5.63	27.74	0.06	6.53	7.94	5.01	1.91	-7.23	29.98	-5.23	3.54	30.91
1986	-13.33	23.86	-20.13	-43.74	1.35	-8.04	-12.46	-8.49	-13.05	14.06	-45.91	-5.54	-3.90	-27.83
1987	-0.60	9.42	-4.21	0.8	-2.19	1.57	-0.64	-0.27	-0.22	-4.89	1.34	-9.21	-13.51	3.12
1988	2.24	5.71	-2.03	11.61	1.89	2.33	2.68	1.44	0.90	2.74	10.99	-7.48	-11.93	7.59
1989	9.86	4.64	9.76	37.96	4.60	6.96	9.51	6.22	8.00	4.17	38.41	-2.95	2.38	26.69
1990	4.85	4.69	3.58	10.16	4.92	3.92	4.87	3.19	4.74	7.97	8.87	-0.44	3.28	9.52
1991	3.96	4.42	2.34	9.56	3.67	3.18	4.15	2.66	3.93	5.43	8.93	-0.54	6.86	8.94
1992	4.42	4.27	3.29	9.54	3.86	3.57	4.58	2.99	4.36	4.91	9.15	1.69	9.36	9.20
1993	4.96	4.24	4.43	9.41	4.38	4.06	5.19	3.40	4.86	5.09	9.00	3.10	10.87	9.55
1994	5.60	4.25	5.72	9.56	4.86	4.59	5.70	3.89	5.43	5.34	9.28	4.26	11.70	9.97
1995	6.13	4.27	6.80	9.63	5.32	5.08	6.22	4.34	5.88	5.60	9.29	5.20	11.98	10.31
1996	6.64	4.29	7.80	9.60	5.77	5.53	6.64	4.77	6.32	5.82	9.31	5.87	11.88	10.61
1997	7.11	4.27	8.68	9.67	6.16	6.02	7.14	5.20	6.74	6.05	9.33	6.38	11.55	10.89
1998	7.62	4.36	9.57	9.73	6.62	6.50	7.52	5.67	7.17	6.26	9.47	6.78	11.09	11.17
1999	8.06	4.33	10.27	9.80	6.99	6.98	7.95	6.11	7.57	6.47	9.52	7.09	10.57	11.45
2000	8.52	4.26	10.93	9.84	7.49	7.46	8.39	6.57	7.97	6.87	9.55	7.41	9.60	11.70
1984-1987	-3.80	17.94	-8.64	-15.43	-0.10	-0.99	-3.22	-2.17	-5.09	1.5	-16.31	-6.79	-2.11	-4.04
1988-2000	5.92	4.24	6.24	9.96	5.11	4.92	5.97	4.23	5.65	5.58	9.61	4.00	9.51	10.16

TABLE 6.5

LOWER PRICE OF OIL: VALUES OF MAJOR ENDOGENOUS VARIABLES

	GDPR	P	VAR	VNR	VMBR	VDSR	VUTR	LEMP	CR	IR	EMAR	MMAR	MMSC	GTRC
1984	13609	5.33	2799	1456	3019	5616	719	20.24	10399	3438	1945	2794	38535	13448
1985	14596	5.66	2957	1860	3020	5983	776	21.26	10598	3189	2528	2648	39898	17605
1986	12650	8.26	2362	1046	3061	5502	680	19.45	9215	3640	1368	2501	38340	12706
1987	12574	9.04	2262	1055	2994	5588	675	19.39	9195	3459	1386	2271	33159	13102
1988	12855	9.55	2216	1177	3051	5719	694	19.67	9278	3554	1538	2101	29204	14096
1989	14123	9.99	2432	1623	3191	6117	759	20.90	10020	3702	2129	2039	29900	17858
1990	14522	10.47	2446	1685	3329	6279	781	21.29	10326	3997	2176	2025	30088	18724
1991	14674	10.92	2393	1712	3409	6365	793	21.45	10480	4172	2188	1976	30760	19247
1992	14939	11.37	2372	1766	3494	6492	812	21.71	10713	4317	2240	1933	32086	20014
1993	15287	11.83	2376	1820	3601	6652	836	22.05	11005	4483	2289	1909	33923	20891
1994	15713	12.30	2403	1881	3724	6839	864	22.47	11351	4666	2345	1902	36243	21883
1995	16206	12.81	2451	1945	3864	7050	894	22.95	11744	4866	2402	1905	39013	22994
1996	16768	13.34	2519	2012	4020	7287	929	23.50	12184	5082	2461	1919	42199	24230
1997	17405	13.89	2610	2081	4193	7551	968	24.12	12676	5313	2521	1940	45773	25607
1998	18136	14.46	2729	2158	4386	7850	1012	24.83	13231	5561	2588	1968	49732	27155
1999	18963	15.07	2876	2239	4600	8185	1061	25.64	13851	5830	2658	2004	54069	28892
2000	19909	15.69	3058	2326	4843	8563	1117	26.56	14549	6131	2729	2050	58471	30845

TABLE 6.6

LOWER PRICE OF OIL: ANNUAL PERCENTAGE GROWTH RATE OF MAJOR ENDOGENOUS VARIABLES

	GDPR	P	VAR	VNR	VMBR	VDSR	VUTR	LEMP	CR	IR	ENAR	MNAR	MMSC	GTRC
1984	-2.31	23.91	4.79	3.11	-4.73	-1.83	4.05	0.28	-7.58	-10.18	10.00	-3.42	1.99	16.92
1985	7.25	24.92	5.63	27.74	0.06	6.53	7.94	5.01	1.91	-7.23	29.98	-5.23	3.54	30.91
1986	-13.33	23.86	-20.13	-43.74	1.35	-8.04	-12.46	-8.49	-13.05	14.06	-45.91	-5.54	-3.90	-27.83
1987	-0.60	9.42	-4.21	0.81	-2.19	1.57	-0.64	-0.27	-0.22	-4.89	1.34	-9.21	-13.51	3.12
1988	2.24	5.71	-2.03	11.61	1.89	2.33	2.68	1.44	0.90	2.74	10.99	-7.48	-11.93	7.59
1989	9.86	4.64	9.76	37.96	4.60	6.96	9.51	6.22	8.00	4.17	38.41	-2.98	2.39	26.69
1990	2.83	4.80	0.57	3.82	4.32	2.65	2.90	1.86	3.05	7.97	5.55	-0.68	9.63	4.85
1991	1.05	4.30	-2.16	1.60	2.40	1.37	1.54	0.75	1.49	4.38	0.55	-2.42	2.23	2.79
1992	1.81	4.12	-0.88	3.15	2.49	1.99	2.39	1.21	2.22	3.47	2.37	-2.17	4.31	3.98
1993	2.34	4.05	0.17	3.06	3.06	2.46	2.95	1.56	2.73	3.84	2.18	-1.2	5.73	4.38
1994	2.78	3.97	1.14	3.35	3.42	2.81	3.35	1.90	3.14	4.08	2.46	-0.37	6.84	4.75
1995	3.14	4.15	2.00	3.40	3.76	3.09	3.47	2.13	3.46	4.28	2.43	0.16	7.64	5.08
1996	3.46	4.14	2.77	3.44	4.04	3.36	3.91	2.40	3.74	4.43	2.45	0.73	8.17	5.37
1997	3.79	4.12	3.61	3.43	4.30	3.62	4.20	2.63	4.04	4.55	2.43	1.09	8.47	5.68
1998	4.20	4.10	4.56	3.70	4.60	3.96	4.54	2.94	4.38	4.66	2.66	1.44	8.65	6.04
1999	4.56	4.22	5.38	3.75	4.88	4.27	4.84	3.26	4.68	4.83	2.70	1.83	8.72	6.40
2000	4.98	4.12	6.33	3.88	5.28	4.62	5.28	3.59	5.04	5.16	2.67	2.30	8.14	6.76
1984-1987	-3.80	17.94	-8.64	-15.43	-0.10	-0.99	-3.22	-2.17	-5.09	1.5	-16.31	-6.79	-2.11	-4.04
1988-2000	3.20	4.09	1.99	4.17	3.66	3.06	3.57	2.19	3.41	4.39	3.24	-0.23	6.05	5.45

TABLE 6.7

EFFECTS OF AGRICULTURAL EXPORT PROMOTION: ACTUAL DIFFERENCE IN MAJOR ENDOGENOUS VARIABLES

	GDPR	VAR	VNR	VMBR	VDSR	VUTR	LEMP	CR	IR	ENOR	MNAR	GTRC
1984	52	163	-129	3	14	2	0.04	34	1	9	4	17
1985	75	213	-168	7	19	3	0.07	46	7	12	9	36
1986	69	123	-83	8	18	3	0.06	42	8	17	10	43
1987	72	126	-138	8	19	3	0.06	42	10	18	10	49
1988	81	140	-93	9	21	3	0.07	48	10	20	12	57
1989	98	189	-133	12	27	4	0.09	57	12	21	14	72
1990	108	200	-141	13	30	4	0.10	63	14	22	15	83
1991	117	212	-147	14	34	5	0.11	68	15	22	16	94
1992	127	226	-158	16	37	5	0.12	74	16	23	17	106
1993	138	240	-167	19	42	6	0.13	81	19	23	18	119
1994	152	254	-177	21	47	7	0.14	88	20	25	18	134
1995	166	271	-186	23	53	7	0.16	96	22	26	19	153
1996	181	287	-197	26	57	8	0.17	105	24	27	19	173
1997	196	305	-209	28	64	8	0.18	112	26	27	20	192
1998	214	325	-221	31	70	10	0.20	123	28	30	21	220
1999	232	346	-235	34	77	10	0.22	134	31	31	22	245
2000	260	367	-248	37	84	11	0.24	145	33	33	24	275

TABLE 6.8

EFFECTS OF AGRICULTURAL EXPORT PROMOTION:
PERCENTAGE DIFFERENCE IN MAJOR ENDOGENOUS VARIABLES

	GDPR	VAR	VNR	VMBR	VDSR	VUTR	LEMP	CR	IR	ENOR	MWAR	GTRC
1984	0.38	5.82	-8.86	0.09	0.25	0.28	0.24	0.31	0.03	20.93	0.14	0.13
1985	0.51	7.20	-9.03	0.23	0.31	0.38	0.34	0.43	0.22	16.90	0.33	0.20
1986	0.54	5.20	-7.93	0.26	0.32	0.44	0.35	0.45	0.22	12.68	0.39	0.34
1987	0.57	5.57	-13.08	0.26	0.34	0.45	0.36	0.46	0.29	11.46	0.44	0.37
1988	0.63	6.31	-7.90	0.29	0.36	0.43	0.40	0.52	0.28	10.25	0.57	0.40
1989	0.69	7.77	-8.18	0.37	0.44	0.53	0.45	0.57	0.33	10.82	0.69	0.40
1990	0.73	8.05	-8.11	0.38	0.47	0.51	0.48	0.61	0.35	10.67	0.74	0.43
1991	0.77	8.53	-8.02	0.40	0.52	0.62	0.52	0.64	0.36	10.09	0.79	0.46
1992	0.81	8.96	-8.04	0.45	0.55	0.60	0.55	0.67	0.37	9.83	0.84	0.49
1993	0.85	9.30	-8.00	0.51	0.61	0.69	0.59	0.70	0.42	9.31	0.89	0.51
1994	0.90	9.54	-7.98	0.54	0.66	0.77	0.62	0.74	0.42	9.47	0.86	0.54
1995	0.94	9.76	-7.88	0.57	0.72	0.73	0.66	0.77	0.44	9.15	0.89	0.57
1996	0.98	9.83	-7.85	0.61	0.74	0.80	0.70	0.80	0.46	8.91	0.86	0.60
1997	1.01	9.86	-7.83	0.63	0.79	0.76	0.73	0.81	0.47	8.33	0.89	0.62
1998	1.04	9.84	-7.77	0.66	0.83	0.89	0.77	0.87	0.48	8.57	0.88	0.65
1999	1.07	9.74	-7.76	0.69	0.86	0.82	0.80	0.87	0.50	8.20	0.89	0.67
2000	1.10	9.53	-7.68	0.70	0.89	0.87	0.83	0.89	0.51	8.09	0.89	0.69

TABLE 6.9

EFFECT OF CHANGE IN THE COMPOSITION OF CONSUMPTION:
ACTUAL DIFFERENCE IN MAJOR ENDOGENOUS VARIABLES

	GDPR	VAR	VDSR	VNR	VHBR	VUTR	LEHP	CR	IR	MWAR	GTRC
1984	75	478	-409	1	4	2	0.07	46	0	5	26
1985	92	491	-413	2	10	3	0.09	56	11	8	43
1986	83	428	-359	2	10	2	0.08	41	10	7	49
1987	84	427	-356	2	10	3	0.09	50	12	6	54
1988	90	432	-358	3	11	4	0.09	52	12	5	60
1989	102	469	-384	3	13	4	0.11	59	13	5	70
1990	113	488	-396	5	14	4	0.10	66	15	6	80
1991	121	503	-404	5	15	5	0.12	70	16	6	91
1992	131	522	-416	4	17	6	0.13	76	17	6	101
1993	142	544	-428	5	20	6	0.13	82	19	6	114
1994	155	567	-444	6	22	7	0.15	89	20	7	128
1995	167	595	-461	6	23	7	0.16	96	22	9	142
1996	181	625	-482	7	26	9	0.17	104	24	9	162
1997	196	660	-504	5	28	9	0.19	112	26	9	182
1998	212	697	-529	5	31	10	0.20	121	28	8	205
1999	231	740	-558	7	34	10	0.22	132	31	10	231
2000	250	787	-590	5	37	11	0.24	143	33	10	260

TABLE 6.10

EFFECT OF CHANGE IN THE COMPOSITION OF CONSUMPTION:
PERCENTAGE DIFFERENCE IN MAJOR ENDOGENOUS VARIABLES

	GDPR	VAR	VDSR	VNR	VHBR	VUTR	LEMP	CR	IR	MNAR	GTRC
1984	0.55	17.07	-7.28	0.07	0.13	0.27	0.35	0.44	0.00	0.18	0.19
1985	0.63	16.60	-6.90	0.10	0.33	0.39	0.41	0.53	0.35	0.30	0.24
1986	0.66	18.12	-6.52	0.19	0.33	0.29	0.41	0.45	0.28	0.28	0.39
1987	0.67	18.88	-6.37	0.19	0.34	0.45	0.42	0.54	0.35	0.26	0.41
1988	0.70	19.50	-6.26	0.17	0.36	0.29	0.44	0.56	0.34	0.24	0.43
1989	0.72	19.28	-6.28	0.12	0.40	0.53	0.47	0.59	0.35	0.25	0.40
1990	0.77	19.65	-6.27	0.17	0.41	0.51	0.50	0.64	0.38	0.25	0.41
1991	0.80	20.26	-6.25	0.16	0.44	0.49	0.54	0.66	0.38	0.30	0.45
1992	0.84	20.70	-6.26	0.15	0.48	0.59	0.57	0.69	0.39	0.30	0.47
1993	0.88	21.09	-6.23	0.14	0.54	0.57	0.60	0.71	0.41	0.29	0.49
1994	0.93	21.28	-6.25	0.13	0.57	0.66	0.64	0.75	0.42	0.28	0.51
1995	0.96	21.43	-6.24	0.17	0.58	0.63	0.67	0.77	0.44	0.28	0.53
1996	0.99	21.42	-6.25	0.16	0.62	0.70	0.70	0.80	0.46	0.27	0.56
1997	1.02	21.35	-6.24	0.19	0.64	0.66	0.73	0.82	0.47	0.26	0.58
1998	1.04	21.11	-6.24	0.17	0.67	0.80	0.76	0.83	0.48	0.30	0.61
1999	1.07	20.84	-6.25	0.16	0.69	0.76	0.79	0.86	0.50	0.33	0.63
2000	1.09	20.46	-6.24	0.15	0.71	0.78	0.82	0.88	0.51	0.35	0.65

TABLE 6.11

EFFECT OF CHANGE IN CAPITAL STOCK ALLOCATION: ACTUAL DIFFERENCE IN MAJOR ENDOGENOUS VARIABLES

	GDPR	VAR	VHBR	VNR	VDSR	VUTR	LEMP	CR	IR	HWAR	GTRC
1984	0	369	-369	0	0	0	0	0	0	0	0
1985	91	587	-521	1	23	3	0.08	56	1	5	39
1986	196	720	-583	4	50	5	0.19	119	10	14	109
1987	276	801	-608	5	71	8	0.27	167	28	21	172
1988	334	855	-624	7	86	9	0.32	199	40	25	223
1989	379	894	-634	8	100	12	0.37	225	48	26	266
1990	420	926	-643	9	114	13	0.40	247	55	25	305
1991	459	958	-652	10	129	15	0.44	269	60	25	345
1992	499	989	-662	11	144	17	0.48	291	65	24	388
1993	540	1023	-674	11	161	19	0.52	314	72	24	434
1994	584	1058	-687	13	179	21	0.56	338	77	24	486
1995	628	1097	-702	14	198	22	0.61	363	84	24	543
1996	676	1138	-717	15	216	25	0.65	390	90	24	607
1997	728	1182	-735	16	237	27	0.70	418	97	25	677
1998	781	1228	-753	17	259	30	0.76	448	104	27	755
1999	839	1279	-773	18	282	33	0.81	481	112	28	843
2000	900	1333	-795	20	306	35	0.87	514	120	29	938

TABLE 6.12

EFFECT OF CHANGE IN CAPITAL STOCK ALLOCATION:
PERCENTAGE DIFFERENCE IN MAJOR ENDOGENOUS VARIABLES

	GDPR	VAR	VHBR	VNR	VDSR	VUTR	LEHP	CR	IR	HNAR	GTRC
1984	0.00	13.18	-12.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1985	0.62	19.85	-17.25	0.05	0.38	0.39	0.41	0.53	0.03	0.19	0.22
1986	1.55	30.48	-19.04	0.38	0.91	0.74	0.97	1.29	0.27	0.56	0.85
1987	2.20	35.41	-20.30	0.47	1.27	1.19	1.37	1.82	0.81	0.93	1.31
1988	2.60	35.58	-20.45	0.59	1.50	1.30	1.63	2.15	1.13	1.19	1.58
1989	2.68	36.76	-19.87	0.49	1.63	1.58	1.74	2.25	1.30	1.28	1.49
1990	2.86	37.30	-19.26	0.52	1.80	1.65	1.88	2.37	1.38	1.23	1.59
1991	3.05	38.58	-18.95	0.55	1.99	1.85	2.03	2.52	1.43	1.24	1.70
1992	3.21	39.21	-18.64	0.56	2.17	2.02	2.16	2.63	1.49	1.19	1.79
1993	3.35	39.67	-18.30	0.53	2.35	2.17	2.28	2.74	1.58	1.18	1.87
1994	3.49	39.72	-17.93	0.59	2.52	2.30	2.40	2.83	1.61	1.16	1.95
1995	3.59	39.52	-17.53	0.59	2.68	2.30	2.51	2.91	1.68	1.13	2.03
1996	3.69	38.99	-17.09	0.60	2.80	2.49	2.61	2.98	1.71	1.14	2.11
1997	3.77	38.24	-16.67	0.60	2.94	2.55	2.71	3.04	1.75	1.10	2.17
1998	3.83	37.19	-16.19	0.59	3.96	2.68	2.80	3.08	1.78	1.14	2.24
1999	3.88	36.02	-15.71	0.58	3.16	2.77	2.88	3.13	1.82	1.14	2.30
2000	3.91	34.65	-15.22	0.62	3.24	2.76	2.95	3.15	1.84	1.13	2.35

FOOTNOTES TO CHAPTER SIX

1. The values assigned to the exogenous variables are discussed in the data appendix.

2. Initially we thought of changing the input-output coefficients and simulating the model within the historical period. However this would imply re-estimating the residuals in the various value added equations. Furthermore it is generally recognised that the most useful application of macromodels of the developing economies is in forecasting the long-term growth patterns.

3. This experiment could instead be undertaken by simultaneously increasing investment expenditures in agriculture and reducing investment expenditures in industry. However as we mentioned in Chapter Four, data on investment expenditures are available only at the aggregate level. As more data on sectoral investment expenditures become available the model could be extended to allow such direct transfers of resources.

CHAPTER SEVEN

SUMMARY AND CONCLUSIONS

7.1 Introduction

The major purpose of this study was to construct and analyse an integrated input-output-macroeconometric model for the Nigerian economy. Macromodels on Nigeria have concentrated on the structural and accounting relationships among the final demand components, and given only cursory treatment to the interindustry transactions within the economy. The recent experience of the 1980s suggests that adequate treatment within a simultaneous framework of both the supply and demand sides is desirable to provide a more realistic and more complete picture of the economic environment in the longer term.

The model is intended for long-term econometric forecasts with detailed structural analysis. Efforts have been made to link the national and interindustry accounts within the framework of a macromodel. National accounts and other statistics are available as continuous time series from 1959 onwards, with occasional shifts of index base year and minor changes in classifications. An input-output table

for Nigeria was prepared for 1973 to complement the national accounts. The input-output table is integrated in the model with annual national accounts, government budget, monetary and balance of payments series over the period 1960-1983.

In addition to providing the basis for long-term projections, the model is also useful in explaining the economic structure, growth and development of the Nigerian economy. The effects of macro-policy initiatives, including development planning may be analysed. The relationships among the major economic variables can be examined. The model also provides information on estimates of structural parameters, and the calculation of multipliers which provide a basis for identifying the effects of specific changes in various government policies and other exogenous variables.

7.2 Summary of the Study

In specifying the model, we have paid attention to the special features of the Nigerian economy. Chapter 2 provided a detailed description of the economy which served as a basis for the construction of the model. Attention was focused on the structure of the country's production. While the agricultural sector was the main source of economic growth in the 1960s, it entered a relative decline in the 1970s when the development of the petroleum-dominated mining

sector transformed Nigeria from an agricultural-based economy to a major oil exporter. Increased petroleum export earnings prompted high levels of economic growth, and by the mid-1970s Nigeria had emerged as the dominant economy in sub-saharan Africa. The petroleum industry has become the mainstay of the Nigerian economy and the major determinant of the country's economic growth. The growth of this industry also led to an expansion of urban-based activities, most notably in construction, commerce and services. The sharp increase in government revenue, derived mostly from oil, enabled the government to assume an important role in changing the flow of economic activity. Government consumption and investment expenditures increased tremendously. In looking to the future and analysing Nigeria's growth prospects it is obviously important to take into account the sensitivity of the economy to developments in the world oil market.

Based on the review of the economy the integrated input-output-macroeconometric model was formulated in Chapter 3. The final demand categories consist of private and public consumption expenditures, private and public investment expenditures, imports by economic categories, oil and other primary exports. The revenue apparatus of the government is explicitly incorporated into the model, emphasising its link to oil export earnings. Also

incorporated are the influence of bank credit on private consumption, the impact of the interest rate on capital formation, the effect of government deficits on the money supply.

The production side is disaggregated into five sectors which are linked to final demand categories through an input-output block. Both are determined simultaneously within the model and, in addition, the supply constraints in production are emphasised through the explicit introduction of capital stock in the residual value added equations.

In total the model consists of 72 equations; 5 input-output equations, 29 behavioural stochastic equations, and 38 definitions and identities. The stochastic equations were estimated by both ordinary least squares and two-stage least squares using principal components of the predetermined variables in the first stage. The estimated equations and the analysis of them, which serve as an empirical description of the major features of Nigerian economy, were presented in Chapter 4.

To test the tracking performance and predictive ability of the model as a simultaneous system, the model was dynamically simulated as described in Chapter 5. The historical simulation results and statistical measures based on Theil's inequality coefficients and its various components suggest that the overall performance of the model

is good. Furthermore, the measures of forecast accuracy indicate that policy simulations and projections based on the model may not be unreliable. Fiscal and monetary policy simulation experiments were also undertaken in Chapter 5.

In Chapter 6 the model was used to forecast values of the major endogenous variables, based on assumptions about the likely course of the exogenous variables over the period 1984 - 2000. The incorporation of an input-output block in the present model also makes possible the simulation of changes in the structure of inter-industry relations and resource use. How can the structure of the economy be changed? To achieve faster growth, which sectors ought to be encouraged? The present model enables us to address questions such as these, and to focus on the agricultural and industrial sectors of the economy. These two sectors are considered to be important in developing countries such as Nigeria. Inter-industry policy simulation experiments necessitate assumptions about changes in coefficients that link value added by sector to final demand. The simulation results indicate that substantial improvements in the economy as a whole would result from devoting more resources to the agricultural sector.

7.3 Future Extensions

The present study can be viewed as a step towards the building of a much more detailed and sophisticated model of the Nigerian economy in the future. The model has been constructed in such a way that extensions will be possible as more disaggregated and consistent data become available. There are many possibilities of extending the model:

(1) The input-output table used for this study relates to 1973. We have modelled the residual differences between actual value added by sector and those generated by the input-output block, and by this means have brought in capital stock to help in explaining the differences. This gives the model some supply characteristics as well as revealing inter-industry flows. Future extensions could conceivably use new and more recent tables, if they became available, and thus model the actual coefficients in the input-output block. As the authors of the 1973 input-output table remark[1]:

> "The actual frequency at which one should estimate full input-output statistics would of course depend on the stability of the input coefficients for the economy in question. For Nigeria, it is probably desirable to produce a full set of input-output tables every five years and

> then to use up-dating techniques to fill in annual changes with less detailed and, less firmer data."

(2) As more reliable data on prices and wages become available, sectoral prices could be linked to final demand prices and the differences between actual sectoral prices and those emerging from the input-output block, could be explicitly modelled.

(3) The final demand components have been disaggregated to the level permitted by the data in that consumption and investment expenditures were divided between the government and private sectors. A more detailed disaggregation by economic categories will be possible within the framework of the model as data on sectoral consumption and investment become available.

(4) The monetary sector is not incorporated completely in the model; a more detailed specification would allow both supply and demand factors to be explicitly examined. In this context, a flow of funds account established as in integral part of the Nigerian national accounts system would be analytically useful as it provides a valuable network of inflow-outflow

data that helps in tracing patterns of inter-sectoral financing in the economy. Since all sectors of the economy are included in the inflow-outflow matrix, it immediately provides a basis for tracing financial implications of macro policy initiatives. The flow of funds accounts would also be useful in identifying surplus sectors and the available channels for fund mobilisation in the system as well as the link between investment and savings, borrowing and lending, on a sector-by-sector basis.

(5) The model has no demographic sector and its interactions with the economy. Sectoral employment and income distribution subsystem which allocates income among socio-economic groups are very important in assessing alternative economic development strategies. Indeed policies designed to meet the basic needs -- housing, nutrition, health and education -- of the poorest groups in society could be effectively pursued only in the context of a broader development strategy encompassing economic growth, structural change and institutional reforms. A socio-economic simulation model of basic needs, however, requires extensive data base on demographic variables, income, wages, fertility, mortality,

household savings and consumption and social accounting matrix. Clearly, stronger research efforts are needed in this direction.

The present modelling efforts should, therefore, be regarded as a first step towards the construction of a comprehensive macroeconomic and sectoral model of the Nigerian economy. In conclusion, it should be recognised that the Nigerian economy, like other developing economies, is subject to structural and institutional changes over time. Periodic revisions and extensions will be necessary in order to maintain the usefulness of the model.

FOOTNOTES TO CHAPTER SEVEN

1. Federal Office of Statistics (1980), The National Accounts of Nigeria, Lagos, Nigeria: p. 120.

APPENDIX A

SOURCES AND NATURE OF THE DATA USED IN THE STUDY

A.1 Introduction

In this appendix, we list the major sources of data used and, in some cases, outline the methods adopted in the construction of data series that were not directly available. The data were taken from both published and unpublished sources. Despite limited data availability for some areas such as capital stock, employment and wages, and the civil war period continuous comparable data are available for most economic variables since independence in 1960.

The specific sources of all data are given in section A.2. All the data used in the present study are reported at the end of this appendix.

A.2 Sources of Data

Domestic Expenditure

The main source of data for private consumption expenditures and public consumption expenditures were various issues of National Account Statistics of Nigeria,

published by the Federal Office of Statistics. Series for gross investment expenditures were also obtained from this source. However separate data on private investment expenditures and public investment expenditures were not available from the National Accounts table. For the period 1960 to 1970 separate series on both private and public investment expenditures were obtained from World Bank (1974), Nigeria: Options for Long Term Development. Series on public investment expenditures from 1971 to 1983 were calculated from the capital expenditures accounts of the central government published annually in Central Bank of Nigeria (various issues), Economic and Financial Review. Private investment expenditures for the period from 1971 to 1983 were then obtained as the difference between gross investment expenditures and public investment expenditures.

Public Finance and External Debt

The main source of data on government total revenue, petroleum revenue, excise duties, custom duties, direct and indirect taxes was Central Bank of Nigeria (various issues), Economic and Financial Review.

The main source of data on interest payments, principal payments and inflow of external public debt was World Bank (1986), World Debt Tables. For the period prior

to 1970, data on external debt was obtained from Central Bank of Nigeria (1976), Economic and Financial Review .

Monetary Data

Bank credit to the private sector, net bank credit to the government, total money supply foreign exchange rate, foreign exchange reserves and foreign interest rate were obtained from the International Monetary Fund (1986), Yearbook of International Financial Statistics.

External Trade and Balance of Payments

Total exports and total imports in national income accounts were obtained from the Federal Office of Statistics (various issues), National Accounts of Nigeria. Series on total exports, petroleum exports and cocoa exports in balance of payments accounts were obtained from the International Monetary Fund (1986), Yearbook of International Financial Statistics.

For the period 1960 to 1970 the main source of data for imports by commodity groups is World Bank (1974), Nigeria: Options for Long Term Development. For the remaining period, these series were obtained from Central Bank of Nigeria (various issues), Annual Reports and Statement of Accounts.

Input-Output Sector

The input-output table used in this study is from Federal Office of Statistics (1981), National Accounts of Nigeria. The table was prepared by the National Accounts Commission set up in 1974 to construct a complete set of accounting tables, including the input-output table for Nigeria. The work of the commission represent the most comprehensive and up-to-date national income accounts series and input-output table. The table has 25 sectors which are aggregated to 5 sectors for the model. Commission, in an emphatical statement summarises the problem involved in preparing an input-output table as follows:

> "Users tend to underestimate the length of time required to prepare the Input-Output table. We must understand that the construction of Input-Output transactions requires many complex and time-consuming stages of compilation, estimation, correction, balancing and reconciliation in a system of national economic accounts. Therefore, given the inevitable lag between the compilation and reconciliation of data for any given base year, the Input-Output final tables will always be a somewhat historical document for an economy and statistical status like Nigeria." Federal Office of Statistics (1981, op. cit.)

The main sources of data on sectoral value added and GDP at factor cost was Federal Office of Statistics (various issues), National Accounts of Nigeria.

Capital Stock and Employment

The series on capital stock and employment series were not as readily available as other economic series used in the present study. There were no readily available benchmark figures for private, public and aggregate capital stocks. On the basis of series for private, public and gross investment from 1959 to 1983, corresponding capital stock series were calculated by using an assumed depreciation rate of 5 percent and using the method provided in the Time Series Processor (TSP) software. This method assumes that capital stock in 1959 is zero. It should be stated that there is need for further work in the compilation of aggregate and sectoral capital stock series for Nigeria. This observation is equally applicable to series on aggregate and sectoral employment series.

Aggregate employment series were constructed based on estimates of unemployment and labour force participation rates obtained from International Labour Office, (various Issues), Yearbook of International Labour Statistics and population from United Nations (various issues), Demographic Yearbook.

Prices and Wages

As a major part of the model was in real terms, it necessitated the use of various price indices to deflate nominal magnitudes. Series on sectoral value added and GDP were available in constant 1963 prices for the period from 1960 to 1973, in constant 1977 prices for the period 1973 to 1983, and in current prices for the period 1960 to 1983. The 1963 price series and the constant 1977 price series were spliced, and the base for all price indices was shifted to 1973. Other price indices were obtained from United Nations (various issues), Yearbook of National Accounts, the world price of oil was obtained from the World Bank (various issues), Commodity Trade and Price Trends.

Wage rate index for the year 1960 to 1970 was obtained from International Labour Office (various issues), International Labour Statistics. For the period 1971 to 1983, wage rate index was calculated by dividing total wages in national income account by total employment.

A.3 Assumptions about Exogenous Variables for Forecast

Here we discuss the exogenous variables whose values for the period from 1984 to 2000 had to be supplied, for the benchmark forecasts. We used actual values for the period 1984 to 1986 for some of the exogenous variables, where these were available. Among these are bank credit to

government and the private sector, nominal public investment. For the remaining portion of the forecast period from 1987 to 2000 these variables are projected to grow at average annual rate of 10 percent to ensure consistency. Exchange rate from 1984 to 1987 is also available and for the remaining period from 1988 to 2000 the exchange rate is fixed at the 1987 level. The price of oil for the period 1984 to 1987 is available. From 1989, the nominal price of oil is projected to increase at 6 percent for model simulation. .

Some exogenous variables are projected based on past growth rates. These include the world price and the producer price of cocoa, quantity of cocoa produced, quantity of other primary product. For variables needed to complete the identities of the model, assumptions of steady level are made. These variables are the error in the balance of payments, the current balance of unrequited transfers, net other capital, net factor payments abroad, and the average tax rate on excise duties. Some of the exogenous variables are specified for the forecast on a mechanical basis. These include dummy variable and time trend.

DATA USED IN THE STUDY

	BOPE	BOP	BCAC	BCUC	BURTC	CGR	CPR	CR
1960	99.00000	10.19995	54.20000	-143.00005	-3.40000	245.68652	3632.47803	3878.16455
1961	30.00000	-40.00005	64.00000	-134.00005	-7.60000	251.55664	3534.21924	3785.77588
1962	48.00000	-12.60005	29.80000	-90.40005	-0.40000	251.55957	3653.56079	3905.12036
1963	-11.00000	-56.60003	69.20000	-114.80003	-5.40000	257.89160	3847.86426	4105.75586
1964	49.50000	12.89999	147.60001	-184.20001	-0.40000	298.66016	3996.21240	4294.87256
1965	21.50000	7.89999	132.00000	-145.60001	-5.40000	343.59741	4000.24683	4343.84424
1966	17.50000	-17.10007	96.60000	-131.20007	-2.40000	337.11279	4240.29736	4577.41016
1967	73.40000	-73.60004	122.80000	-269.80005	15.40000	303.59912	3319.68945	3623.28857
1968	9.40000	3.60001	160.00000	-165.79999	34.40000	351.31836	3193.42041	3544.73877
1969	65.50000	10.70002	80.60000	-135.39998	20.80000	691.51636	3695.12378	4386.64014
1970	108.00000	64.20000	49.20000	-93.00001	45.00000	713.75684	4923.51709	5637.27393
1971	162.30000	146.50002	288.00000	-303.79999	1.80000	797.45801	5161.80664	5959.26465
1972	26.60000	-57.20008	259.19998	-343.00006	-14.30000	918.83496	5354.45898	6213.29395
1973	-34.50000	160.49989	59.20000	135.79990	-29.10000	976.43018	7033.20020	8009.63037
1974	453.00000	3128.30005	-5.89999	2681.19995	-62.10000	999.30664	8348.52051	9347.82715
1975	16.00000	-84.40027	141.10001	-241.50027	-76.80000	1279.69580	7831.07275	9110.76855
1976	-191.00000	-192.39995	-50.60001	49.20007	-97.80000	1305.86230	8232.15430	9538.01660
1977	73.00000	-517.70087	234.39999	-825.10083	-118.70000	1835.11816	9026.82422	10861.94238
1978	813.00000	-1529.09973	1111.90002	-3453.99976	-170.60001	1977.20020	9413.91113	11391.11133
1979	315.00000	2145.70020	852.60004	978.10004	-233.50000	1510.55322	8022.91064	9533.46387
1980	468.00000	2249.79834	-817.70001	2599.49829	-315.20001	1242.63721	7527.92334	8770.56055
1981	-327.29999	-3203.10083	833.09998	-3708.90088	-347.50000	1404.42969	9153.56348	10557.99316
1982	72.10000	-1304.80066	3470.90615	-4847.80078	-289.39999	1355.34766	10002.66992	11358.01758
1983	-175.30000	-369.70016	2832.19995	-3026.60010	-285.79999	1365.20996	9886.97949	11252.18945

	DEPR	DGR	DPR	DWAR	EAOR	ECR	ENAR	ENOR
1960	29.10618	14.70728	14.39890	0.00000	528.70239	142.34297	711.30811	671.04541
1961	61.44425	27.01014	34.43411	0.00000	604.35040	137.55438	871.95764	761.90479
1962	97.34557	38.88397	58.46161	0.00000	602.74817	171.11917	936.81360	773.86731
1963	129.53560	50.52043	79.01517	0.00000	647.21863	153.53726	967.99335	800.75586
1964	163.96904	61.21476	102.75429	0.00000	666.63544	187.12575	1081.11902	853.76123
1965	208.53580	72.42056	136.11523	0.00000	791.99976	213.03792	1449.15918	1005.03772
1966	259.69553	86.61877	173.07674	0.00000	816.35712	142.30078	1495.40649	958.65790
1967	304.61255	100.76714	203.84543	1.00000	583.93427	276.73401	1322.23010	860.66821
1968	338.01917	112.42395	225.59521	1.00000	622.64301	258.16901	1180.99670	880.81195
1969	363.39697	123.55839	239.83858	1.00000	603.22021	235.45769	1531.14771	838.67786
1970	391.88602	131.44182	260.44418	0.00000	557.13501	304.93396	2274.39478	862.06897
1971	449.31223	142.36359	306.94864	0.00000	390.68684	283.59512	2842.89233	674.28210
1972	528.55450	146.84058	381.71396	0.00000	314.53470	202.36398	2968.84692	516.81866
1973	597.72852	165.98796	431.82056	0.00000	271.80000	112.00000	2467.00000	383.00000
1974	693.14209	184.51857	508.62354	0.00000	107.92233	63.55424	2495.68311	171.47653
1975	782.90643	215.86121	567.04529	0.00000	47.29277	69.94563	2113.35181	117.23843
1976	925.36713	285.37021	639.99683	0.00000	113.84001	73.64143	2226.96777	187.48163
1977	1133.58142	410.78561	722.79584	0.00000	81.98172	91.29782	2599.19312	173.27954
1978	1362.86121	557.53448	805.32678	0.00000	84.30428	118.58183	2125.08521	202.88611
1979	1562.97876	678.18762	884.79114	0.00000	128.86415	70.18492	3161.21509	199.04904
1980	1714.10571	773.70898	940.39679	0.00000	77.83690	75.89796	3963.17554	153.73492
1981	1888.04822	886.89063	1001.15765	0.00000	48.52752	35.93660	3038.74072	84.46411
1982	2117.19507	1064.61353	1052.58142	0.00000	19.35886	29.15786	2280.56543	48.51677
1983	2265.24854	1185.63440	1079.61401	0.00000	51.79680	46.16670	1808.79102	97.96348

APPENDIX A (CONTINUED)

	EOC	EOQ	EOR	ESFR	ETGR	ETGSR	FADS	FDSC
1960	9.00000	6.24400	18.30124	100.00000	689.34662	788.58002	1.10000	3.57143
1961	23.00000	16.50500	54.08583	100.00000	815.99060	963.66840	4.30000	9.35714
1962	34.00000	24.68000	86.83659	100.00000	860.70392	1067.06848	4.50000	8.14286
1963	40.80000	27.70100	94.48447	150.70000	895.24036	1045.94299	14.80000	19.00000
1964	64.00000	43.43200	149.70059	179.64101	1003.46179	1183.10254	15.10000	15.21429
1965	136.00000	96.98500	340.86066	327.82800	1345.89832	1673.72607	19.20000	19.64286
1966	184.00000	139.55000	459.35690	365.98801	1418.01477	1784.00232	24.80000	25.71428
1967	145.00000	109.27500	368.13242	182.79700	1228.80066	1411.59741	25.00000	25.85714
1968	74.00000	52.13000	187.29909	139.20900	1068.11108	1207.31982	24.50000	28.00000
1969	262.00000	197.24600	587.52301	143.97000	1426.20093	1570.16650	33.10000	38.07143
1970	510.00000	383.45499	1169.29565	159.11600	2031.36462	2190.48071	36.00000	39.78572
1971	953.00000	542.54498	1889.97314	24.99000	2564.25513	2589.24341	32.80000	40.27085
1972	1176.00000	650.97998	2356.00513	205.75000	2872.88319	3078.63354	32.60000	37.30263
1973	1894.00000	723.31403	1894.00000	305.20001	2277.00000	2582.19995	43.10000	48.35526
1974	5366.00000	795.71002	2144.85571	195.70000	2316.33228	2512.03125	33.50000	34.89688
1975	4630.00000	627.83899	1840.04712	188.73399	1957.28552	2146.01953	205.50000	151.77254
1976	6196.00000	736.82300	2093.03833	178.15820	2280.51978	2458.67798	335.89999	234.85178
1977	7073.00000	744.41302	2196.42700	188.52699	2369.70654	2558.23315	61.90000	68.38985
1978	5671.00000	667.38702	1751.24365	58.64200	1954.12976	2012.77222	54.60000	66.11623
1979	9706.00000	812.72699	2791.86426	242.28208	2990.51333	3233.19507	57.40000	143.21017
1980	13632.00000	701.26001	3774.06226	299.60300	3929.79712	4229.39990	65.70000	276.38412
1981	10553.00000	458.16199	2748.16699	184.39999	2852.63118	3037.03564	361.39999	554.93494
1982	8003.00000	366.41000	1912.70801	7.53000	1961.22473	1968.75317	626.59998	937.99652
1983	7201.00000	339.12201	1621.68970	61.76000	1719.65320	1781.40405	948.20001	1378.21033

	FDSS	FDSR	FEXR	FIDS	FLIBOR	FNFVC	FNLOSC	FODC
1960	5.00000	0.00921	0.71429	11.01000	4.18000	38.00000	9.05715	82.42857
1961	13.10000	0.02283	0.71429	9.01000	3.58000	50.00000	10.57143	85.85714
1962	11.40000	0.01949	0.71429	81.50000	3.77000	43.40000	-68.60001	140.85715
1963	26.60000	0.04291	0.71429	0.20000	3.95000	75.80000	3.82857	130.42857
1964	21.30000	0.03008	0.71429	25.00000	4.62000	126.00000	14.52857	137.50000
1965	27.50000	0.02941	0.71429	32.40000	4.81000	110.40000	12.17143	146.92857
1966	36.00000	0.03598	0.71429	32.70000	6.12000	118.00000	-19.04287	152.57144
1967	36.20000	0.04651	0.71429	193.80000	5.46000	79.00000	-76.77142	273.14285
1968	39.20000	0.05870	0.71429	74.60000	6.36000	89.20000	35.01426	308.92859
1969	53.30000	0.05437	0.71429	47.70000	9.76000	100.20000	-30.02856	319.35715
1970	55.70000	0.04164	0.71429	68.58000	8.52000	128.60001	-102.61430	342.57144
1971	56.50000	0.03084	0.71276	128.27299	6.58000	142.80000	77.15136	410.62009
1972	56.70000	0.02427	0.65789	88.96000	5.14000	287.79999	-65.67728	447.49736
1973	73.50000	0.01873	0.65789	520.00000	9.42000	186.30000	-440.85004	761.64739
1974	55.50000	0.00555	0.62877	42.60000	10.90000	181.60001	-193.21808	767.16547
1975	246.60001	0.02811	0.61546	62.11000	6.95000	253.00000	-23.64890	678.91437
1976	374.79999	0.03227	0.62661	105.52000	5.57000	212.39999	-118.64289	534.55725
1977	106.10001	0.00830	0.64458	138.78799	6.85000	283.79999	-98.96037	584.11741
1978	104.10001	0.01014	0.63512	1494.50696	8.85000	134.39999	62.98299	1498.63464
1979	237.60001	0.01274	0.60274	828.61542	12.09000	184.30000	203.46042	1963.47424
1980	505.70001	0.01810	0.54654	711.13141	14.19000	-404.10001	-766.35254	2316.22681
1981	904.09998	0.04793	0.61380	2855.80396	16.87000	-101.30000	-596.66028	3847.28711
1982	1393.30005	0.11387	0.67322	3987.93896	13.29000	290.00000	917.98163	6110.20557
1983	1905.10022	0.17423	0.72343	4738.76318	9.72000	264.29999	174.31433	8852.41992

	FODS	FRC	GDMC	GDOC	GDPC	GDPDR	GDPR	GDTC
1940	115.40000	245.08000	11.60000	1.40000	2252.11768	3912.77319	3975.49463	13.00000
1941	120.20000	205.00000	8.40000	7.60000	2356.23511	3884.21265	3975.56830	16.00000
1942	197.20000	192.14287	9.20000	8.80000	2595.05176	4031.85889	4145.51660	18.00000
1943	182.60001	135.71429	10.40000	5.60000	2746.57163	4391.32471	4515.08545	16.00000
1944	192.50000	148.57143	1.80000	13.20000	2885.87373	4526.61328	4694.15332	15.00000
1945	205.70000	156.42857	2.70000	14.30000	3112.61816	4715.84717	5031.14453	17.00000
1946	213.60001	139.28572	4.00000	20.00000	3369.54590	4413.59229	4854.44287	24.00000
1947	382.39999	65.71429	3.00000	29.00000	2748.56152	3758.23438	4103.00439	32.00000
1948	432.50000	69.28571	19.00000	17.00000	2602.89233	3803.85254	3982.75879	36.00000
1949	447.10001	80.00000	13.00000	81.00000	3513.59375	4565.08838	5115.07178	94.00000
1950	479.60001	144.28572	47.00000	98.00000	5138.93701	5709.89551	6690.36621	145.00000
1951	576.09998	290.80542	72.00000	383.00000	6512.84375	6112.77148	7474.05957	455.00000
1952	680.50000	233.55263	84.00000	541.00000	7222.22021	6244.88623	8014.18115	625.00000
1953	1157.40002	394.07895	84.00000	769.00000	10990.70996	8970.12012	10990.70996	853.00000
1954	1220.09998	3522.38428	159.00000	2873.00000	10133.93750	9652.80664	12154.43848	3032.00000
1955	1103.09998	3437.96167	282.00000	2708.00000	21717.95508	10355.84082	12326.64941	2990.00000
1956	853.09998	3245.81714	228.00000	3625.00000	27361.32227	11123.58496	13540.11426	3853.00000
1957	906.20001	2727.85889	509.00000	4331.00000	32156.03516	12070.89160	14552.94238	4840.00000
1958	2359.60010	1198.47583	546.00000	3416.00000	35433.21875	11430.44434	13588.38965	3962.00000
1959	3257.60010	3343.90169	590.00000	5164.00000	42898.29297	11256.92773	13851.87695	5154.00000
1960	4238.00000	5593.81348	1197.00000	8564.00000	50214.03125	12089.08691	14424.22070	9761.00000
1961	4268.00000	2390.74390	537.00000	6326.00000	54503.10156	12886.18066	14562.62500	6863.00000
1962	9076.09961	1085.90271	140.00000	4846.00000	58536.50781	13242.08789	14711.58301	4986.00000
1963	12236.70020	716.19763	584.00000	3747.00000	60020.63281	12518.80957	13930.81445	4331.00000

	GETC	GEXPC	GMTC	GNDRC	GNPR	GPDRC	GSDIS	GSRTC
1940	29.00000	310.09021	109.00000	238.30000	3955.49463	1.40000	125.71143	48.20000
1941	27.00000	334.93423	121.00000	259.60001	3954.56030	14.20000	98.96994	50.40000
1942	25.00000	356.12952	118.00000	262.79999	4110.51660	35.00000	66.32953	58.40000
1943	27.00000	354.94806	123.00000	286.79999	4457.08545	22.60000	53.57664	59.80000
1944	30.00000	393.95517	152.00000	302.20001	4594.15332	33.00000	2.68373	56.40000
1945	32.00000	470.68661	170.00000	340.89999	4831.14453	39.90000	44.35805	63.20000
1946	28.00000	534.52893	114.00000	308.39999	4633.44287	56.80000	99.48608	60.00000
1947	30.00000	489.85448	107.00000	281.80002	4023.00439	63.00000	-94.51498	32.00000
1948	30.00000	515.61022	117.00000	326.00000	3837.75879	38.80000	-165.37550	55.80000
1949	39.00000	735.21558	162.00000	415.79999	4794.07178	124.80000	-203.01299	72.20000
1950	41.00000	870.25946	216.00000	550.20001	6283.36621	164.80000	-397.15485	82.00000
1951	38.00000	955.23083	285.00000	784.00000	7005.05957	510.00000	-452.81833	120.00000
1952	27.00000	1401.38379	275.00000	786.20001	7419.18115	744.79999	28.10483	145.00000
1953	13.00000	1610.95020	308.00000	846.20001	10420.70996	1015.79999	-137.99982	166.00000
1954	4.00000	2835.49238	328.00000	1040.80005	11932.43848	3727.19995	3079.17041	250.80000
1955	7.00000	5287.88965	629.00000	1695.00000	12245.64941	4272.00000	4312.14063	451.00000
1956	6.00000	8647.26270	724.00000	1851.00000	13464.11426	5365.00000	6318.62012	450.80000
1957	4.20000	11661.21289	964.00000	2122.19995	14396.94238	6081.00000	7037.45264	338.00000
1958	2.80000	13607.16406	1436.00000	3753.60010	13529.38965	4654.00000	5796.84688	938.79999
1959	8.20000	13344.85059	871.00000	3341.19995	13752.57715	8881.00000	6227.81104	1309.80000
1960	0.18000	15837.37109	1407.00000	4807.60010	14332.22070	12953.50000	7138.01855	1327.00000
1961	0.10000	22664.12500	1749.00000	4491.30029	14484.62500	8565.00000	10342.76367	1049.19995
1962	0.30000	20183.33398	1669.00000	5183.10010	14632.88281	7814.00000	2409.31543	1986.80005
1963	0.10000	18405.88086	1106.00000	4714.60010	13859.81445	6786.00000	-4525.93359	688.50000

APPENDIX A (CONTINUED)

	GTRC	GTRPR	GURC	GXTC	HDI	HLGC	HLPC	HMSC
1960	239.70000	36.00000	19.50000	21.00000	5.62000	-61.00000	111.00000	286.00000
1961	275.80082	39.00000	39.80000	13.00000	5.50000	-27.00000	118.00000	343.00000
1962	297.79999	38.00000	39.20000	13.00000	4.50000	-28.00000	175.00000	368.00000
1963	309.39999	48.00000	47.60000	19.00000	4.00000	25.00000	208.00000	412.00000
1964	335.20001	51.00000	36.80000	25.00000	5.00000	82.00000	249.00000	495.00000
1965	380.79999	81.00000	40.00000	33.00000	5.00000	76.00000	271.00000	557.00000
1966	365.19998	52.00000	30.40000	72.00000	5.00000	121.00000	315.00000	628.00000
1967	344.80002	82.00000	59.80000	50.00000	5.00000	182.00000	297.00000	614.00000
1968	364.79999	86.00000	47.20000	57.00000	4.50000	319.00000	298.00000	871.00000
1969	542.59998	77.00000	51.60000	78.00000	4.50000	512.00000	325.00000	1200.00000
1970	717.00000	51.00000	51.20000	113.00000	4.50000	694.00000	476.00000	1667.00000
1971	1294.00000	48.00000	100.00000	169.00000	4.50000	556.00000	594.00000	1819.00000
1972	1551.00000	91.00000	75.20000	180.00000	4.50000	550.00000	756.00000	1895.00000
1973	1862.00000	77.00000	79.20000	196.00000	4.50000	589.00000	854.00000	2197.00000
1974	4788.00000	81.00000	152.79999	165.00000	4.50000	-1310.00000	1134.00000	3918.00000
1975	5967.00000	102.00000	200.00000	126.00000	3.50000	-631.00000	1792.00000	5479.00000
1976	7216.00000	168.00000	291.00000	152.00000	3.50000	622.00000	2452.00000	7095.00000
1977	8203.20020	84.00000	41.00000	266.00000	4.00000	2452.00000	3558.00000	10130.00000
1978	8407.60059	259.00000	571.00000	259.00000	5.00000	3143.00000	4562.00000	10730.00000
1979	12222.20020	176.00000	298.00000	273.00000	5.00000	3313.00000	5358.00000	13933.00000
1980	17161.09961	201.00000	470.50000	406.00000	6.00000	3539.00000	7150.00000	18203.00000
1981	13056.30078	121.00000	579.00000	577.00000	6.00000	6299.00000	9448.00000	21367.00000
1982	12997.10059	103.00000	706.00000	681.00000	8.00000	10328.00000	11083.00000	28242.00000
1983	11500.60059	159.00000	1498.00000	838.00000	8.00000	15475.00000	12125.00000	37781.00000

	IGR	IPR	IR	KGR	KPR	KR	LEMP	LWIR
1960	260.76450	415.10312	675.86761	294.14557	287.97797	582.12354	13.16119	0.46414
1961	264.48666	514.98395	779.47058	540.20276	688.68219	1228.88501	12.78350	0.48106
1962	271.61325	469.53299	741.14624	777.67932	1169.23206	1946.91125	12.62287	0.49799
1963	264.40704	553.79749	818.20453	1010.40857	1580.30347	2590.71191	12.67603	0.51652
1964	285.33066	769.97321	1055.30383	1224.29517	2055.08569	3279.38086	12.38531	0.55197
1965	356.38489	875.34534	1231.73022	1448.41113	2722.30469	4170.71582	12.66203	0.57131
1966	369.58612	788.45038	1158.03650	1732.37549	3461.53467	5193.91016	12.04281	0.67843
1967	333.90326	638.84137	972.74463	2015.34277	4076.90845	6092.25098	13.42787	0.68815
1968	335.11279	510.46252	845.57532	2248.47900	4511.90430	6760.38330	15.01625	0.66076
1969	281.22681	651.95087	933.17767	2471.16772	4796.77148	7267.93945	15.79786	0.65351
1970	349.87732	1190.53284	1540.41016	2628.83618	5208.88379	7837.72021	16.03636	0.68332
1971	231.98340	1802.25488	2034.15833	2847.27173	6138.97266	8986.24414	16.35391	0.78324
1972	528.18835	1383.84644	1912.03479	2936.81152	7634.27881	10571.08984	16.65829	0.80580
1973	538.12000	1967.88000	2506.00000	3318.15918	8636.41113	11954.57031	16.42480	1.00000
1974	811.37140	1677.05762	2488.42896	3690.37134	10172.47070	13862.84180	16.64798	1.37309
1975	1606.04163	2026.07727	3632.11890	4317.22412	11340.90527	15658.12891	17.81074	1.82434
1976	2793.67798	2295.97583	5089.65381	5707.48430	12799.93652	18507.34180	18.64990	2.07897
1977	3345.76270	2373.41504	5719.17773	8215.71191	14455.91602	22671.62891	20.09403	2.35375
1978	2970.59692	2394.61450	5365.21143	11150.68945	16106.53516	27257.22461	20.61350	2.76793
1979	2588.61499	1996.90405	4585.51904	13563.75195	17695.82227	31259.57422	21.50162	2.70911
1980	3037.34277	2155.61279	5192.95557	15474.17969	18807.93555	34282.11328	22.00382	3.06205
1981	4441.34766	2029.63330	6470.98096	17737.81250	20023.15234	37760.96484	23.10304	3.38598
1982	3485.03125	1593.23389	5078.26514	21292.26953	21051.62695	42343.89844	23.70654	3.47768
1983	2587.74536	1198.97925	3786.72461	23712.68750	21592.27930	45304.96875	20.19086	4.28928

	MCR	MIGS	MRR	MNAR	MRR	MSFR	MSOPR	MYGR
1960	337.26352	3.90000	138.46999	667.94629	116.53414	130.79243	126.97325	592.26764
1961	331.88834	8.80000	149.01111	676.23950	121.91817	123.54376	115.02883	602.81763
1962	292.97418	6.90000	148.56984	633.71283	123.57678	139.96112	133.11778	565.12079
1963	273.23126	11.80000	138.59557	632.78772	134.63570	182.41815	171.29280	546.46252
1964	284.67905	4.20000	207.03934	759.57556	165.63147	234.98965	229.25909	657.34985
1965	285.60550	8.30000	250.06346	819.24347	162.47778	327.49429	319.96881	698.14673
1966	246.36063	11.20000	265.02426	794.57507	126.91303	411.09866	401.14471	638.29791
1967	235.14235	11.20000	189.12531	773.17413	131.89001	490.48157	480.52759	556.17767
1968	178.06816	14.70000	170.38176	719.19037	144.76044	374.32745	360.87825	493.21036
1969	222.71996	20.20000	214.01021	873.70917	180.41559	448.42603	430.47336	617.14575
1970	288.96780	19.70000	380.80078	1297.90625	255.90793	413.12604	395.89639	925.67651
1971	416.25589	23.70000	501.69791	1557.56384	281.52045	565.45081	546.94672	1199.47424
1972	424.11685	24.10000	400.13083	1496.18408	255.12428	954.42645	937.13983	1079.37195
1973	455.00000	30.40000	442.00000	1762.50000	328.00000	1192.30005	1172.30005	1225.00000
1974	326.62567	22.00000	367.22995	1716.34326	343.34506	1077.38696	1069.12708	1037.28068
1975	560.77374	41.10000	703.52460	2314.90747	466.38147	856.78424	845.02222	1730.67981
1976	633.63959	38.90000	898.92126	2588.90137	524.57050	792.00958	782.27130	2057.13135
1977	938.69818	44.20000	1461.95129	3803.82495	829.08563	804.95202	792.10138	3229.73511
1978	937.28497	49.50000	1582.65527	4058.54517	774.52533	673.83301	661.10431	3294.46558
1979	773.55798	180.20000	1335.34326	3030.66284	634.58215	943.67444	903.74170	2743.48340
1980	724.76752	440.00000	1575.69714	3863.34668	719.45551	1081.64014	1001.80054	3019.92017
1981	1238.08398	542.70001	1208.31201	4728.35547	948.18512	1098.06628	997.89246	3394.58105
1982	742.52173	766.70001	1119.35229	3379.53101	859.34741	755.26392	615.03846	2721.22144
1983	653.37683	956.90002	780.59381	2050.86206	612.37091	584.70428	413.70190	2046.34155

	MTGSR	MFPAR	MYC	MYDR	MYR	P	PCPI	PDC
1960	723.06012	-20.00000	2224.29907	3939.44043	3926.38843	0.56650	0.52667	0.57553
1961	726.36145	-21.00000	2307.37183	3905.11987	3893.11597	0.59268	0.56000	0.61179
1962	705.08197	-35.00000	2512.20483	4022.41675	4013.17114	0.62599	0.59000	0.64756
1963	728.88068	-58.00000	2632.49170	4349.24756	4327.54980	0.60831	0.57333	0.63864
1964	892.33954	-100.00000	2722.83545	4456.77832	4430.18408	0.61461	0.58000	0.64421
1965	1025.64099	-200.00000	2859.86938	4676.13037	4622.60889	0.61867	0.60333	0.64756
1966	1049.39661	-223.00000	3034.69721	4391.15674	4373.74756	0.69383	0.66000	0.66684
1967	1046.65930	-80.00000	2490.91357	3752.62280	3718.39185	0.66989	0.63667	0.70850
1968	867.53778	-145.00000	2287.21997	3530.65503	3499.73975	0.65354	0.63333	0.71614
1969	1065.57178	-321.00000	3043.47461	4370.83008	4430.67480	0.68691	0.69667	0.74850
1970	1338.80261	-407.00000	4529.30469	5753.70508	5891.47998	0.76811	0.79333	0.78318
1971	1764.92505	-671.00000	5711.10498	6081.45557	6555.74756	0.87116	0.92333	0.88130
1972	2033.79846	-545.00000	6209.69482	6288.09131	6890.62646	0.90118	0.94667	0.92084
1973	2417.30005	-570.00000	9822.98145	9046.98145	9822.98145	1.00000	1.00000	1.00000
1974	2114.58765	-222.00000	16768.58203	9288.07129	11239.29688	1.49196	1.12667	1.31301
1975	2587.46411	-81.00000	20195.86328	9867.68262	11462.74316	1.76187	1.50333	1.74797
1976	2849.14087	-76.00000	25337.79883	10808.03906	12538.74707	2.02076	1.83667	1.97968
1977	4034.68799	-156.00000	29306.58984	11156.91016	13263.36133	2.20959	2.23800	2.08537
1978	3948.29834	-59.00000	31725.56055	10906.12891	12166.52832	2.60761	2.71333	2.52846
1979	3687.15771	-99.30000	37750.33594	10507.62988	12189.59863	3.09693	3.03800	3.23171
1980	4101.56055	-92.00000	43926.56250	10015.22168	12618.11523	3.48123	3.33333	4.06504
1981	4492.64746	-78.00000	47144.83203	10883.85938	12596.57715	3.74267	4.02667	3.91870
1982	3476.48560	-78.70000	49799.16797	11365.58984	12515.68750	3.97894	4.33667	4.06098
1983	2631.04590	-71.00000	49954.95313	10748.33984	11594.56641	4.30848	5.34333	4.07317

	PDE	PDM	PLNCI	PPCOI	PUMS	PWOS	QCD	QGI
1960	0.49177	0.72940	0.40000	0.39741	0.62083	2.01794	186.00000	1374.00000
1961	0.42525	0.73820	0.42857	0.39926	0.62083	1.95092	191.00000	1264.00000
1962	0.39154	0.72020	0.40553	0.35490	0.61806	1.92869	176.00000	1580.00000
1963	0.42335	0.75760	0.48848	0.37338	0.62917	2.02159	216.00000	1465.00000
1964	0.42752	0.77280	0.44700	0.39187	0.64028	2.06300	294.00000	1418.00000
1965	0.39899	0.78780	0.32258	0.42884	0.65139	1.96319	182.00000	1570.00000
1966	0.40056	0.80370	0.45853	0.31238	0.66667	1.84593	263.00000	1376.00000
1967	0.39388	0.80370	0.52995	0.33087	0.66806	1.85770	234.00000	970.00000
1968	0.39509	0.78060	0.63825	0.34935	0.66389	1.98734	189.00000	1140.00000
1969	0.44594	0.80370	0.79954	0.53235	0.68611	1.85961	224.00000	1250.00000
1970	0.43616	0.81670	0.59677	0.54898	0.71944	1.86202	302.00000	739.00000
1971	0.50424	0.91290	0.47696	0.54898	0.75139	2.46442	254.00000	708.00000
1972	0.49915	0.91720	0.56912	0.54898	0.82083	2.74589	241.00000	948.00000
1973	1.00000	1.00000	1.00000	1.00000	1.00000	3.98012	215.00000	462.00000
1974	2.50180	1.67470	1.38018	1.21996	1.26389	10.72512	205.00000	618.00000
1975	2.51624	2.15060	1.10369	1.21996	1.38889	11.98209	225.00000	375.00000
1976	2.96029	2.50300	1.81106	1.21996	1.40694	13.42004	121.00000	433.00000
1977	3.22023	2.21690	3.35484	1.90388	1.52917	14.74054	188.00000	419.00000
1978	3.23827	2.46990	3.01382	1.90388	1.71250	13.37903	161.00000	358.00000
1979	3.47653	2.71990	2.91475	2.21811	1.98056	19.81382	144.00000	367.00000
1980	3.61011	3.01200	2.30415	2.40296	2.24167	35.56808	146.00000	286.00000
1981	3.81227	3.32530	1.83871	2.40296	2.14583	37.52591	184.00000	279.00000
1982	4.18412	3.68070	1.54147	2.40296	2.19444	32.44359	149.00000	246.00000
1983	4.44043	4.04820	1.87558	2.58780	2.27778	29.35210	115.00000	159.00000

	RAR	RDSR	RMBR	RNR	RUTR	TGXTC	TIME	YAR
1960	1278.61951	-930.21100	-335.23190	-553.55487	-51.35033	0.01004	1.00000	2735.90552
1961	1203.39136	-910.51642	-335.82486	-642.94208	-38.47183	0.00601	2.00000	2653.66479
1962	1252.97986	-951.85736	-303.77246	-668.06360	-48.32463	0.00549	3.00000	2749.56348
1963	1399.35706	-965.66010	-314.37173	-690.19397	-51.97328	0.00773	4.00000	2975.59155
1964	1294.89539	-959.02179	-394.18723	-742.63141	-44.45084	0.00971	5.00000	2964.61377
1965	1245.48975	-936.69879	-374.86627	-865.60870	-70.84068	0.01274	6.00000	2983.15845
1966	890.32239	-1062.58374	-372.50470	-771.92328	-84.86287	0.02546	7.00000	2708.46436
1967	871.98438	-773.95264	-279.73331	-712.95184	-71.02936	0.02126	8.00000	2325.27710
1968	888.67261	-658.92529	-231.22910	-770.46338	-38.57263	0.02492	9.00000	2291.04272
1969	903.13306	-771.52393	-191.36499	-666.55652	-84.75024	0.02820	10.00000	2636.52344
1970	953.89258	-1012.31238	-341.47064	-816.57300	-167.69806	0.02930	11.00000	3236.35840
1971	908.82202	-1059.71191	-465.26904	-867.16382	-200.68785	0.03715	12.00000	3395.27832
1972	571.13428	-1095.96912	-258.36121	-551.06116	-168.60217	0.03651	13.00000	3171.30566
1973	-56.14526	209.63403	-117.85205	-19.49316	-22.09207	0.02787	14.00000	3138.55005
1974	-199.28589	-24.00537	-251.30493	408.96875	-79.74258	0.01505	15.00000	3463.84937
1975	-515.45654	1053.38672	-528.09827	94.82739	-48.83643	0.00920	16.00000	3104.12622
1976	-840.51050	1119.40332	-634.56885	357.55054	-143.71222	0.00933	17.00000	3055.54248
1977	-1143.37305	1073.09961	-652.34375	130.40698	-117.72455	0.01413	18.00000	3264.15967
1978	-1504.28174	516.04639	-491.99219	162.37549	-69.29327	0.01088	19.00000	2999.49609
1979	-1235.95972	899.67822	265.10815	-69.97559	-56.17389	0.01053	20.00000	2695.86328
1980	-867.55005	1585.77710	360.20313	-888.36279	45.63715	0.01327	21.00000	2905.13965
1981	-1637.31128	1459.65039	49.89453	-996.08997	129.92102	0.01609	22.00000	2742.84644
1982	-1394.76221	938.67285	481.94971	-640.07715	173.41718	0.01676	23.00000	3111.87744
1983	-1415.26440	774.73877	639.95776	-321.23608	30.93451	0.02081	24.00000	2940.20044

	VDSR	VMBR	VNR	VUTR
1960	730.56024	288.33530	62.72163	157.97203
1961	727.38556	324.48001	91.34782	178.68221
1962	747.65648	357.15228	113.65789	177.48865
1963	830.72980	397.77109	123.76070	187.23235
1964	921.96210	426.65781	167.54024	213.37958
1965	991.76508	528.26031	315.29745	212.66316
1966	969.32239	526.40472	442.85052	209.40062
1967	817.67993	449.24374	344.77023	166.03358
1968	889.46582	438.48355	178.90607	184.86055
1969	1141.98010	594.95099	549.98340	191.63397
1970	1459.79626	803.76825	980.47046	209.97278
1971	1578.43042	909.15186	1363.28784	229.91112
1972	1688.98474	1104.71643	1769.29529	279.87924
1973	3721.43018	1620.10959	2020.58997	490.03000
1974	4082.89746	1612.28040	2501.63159	493.77957
1975	5011.67188	1723.49280	1970.80774	516.55035
1976	5346.83643	2229.45142	2416.52930	491.75464
1977	5704.22021	2526.61255	2482.05103	575.89911
1978	5263.72266	2566.44946	2157.94507	600.77600
1979	5043.37451	2925.22754	2594.94946	592.46204
1980	5327.17529	3161.38501	2335.13452	695.38660
1981	5858.87305	3456.05884	1676.44397	828.40259
1982	5798.02051	3468.88721	1469.49585	863.30243
1983	5720.55859	3167.86328	1412.00500	690.18756

	BOPE	BURTC	DWAR	EOQ	ESFR	FEXR	FIDS	FLIBOR
1984	120.00000	-318.00000	0.00000	399.71799	180.00000	0.76423	1848.00000	10.94000
1985	120.00000	-326.00000	0.00000	455.81900	180.00000	0.89238	1560.00000	9.30000
1986	120.00000	-334.00000	0.00000	340.00000	180.00000	0.99960	1599.00000	8.40000
1987	120.00000	-342.00000	0.00000	361.25000	180.00000	0.99960	1639.00000	8.40000
1988	120.00000	-350.00000	0.00000	400.00000	180.00000	0.99960	1680.00000	8.00000
1989	120.00000	-357.00000	0.00000	500.00000	180.00000	0.99960	1722.00000	8.00000
1990	120.00000	-365.00000	0.00000	500.00000	180.00000	0.99960	1765.00000	8.00000
1991	120.00000	-373.00000	0.00000	500.00000	180.00000	0.99960	1809.00000	8.00000
1992	120.00000	-381.00000	0.00000	500.00000	180.00000	0.99960	1854.00000	8.00000
1993	120.00000	-389.00000	0.00000	500.00000	180.00000	0.99960	1901.00000	8.00000
1994	120.00000	-397.00000	0.00000	500.00000	180.00000	0.99960	1949.00000	8.00000
1995	120.00000	-405.00000	0.00000	500.00000	180.00000	0.99960	1997.00000	8.00000
1996	120.00000	-413.00000	0.00000	500.00000	180.00000	0.99960	2047.00000	8.00000
1997	120.00000	-421.00000	0.00000	500.00000	180.00000	0.99960	2098.00000	8.00000
1998	120.00000	-428.00000	0.00000	500.00000	180.00000	0.99960	2150.00000	8.00000
1999	120.00000	-436.00000	0.00000	500.00000	180.00000	0.99960	2204.00000	8.00000
2000	120.00000	-444.00000	0.00000	500.00000	180.00000	0.99960	2260.00000	8.00000

	FNFVC	FNLOSC	GETC	GSDIS	GTRPR	HDI	HLPC	IGR
1984	223.80000	174.00000	0.10000	-4500.00000	160.00000	8.00000	12600.00000	2310.22974
1985	240.00000	174.00000	0.10000	-4500.00000	160.00000	8.00000	13603.00000	2107.65259
1986	244.80000	174.00000	0.10000	-4500.00000	160.00000	8.00000	17582.00000	2414.62329
1987	249.70000	174.00000	0.10000	-4500.00000	160.00000	8.00000	18637.00000	2515.22363
1988	254.70000	174.00000	0.10000	-4500.00000	160.00000	8.00000	20035.00000	2620.94922
1989	260.00000	174.00000	0.10000	-4500.00000	160.00000	8.00000	22226.00000	2728.75928
1990	265.20001	174.00000	0.10000	-4500.00000	160.00000	8.00000	24657.00000	2842.33228
1991	270.39999	174.00000	0.10000	-4500.00000	160.00000	8.00000	27354.00000	2960.54858
1992	275.79999	174.00000	0.10000	-4500.00000	160.00000	8.00000	30346.00000	3083.63477
1993	281.29999	174.00000	0.10000	-4500.00000	160.00000	8.00000	33665.00000	3211.90503
1994	287.00000	174.00000	0.10000	-4500.00000	160.00000	8.00000	37347.00000	3345.33472
1995	292.79999	174.00000	0.10000	-4500.00000	160.00000	8.00000	41432.00000	3484.36377
1996	298.70001	174.00000	0.10000	-4500.00000	160.00000	8.00000	45963.00000	3629.31665
1997	304.70001	174.00000	0.10000	-4500.00000	160.00000	8.00000	50990.00000	3780.21431
1998	310.79999	174.00000	0.10000	-4500.00000	160.00000	8.00000	56567.00000	3937.28784
1999	317.10001	174.00000	0.10000	-4500.00000	160.00000	8.00000	62754.00000	4101.06738
2000	323.89999	174.00000	0.10000	-4500.00000	160.00000	8.00000	69030.00000	4283.83252

	NFPAR	PDE	PLNCI	PPCOI	PUMS	PWOS	QCO	QGT
1984	-90.00000	5.00000	2.11982	2.63268	2.34001	28.88120	150.00000	195.00000
1985	-90.00000	5.00000	1.99540	2.71511	2.40126	28.59600	154.00000	300.00000
1986	-90.00000	5.00000	1.83180	2.80012	2.46410	16.00000	158.00000	315.00000
1987	-90.00000	5.00000	2.15370	2.88780	2.52860	15.00000	162.00000	350.00000
1988	-90.00000	5.00000	2.60160	2.97821	2.59477	15.00000	166.00000	341.00000
1989	-90.00000	5.00000	2.37180	3.07146	2.66268	18.00000	170.00000	372.00000
1990	-90.00000	5.00000	2.48900	3.16763	2.73237	19.08000	174.00000	383.00000
1991	-90.00000	5.00000	2.61190	3.26681	2.80388	20.02300	178.00000	400.00000
1992	-90.00000	5.00000	2.74090	3.36910	2.87727	21.43830	183.00000	412.00000
1993	-90.00000	5.00000	2.87630	3.47458	2.95257	22.72460	187.00000	432.00000
1994	-90.00000	5.00000	3.01840	3.58337	3.02985	24.08810	192.00000	454.00000
1995	-90.00000	5.00000	3.16750	3.69557	3.10915	25.53330	197.00000	477.00000
1996	-90.00000	5.00000	3.32390	3.81128	3.19052	27.06500	202.00000	501.00000
1997	-90.00000	5.00000	3.48800	3.93061	3.27402	28.68930	207.00000	525.00000
1998	-90.00000	5.00000	3.66040	4.05368	3.35971	30.41060	218.00000	552.00000
1999	-90.00000	5.00000	3.84120	4.18060	3.44764	32.23530	229.00000	579.00000
2000	-90.00000	5.00000	4.02200	4.30752	3.53557	34.16940	242.00000	606.00000

	RMR	TGXTC	TIME
1984	-300.00000	0.01880	25.00000
1985	-300.00000	0.01880	26.00000
1986	-300.00000	0.01880	27.00000
1987	-300.00000	0.01880	28.00000
1988	-300.00000	0.01880	29.00000
1989	-300.00000	0.01880	30.00000
1990	-300.00000	0.01880	31.00000
1991	-300.00000	0.01880	32.00000
1992	-300.00000	0.01880	33.00000
1993	-300.00000	0.01880	34.00000
1994	-300.00000	0.01880	35.00000
1995	-300.00000	0.01880	36.00000
1996	-300.00000	0.01880	37.00000
1997	-300.00000	0.01880	38.00000
1998	-300.00000	0.01880	39.00000
1999	-300.00000	0.01880	40.00000
2000	-300.00000	0.01880	41.00000

APPENDIX B

HISTORICAL SIMULATION RESULTS

SIMULATION RESULTS

	GDPR	P	VAR	VNR	VMBR	VDSR	VUTR	LEMP
1964	5000.76700	0.61895	3004.10793	296.07847	626.47954	866.27127	207.82978	11.43851
1965	5348.90343	0.68233	3124.53681	285.15927	595.57537	1123.16389	220.46609	11.67552
1966	6242.43025	0.72905	3225.01122	657.45806	668.56419	1434.29252	257.10425	12.17116
1967	6505.01374	0.76789	3276.51261	455.21583	739.79496	1773.05199	260.43835	15.91490
1968	4734.81697	0.73454	2598.22461	44.60559	613.71288	1296.15388	182.04001	14.88251
1969	4203.54749	0.70532	2087.43749	480.28960	471.72153	1002.33435	161.76452	14.62656
1970	3749.09669	0.71149	1648.51469	800.85079	390.91692	754.29540	154.51889	11.13597
1971	6700.00152	0.91028	2659.69464	951.85945	592.55512	2217.12213	278.73015	12.80366
1972	8021.95104	0.97193	2655.62780	1742.01881	871.64572	2426.98917	325.66953	13.81850
1973	9954.83911	1.19112	3057.40563	2150.26314	1080.13109	3279.95369	387.08556	15.68141
1974	12046.47099	1.54609	3512.60928	2543.91287	1425.98199	4105.81267	458.15418	17.88090
1975	11188.07717	1.81507	3080.31685	2110.81392	1743.01135	3823.55751	430.37753	17.31225
1976	12849.35357	1.94828	3209.93913	2501.13132	2358.01160	4276.48686	503.78467	18.88710
1977	13837.27996	2.25530	3291.33136	2497.99699	2782.49844	4688.87333	576.57983	19.94295
1978	12845.91776	2.61108	2903.57692	2062.31113	2703.38180	4627.93954	548.70837	19.15039
1979	14284.55653	2.97853	3149.92136	2593.10584	2663.26453	5218.48611	659.77868	20.58825
1980	15629.20595	3.21020	3435.83630	2525.34215	3158.47707	5724.19512	785.35531	21.90512
1981	14943.74724	3.54714	3142.84839	1692.16842	3700.20583	5642.03180	766.49279	21.32200
1982	14099.32121	4.08425	2905.94175	1245.81348	3424.41009	5799.54534	723.61056	20.60017
1983	12367.14966	4.73937	2235.14355	1252.93470	2850.36876	5370.42819	658.27366	19.02608

	CR	IR	ENAR	MNAR	BCUC	HMSC	GTRC	KR
1964	3998.16436	1340.92452	1243.19116	727.46344	-175.21362	832.50785	171.63176	3279.38093
1965	4560.34708	1162.46205	1409.29029	880.53895	-288.79921	1238.78323	290.42960	4456.33636
1966	5050.93158	1225.49524	1786.23324	964.03180	-232.37203	1594.69972	433.50320	5395.98154
1967	5715.64700	1317.71105	1389.11851	1063.65578	-468.36061	1975.10264	427.78742	6351.67764
1968	4343.76589	1356.50656	914.67449	764.94595	-390.05186	2492.34801	258.95576	7351.80473
1969	3249.09921	1208.75448	1418.09626	406.11250	125.98606	3036.23530	366.52488	8340.72097
1970	2329.22158	1201.35953	2113.35727	322.92078	474.05880	3725.86506	546.43372	9132.43930
1971	5879.30772	1618.33592	2342.52050	1160.46732	-170.39160	4327.23885	1298.93338	9877.37675
1972	6169.96736	1737.61088	2957.56190	1611.73483	-335.42766	4920.73972	1652.84935	10401.65371
1973	7961.46965	1536.16526	2704.73021	1681.32576	186.41828	5343.34430	2555.67585	11618.58178
1974	9862.38963	2486.08862	2569.77318	2314.72610	2109.49803	4953.27354	6086.36226	12913.81781
1975	9163.52991	3580.15326	2351.62797	2954.59583	-70.16180	5487.30934	5689.12427	14811.21539
1976	9733.92527	4963.95659	2393.40233	3345.82732	86.84104	6304.12847	7477.38664	17650.80771
1977	10229.82500	5753.83501	2627.71890	3578.98076	-142.17550	7964.36242	8854.42777	21732.22371
1978	9775.23982	5360.56182	2010.86959	3428.97042	-2907.89434	9842.11444	7761.58025	26399.44728
1979	10640.96113	4517.64039	3144.55894	3341.59488	640.36345	12357.08029	11868.57440	30440.03641
1980	11333.02753	5172.29371	4149.72409	3866.12210	2790.16727	16597.70148	16060.89856	33435.67462
1981	10772.99827	6449.73383	3028.03421	4205.61499	-2901.24522	20780.42885	13873.84774	36936.10421
1982	10868.69197	5395.30145	1963.85794	3679.66077	-6324.21889	27901.10349	11882.36045	41539.10839
1983	9547.62724	3739.07164	1690.35645	2892.72647	-5680.84309	36939.67689	11226.10406	44857.45392

APPENDIX B (CONTINUED)

	EOR	EOC	ETGR	ENOR	EAOR	ECR	ETGSR	MCR
1964	149.70061	64.00001	1096.47771	946.77710	704.63908	242.13802	1276.11872	218.99931
1965	340.86066	136.00000	1116.57758	775.71692	678.14088	97.57604	1444.40558	291.03540
1966	459.35689	183.99999	1460.32532	1000.96843	763.83720	237.13124	1826.31333	305.22731
1967	368.13240	144.99999	1241.17112	873.03871	654.46163	218.57708	1423.96811	343.15721
1968	187.29910	74.00000	804.06608	616.76698	425.56225	191.20472	943.27508	218.57880
1969	587.52301	262.00000	1309.35753	721.83452	521.40682	200.42771	1453.32753	71.20498
1970	1169.29569	510.00001	1998.62999	829.33430	583.42389	245.91041	2157.74599	29.86105
1971	1889.97316	953.00001	2364.93755	474.96438	295.32641	179.63795	2389.92757	399.85725
1972	2356.00513	1175.99998	2807.42115	451.41601	277.84686	173.56714	3013.17115	486.84331
1973	1894.00000	1894.00000	2451.70803	557.70803	413.15884	144.54919	2756.92805	495.90046
1974	2144.85565	5366.00000	2424.47347	279.61782	139.15613	140.46168	2620.17347	606.97864
1975	1840.04720	4630.00016	2210.42102	370.37382	227.10762	143.26620	2399.15501	849.65116
1976	2093.03804	6195.99948	2263.32139	170.28336	90.10626	80.17710	2441.47959	827.84552
1977	2196.42669	7072.99997	2490.35541	293.92853	122.80618	171.12235	2678.88240	825.94040
1978	1751.24363	5670.99978	1995.26642	244.02279	114.91309	129.10970	2053.90842	820.43923
1979	2791.96429	9705.99987	2960.24737	168.38367	80.52181	87.86186	3202.52987	772.36555
1980	3776.06222	13632.00017	3921.33129	145.26906	85.59593	59.67312	4220.93428	898.48303
1981	2768.16703	10552.99993	2900.07037	131.90333	39.92082	91.97452	3084.47036	970.45068
1982	1912.70801	8003.00019	1998.74757	86.03956	33.72711	52.31245	2006.27757	856.54245
1983	1621.68974	7201.00006	1667.41575	45.72601	17.37715	28.34885	1729.17575	676.25133

	MRR	MKR	MSOPR	MIGS	MTGR	MTGSR	MSFR	BCAC
1964	142.36066	241.83816	374.44457	-10.20321	603.19812	967.85105	364.65292	154.74368
1965	165.12704	261.89543	410.96206	-9.10815	718.05787	1120.56006	402.50219	140.70192
1966	184.35125	296.31652	423.41531	-6.10237	785.89509	1203.85300	417.95791	107.55413
1967	194.77149	353.62200	412.09050	-0.45197	891.55070	1303.23845	411.68775	132.29706
1968	137.09709	335.51558	310.29270	4.17382	691.19146	1005.24381	314.05236	156.60127
1969	62.96014	223.34653	275.35604	16.20721	358.11165	647.26952	289.15787	80.22206
1970	31.93906	156.99955	332.46764	13.98856	220.79869	564.27699	343.47830	49.92459
1971	156.45475	263.69175	571.79617	11.06861	820.00374	1399.81820	579.81446	284.13999
1972	272.61856	462.62908	623.58539	6.49152	1222.09095	1850.00524	627.91428	249.79520
1973	345.59023	433.38614	616.80678	55.83958	1274.87683	1919.42955	644.55272	54.03377
1974	437.14525	548.80088	935.24883	63.23599	1592.92478	2551.31534	958.39056	-45.30065
1975	605.46893	829.56642	894.24079	32.94092	2284.68651	3189.65104	904.96453	211.56753
1976	650.00945	1142.49981	914.02181	23.76447	2658.35478	3579.94580	921.59102	104.59782
1977	734.19528	1310.72377	933.36903	29.25921	2870.85945	3812.54100	941.68155	216.36012
1978	741.89312	1246.26581	820.94705	134.96988	2808.59817	3662.88983	854.29167	1086.49439
1979	722.77368	1093.14509	947.05540	239.84895	2578.28451	3575.72349	997.43899	748.83773
1980	784.76715	1256.63811	1105.02126	325.40704	2933.88831	4098.99484	1165.10653	-938.81366
1981	652.36843	1527.63221	957.65781	680.81144	3350.45138	4437.67489	1087.22351	853.50368
1982	804.22471	1311.42953	786.92445	842.44562	2572.19669	3912.92010	940.72341	3507.77629
1983	676.43731	979.92660	645.40452	866.08833	2332.61524	3127.92980	795.31456	3214.87540

APPENDIX B (CONTINUED)

	GPGRC	GDOC	HLGC	PDM	GIIR	GNORC	GDPOR	NYC
1964	-120.92473	-68.29153	257.98038	0.74431	-644.13482	292.55649	4704.68852	2931.85012
1965	-55.99586	-25.24496	246.24268	0.76721	-777.44104	346.42545	5063.74416	3361.21853
1966	-12.70994	3.45271	135.91619	0.79870	-693.51282	446.21314	5584.97219	4191.79053
1967	-47.87975	-19.86417	252.38482	0.80157	-556.83229	475.66717	6049.79791	4689.82917
1968	-111.90683	-62.31284	495.45479	0.79297	-912.49959	370.86259	4690.13137	3101.41359
1969	57.62969	50.08648	515.38106	0.83877	-1277.00470	308.89519	3723.25189	2444.29436
1970	281.27362	198.35794	646.78330	0.90747	-1710.91688	265.16010	2948.24591	2052.99100
1971	690.76661	463.21379	515.50327	0.98391	-1423.77503	618.16677	5748.10204	5220.59083
1972	881.86575	596.53852	446.12093	0.98657	-1337.89033	770.98359	6279.93222	6112.99804
1973	1529.35101	1025.80831	192.03668	1.32403	-1109.02942	1026.32485	7804.57597	10486.52483
1974	4660.36597	3101.60867	-1513.71198	1.71815	-398.19808	1425.99629	9502.55811	17278.73757
1975	3996.64965	2651.57735	-279.39532	1.89056	-528.11797	1692.47562	9077.26325	18824.29489
1976	5405.95121	3597.83944	269.08462	1.96731	-474.82121	2068.53543	10348.22226	23166.61351
1977	6195.72151	4122.17064	1363.16705	2.26685	-784.78968	2654.70626	11339.28297	28404.69499
1978	4935.41173	3293.35952	1911.95150	2.56311	-414.01195	2826.16852	10783.60663	29941.15707
1979	8574.13454	5696.35904	3417.97248	2.86930	-303.22151	3294.43985	11691.45069	37717.94343
1980	12114.56244	8043.59200	5534.20258	2.95991	-688.57034	3946.33612	13103.86380	44510.81171
1981	9337.95375	6202.75393	4809.68828	3.22524	-564.17933	4535.89699	13251.57882	46179.97429
1982	7038.38643	4678.13873	11343.94346	3.68761	35.41616	4843.97402	12853.50773	48780.88304
1983	6315.15071	4198.69790	15806.31971	4.17955	706.91322	4910.95334	11114.21416	47646.20459

	GNPR	NYR	NYDR	GDPC	RDSR	RUTR	RAR	RMDR
1964	4900.76700	4736.79795	3835.60636	3095.23427	-927.67676	-57.22624	1395.26454	-287.05288
1965	5149.90343	4926.09661	3979.06045	3649.71929	-878.33510	-65.72104	1323.71178	-295.64176
1966	6019.43025	5749.63117	3721.00015	4551.06758	-793.01037	-69.53410	1212.30494	-300.73625
1967	6435.01374	6107.42985	6134.68031	4995.12953	-708.12198	-74.97125	1068.79940	-313.07218
1968	4539.91697	4222.22673	4337.32528	3477.93395	-622.37911	-80.57267	902.81196	-327.70046
1969	3882.54749	3465.51143	3425.75425	2964.84592	-530.24689	-85.72069	721.61817	-341.42353
1970	3342.09669	2895.47472	2619.59477	2667.45077	-434.90753	-90.89673	529.46778	-355.67418
1971	6229.00153	5735.14276	5198.56985	6098.88331	-346.28297	-98.24388	326.34611	-376.94615
1972	7426.95104	6906.86837	6292.93126	7796.78123	-267.88543	-106.56214	114.68658	-402.79453
1973	9384.83911	8803.91002	7903.48612	11857.42099	-200.46952	-117.50248	-106.60569	-438.46976
1974	11824.47099	11175.78009	9103.15858	18624.90217	-113.31251	-121.38940	-323.45774	-452.86832
1975	11107.07717	10366.51638	8965.95094	20316.14635	-6.85956	-122.27880	-534.91366	-453.78739
1976	12773.35357	11890.81316	10055.17811	25034.11701	123.85635	-117.24552	-734.70207	-431.82020
1977	13681.27396	12594.66875	10684.64475	31207.14997	282.00678	-99.96623	-909.91917	-364.32088
1978	12786.91776	11466.94538	10316.38238	33541.76973	461.94824	-66.48398	-1047.52374	-233.58182
1979	14185.25653	12663.25468	10759.62946	42547.04723	663.04405	-23.17223	-1148.94819	-56.42491
1980	15537.20595	13855.42219	11377.76471	50172.91457	868.30348	15.31993	-1234.93236	116.38109
1981	14865.74724	13018.93800	11219.42380	53007.53896	1041.42943	41.327 0	-1326.97662	249.46171
1982	14020.62122	11943.66577	10743.58685	57585.11269	1207.76314	70.261e7	-1415.10103	385.12358
1983	12296.14386	10053.27613	9193.65406	58612.50573	1358.73557	111.91397	-1482.51317	561.89753

APPENDIX B (CONTINUED)

	BOP	FRC	FADS	FODS	FODC	FDSS	FDSC	FNDC
1964	29.03007	164.74436	5.09584	202.50117	144.64369	-5.10437	-3.64598	14.21511
1965	-126.59728	36.14708	7.01731	227.88386	162.77419	-2.09084	-1.49346	18.13049
1966	-107.31790	-69.17092	9.46420	251.11965	179.37118	3.36184	2.40131	16.59700
1967	-262.66355	-331.83437	11.70413	433.21552	309.43967	11.25217	8.03726	130.06848
1968	-224.05058	-555.88495	29.25818	478.55734	341.82668	33.43200	23.88000	32.38702
1969	271.70812	-284.17684	33.62913	492.62822	351.87731	49.83634	35.59738	10.05062
1970	631.98339	347.80655	34.98556	526.14266	375.81619	48.97412	34.98151	23.93889
1971	276.04938	623.85493	38.21635	616.19930	439.20120	49.28496	35.12827	64.18862
1972	-59.03246	564.82248	46.39781	658.26149	433.06676	53.38933	35.12456	27.67249
1973	205.95205	770.77453	50.95261	1127.30888	741.65057	106.79219	70.25802	308.58381
1974	2517.19733	3237.97190	96.16878	1073.74010	675.13837	159.40476	100.22935	-33.68258
1975	157.40573	3445.37763	91.00475	1044.84536	643.06094	123.94567	76.28365	-17.78357
1976	3.43986	3445.61649	99.21929	1062.14606	665.54670	111.98376	70.16965	10.84072
1977	147.13463	3593.00111	89.38708	1111.04698	716.15767	119.14629	76.79921	31.52051
1978	-1039.39994	2584.60117	94.60113	2510.95281	1594.76212	229.57101	145.80567	889.11141
1979	1704.20119	4288.80235	229.55205	3110.01617	1874.51999	469.40100	282.92507	361.07731
1980	2319.35361	6608.15595	287.30176	3533.84582	1931.37996	612.70879	334.86845	231.63888
1981	-2375.04153	4233.11443	329.15894	6061.49084	3720.53217	1008.97038	619.30420	1551.46396
1982	-2744.34261	1498.77182	571.82392	9477.60589	6380.50742	1414.26953	952.11358	2299.79466
1983	-2641.26770	-1152.49587	901.13741	13315.23166	9632.66394	1767.22574	1278.46755	2776.26108

	GURC	GMTC	GSRTC	GITC	GOTC	GXTC	GEXPC	GDNC
1964	5.40627	136.90370	56.62745	191.82235	-29.59111	24.91864	413.51095	38.70042
1965	13.08022	151.51596	67.07240	221.90476	19.12310	38.38879	559.26077	44.36808
1966	25.55468	162.52474	84.14157	281.18525	58.78435	90.66052	628.70239	55.33163
1967	31.70040	174.98782	92.58621	289.47482	42.04158	84.48700	652.72573	61.90574
1968	10.70275	151.11400	63.83148	255.38970	-21.37418	74.27570	582.62206	40.95866
1969	3.60172	115.60305	54.17839	218.85039	82.35117	64.24734	562.14357	32.26469
1970	-0.51416	101.26723	48.60366	189.97112	225.45742	47.70389	653.20113	27.09948
1971	46.97611	188.20015	113.66151	388.61735	532.12556	162.41720	915.80746	68.91179
1972	70.47464	245.37775	146.28039	465.61700	685.15008	193.23924	1389.94928	88.61157
1973	126.67299	314.51645	225.02167	536.20806	1164.23044	208.69161	1902.49641	138.42213
1974	220.33342	464.37764	357.82764	619.75590	3329.68800	148.87825	3790.94200	228.07933
1975	243.73986	691.71988	391.24627	809.00880	2910.05805	110.28892	5432.48618	248.48069
1976	309.03553	822.23571	484.85668	968.84392	3903.63873	140.60822	8710.93179	305.29930
1977	394.46893	1006.26287	608.05741	1277.23795	4497.11261	266.77507	11205.56771	374.94197
1978	426.77955	1104.48640	654.83300	1349.33270	3679.18179	242.04630	11704.68991	395.22327
1979	551.41059	1133.02991	836.04472	1409.10770	6194.23589	275.87779	12994.33497	497.87685
1980	656.95089	1317.40388	990.33294	1711.50957	8631.13471	394.00569	16611.25906	587.54271
1981	696.18146	1621.58738	1047.85257	2182.28729	5812.32958	560.59991	22012.76402	609.57566
1982	759.53407	1643.70409	1140.91522	2299.61708	5322.09638	655.61299	20121.41448	643.90765
1983	773.75296	1470.10286	1161.83057	2346.43992	4827.62779	876.23706	18496.74442	628.92990

APPENDIX B (CONTINUED)

	PDC	LWIR	CPR	CGR	IPR	FOSR	DEPR	DPR
1964	0.70213	0.59862	3654.63773	343.52663	1055.59386	-0.00668	163.96905	102.75429
1965	0.72289	0.66545	4168.56385	391.78323	806.07716	-0.00259	222.81682	150.39627
1966	0.77331	0.73280	4604.18506	446.74652	855.90912	0.00328	269.79908	183.18031
1967	0.75255	0.71994	5281.10387	434.54313	983.80779	0.01433	317.58389	216.81675
1968	0.74958	0.64817	3975.76280	368.00309	1021.39377	0.06408	367.59024	255.16630
1969	0.80593	0.60765	2826.73419	422.36503	927.52767	0.05493	417.03605	293.47787
1970	0.89193	0.63589	1825.06952	503.15206	851.48221	0.03717	456.62197	325.18017
1971	0.84697	0.90113	5161.90664	717.50106	786.43252	0.02915	493.85879	351.49525
1972	0.99857	0.98309	5354.45898	806.50837	1208.82253	0.02335	520.08268	373.24212
1973	1.06475	1.20583	7033.20020	951.26945	1398.04526	0.02548	580.92909	415.02114
1974	1.13472	1.54409	8349.52051	1533.86912	1674.71722	0.01529	648.69090	464.17234
1975	1.53001	1.77493	7931.07275	1272.45715	1974.11164	0.01264	740.56078	524.69959
1976	1.93131	1.91003	8232.15430	1501.77098	2170.27862	0.00971	882.54041	597.17018
1977	2.17017	2.19336	3699.39081	1530.43419	2408.07232	0.00890	1086.61120	675.82560
1978	2.60020	2.50383	8554.97311	1220.26671	2389.96489	0.02192	1319.97238	762.43793
1979	2.88194	2.84603	9091.45170	1549.50943	1929.02540	0.02541	1522.00184	843.81427
1980	3.15182	3.06414	9422.25015	1880.77738	2134.95094	0.02198	1671.78376	898.07482
1981	3.76870	3.36239	9247.37274	1525.62553	2008.38618	0.05267	1846.80924	959.91861
1982	4.04451	3.83953	3668.99539	1199.69658	1910.27020	0.11342	2076.95545	1012.34198
1983	4.94016	4.41491	3523.79023	1023.83701	1151.32628	0.16650	2242.87273	1057.23838

	DGR	KPR	KGR
1964	61.21476	2055.09576	1224.29517
1965	72.42055	3007.92531	1469.41106
1966	86.61877	3663.60617	1732.37537
1967	100.76714	4336.33493	2015.34271
1968	112.42394	5103.32592	2248.47881
1969	123.55838	5869.55333	2471.16763
1970	131.44180	6503.60327	2628.83603
1971	142.36356	7029.90524	2847.27151
1972	146.84056	7464.84241	2936.81130
1973	165.90795	8300.42272	3318.15905
1974	184.51855	9283.44675	3690.37106
1975	215.86120	10493.99153	4317.22386
1976	285.37022	11943.40347	5707.40424
1977	410.78560	13516.51177	8215.71194
1978	557.53446	15248.75834	11150.68894
1979	678.18757	16876.28513	13563.75128
1980	773.70894	17961.49608	15474.17855
1981	886.89062	19198.37200	17737.81221
1982	1064.61347	20246.83934	21292.26904
1983	1185.63435	21144.76733	23712.68659

APPENDIX C

BENCHMARK FORECAST RESULTS

SIMULATION RESULTS

	GDPR	P	VAR	VNR	VMBR	VDSR	VUTR	LEMP
1984	13609.57505	5.33894	2799.11533	1456.04005	3018.40282	5615.90111	719.11575	20.24719
1985	14595.47952	6.66896	2956.85123	1859.54492	3020.21519	5982.62896	776.23862	21.26090
1986	12649.46983	8.26047	2361.38909	1046.09605	3060.99759	5501.47555	679.51155	19.45386
1987	12573.72925	9.03901	2261.98690	1054.61128	2993.98496	5588.10596	675.13915	19.39958
1988	12955.33785	9.55557	2215.85959	1177.05313	3050.84023	5718.31249	693.27240	19.67989
1989	14123.22137	9.99315	2432.17720	1623.84171	3191.39353	6116.60566	759.20327	20.90500
1990	14665.25329	10.46795	2482.49559	1737.35101	3338.79030	6317.81966	788.80664	21.43441
1991	15024.55443	10.82504	2453.10436	1832.32316	3439.37374	6459.12021	810.73345	21.78783
1992	15523.57446	11.38164	2521.59804	1963.22795	3550.56477	6647.42553	840.75827	22.27523
1993	16081.62379	11.85480	2579.07906	2084.48935	3682.87061	6861.14567	874.04010	22.81972
1994	16733.38262	12.34793	2663.52160	2216.76012	3832.98779	7107.91370	912.14880	23.45472
1995	17421.55517	12.86386	2775.93956	2357.77894	4003.34147	7389.16085	955.33434	24.18299
1996	18331.46519	13.40394	2917.59745	2507.70616	4194.98835	7707.22197	1003.95124	25.00977
1997	19231.91134	13.96908	3090.91063	2667.22068	4409.47699	8065.78031	1058.52274	25.94366
1998	20334.63209	14.56014	3301.65365	2840.89775	4649.57780	8472.32075	1120.18214	27.00573
1999	21514.06967	15.17823	3551.19033	3026.47590	4917.69823	8929.50642	1189.19799	28.20037
2000	23007.07042	15.81407	3846.74735	3225.71144	5221.24612	9446.45406	1266.91145	29.55354

	CR	IR	ENAR	MNAR	BCUC	HMSC	GTRC	KR
1984	19371.95270	3437.44708	1944.68578	2794.04698	-4273.81396	38535.06112	13447.34147	46826.44253
1985	19597.93784	3198.74459	2527.75791	2647.86786	-3609.41877	39898.05627	17604.44683	47922.56692
1986	9215.07131	3636.38071	1367.27580	2501.06533	-11204.69360	38339.69130	12705.49227	48715.18259
1987	9194.70282	3459.02931	1385.61221	2270.61085	-10084.51828	33159.17876	13101.53579	49916.40359
1988	9277.62673	3553.91324	1537.98433	2100.62213	-8627.52362	29203.60962	14095.50965	50879.61212
1989	10019.84525	3702.03290	2128.78974	2038.63013	-5660.11149	29900.05553	17857.89524	51869.54415
1990	10410.26374	3997.09075	2246.96502	2036.63878	-5512.42899	30484.28590	19141.28586	52997.09923
1991	10688.47842	4192.89493	2351.64727	2017.04355	-5312.30098	31852.81498	20247.12515	54344.33438
1992	11058.31675	4367.42444	2507.29143	2014.88715	-4992.43499	34123.71775	21691.60195	55820.01194
1993	11472.95139	4561.11005	2646.45662	2036.06909	-4952.42333	36983.28677	23189.22503	57396.43512
1994	11949.57286	4790.41892	2798.71636	2074.74186	-5010.81440	40410.22046	24862.73378	59093.72273
1995	12489.63522	5012.74065	2960.17716	2129.13585	-5185.11727	44339.94072	26730.60885	60919.45480
1996	13096.11007	5264.73703	3130.75557	2196.64269	-5465.36916	48711.83440	28812.21884	62886.22198
1997	13774.29218	5537.34062	3311.05509	2275.34532	-5842.40191	53474.95669	31132.25684	65006.69717
1998	14537.59333	5831.89261	3506.94942	2364.93026	-6292.57943	58597.80444	33729.55919	67293.70215
1999	15333.93445	6152.08421	3714.74168	2464.96104	-6842.68199	64047.45466	36633.54892	69760.90886
2000	16344.69375	6510.83093	3935.22052	2578.18102	-7505.74880	69486.81276	39884.29426	72424.94679

APPENDIX C (CONTINUED)

	MRR	MKR	MSOPR	MIGS	MIGR	MIGSR	MSFR	BCAC
1984	579.72795	933.71222	682.96419	947.20766	2188.63924	3029.48658	840.84734	918.15604
1985	553.26940	894.76463	567.54174	823.42317	2084.97719	2883.65746	798.68027	706.02972
1986	429.54427	1025.51471	537.62523	761.36072	2083.07213	2737.20642	654.13429	753.34794
1987	433.37245	1023.17667	467.38233	780.97822	1903.71993	2501.30372	603.58379	765.99960
1988	325.31741	1057.99636	419.73919	762.11833	1807.72005	2337.72200	530.00194	778.98553
1989	273.67736	1096.11331	403.28758	791.68598	1762.61503	2275.87842	513.26339	792.50121
1990	238.76955	1149.19838	379.78362	801.71339	1784.21815	2273.89184	489.67368	806.12452
1991	210.59101	1217.60239	357.06140	822.21079	1787.87643	2254.34353	466.46710	819.93539
1992	190.52037	1240.96882	341.44669	843.19745	1801.62368	2252.19230	450.56862	834.11578
1993	178.33245	1309.24203	329.25543	864.70627	1835.22204	2273.32352	438.10148	849.54895
1994	173.02409	1360.32158	319.98174	886.76956	1883.34641	2311.90369	428.55728	865.22417
1995	173.62154	1415.41054	312.90200	909.32483	1945.36263	2366.16744	420.80481	880.03776
1996	173.17619	1474.66198	305.90826	932.43377	2019.57048	2433.51266	413.94218	896.08168
1997	173.02237	1538.22454	299.51847	956.09757	2104.74122	2512.02685	407.28563	912.24729
1998	173.51913	1606.39340	293.17463	980.31730	2200.72171	2601.39729	400.67559	928.53252
1999	219.63533	1679.92501	286.27789	1005.14849	2307.67060	2701.18857	393.51798	946.03514
2000	240.33963	1761.53017	279.56752	1030.64131	2428.50825	2814.13747	385.62922	964.95699

	BOP	FRC	FAGS	FODS	FODC	FOSS	FOSC	FNDC
1984	-3235.65792	-2519.46029	1157.11410	12917.58609	9872.05626	2114.32176	1615.83621	520.35604
1985	-2743.39305	-5302.84934	1232.75150	13244.83459	11019.41364	2056.23467	1834.94085	292.02972
1986	-13331.32565	-15634.17500	1264.29826	13579.53634	13574.10767	2025.65897	2024.84918	334.56794
1987	-9138.51269	-24832.69368	1295.56350	13921.97283	13916.40727	2077.54172	2076.71119	342.29960
1988	-7723.53903	-32561.23177	1329.57639	14272.39845	14266.69280	2091.69272	2090.85652	350.28553
1989	-4747.61029	-37308.84205	1363.35541	14631.04304	14625.19401	2145.04139	2144.18387	358.50121
1990	-4555.30447	-41895.14652	1397.92875	14998.11429	14992.11852	2199.64214	2198.76279	366.92451
1991	-4372.36539	-46267.51211	1433.31442	15373.79987	15367.65391	2255.52521	2254.62352	375.53539
1992	-4038.31921	-50305.83132	1469.53051	15758.26936	15751.96970	2312.71796	2311.79341	384.31579
1993	-3962.87438	-54238.70571	1506.59337	16152.67599	16146.21866	2371.29964	2370.35167	394.24896
1994	-4025.59023	-58314.29594	1544.61417	16557.06182	16550.44283	2431.38373	2430.41174	404.22417
1995	-4185.07951	-62499.37545	1583.59696	16970.46486	16963.68061	2492.92179	2491.92520	413.23777
1996	-4449.28748	-66948.66293	1623.44901	17394.01585	17387.06227	2555.88279	2554.86103	423.38166
1997	-4913.15468	-71758.81761	1564.27933	17827.73652	17820.60955	2620.37690	2619.32936	433.54728
1998	-5244.04691	-77302.86452	1736.39000	18271.64651	18264.34209	2686.40730	2685.33330	444.43429
1999	-5776.64685	-82779.51137	1748.36293	18726.76359	18719.27722	2754.03141	2752.93044	454.93513
2000	-6420.79181	-89200.30318	1792.75621	19194.00737	19186.33422	2823.39752	2822.26882	467.05700

APPENDIX C (CONTINUED)

	NYR	NYDR	GDPC	PDSR	RUTR	RAR	RMBR	PDC
1984	11177.25290	10221.67757	92652.97380	1223.09301	130.05759	-1218.11086	755.57212	5.44299
1985	12109.35954	11092.63941	97336.64142	1459.06908	152.59142	-1172.95407	812.33411	6.80129
1986	10123.71066	9769.40315	104490.57150	1591.92872	154.39646	-1212.01323	830.25531	8.42653
1987	9987.33303	9669.58590	113654.02527	1644.11058	148.52276	-1298.83716	821.71402	9.22156
1988	10221.35720	9802.33105	122960.07493	1684.32076	145.52555	-1403.30309	817.52099	9.74907
1989	11439.74412	10920.49686	141220.27623	1695.31550	140.51807	-1520.61304	806.40009	10.20206
1990	11925.40923	11393.52030	153515.27383	1691.21478	135.60213	-1643.69441	794.22670	10.68079
1991	12217.43017	11678.26461	164144.94214	1692.45417	131.77728	-1768.12243	785.18519	11.14756
1992	12542.57342	12092.21022	175693.70799	1693.11622	130.81288	-1889.33566	786.10301	11.61384
1993	13121.33199	12544.73073	193644.35972	1693.22360	131.85854	-2006.82432	795.64683	12.09702
1994	13663.29264	13093.71230	206622.65723	1710.90424	134.43182	-2120.77976	812.27997	12.60060
1995	14345.53233	13731.39045	224920.30050	1730.32778	139.65250	-2230.97198	836.12370	13.12747
1996	15197.15424	14462.45926	243713.80390	1769.92106	144.62891	-2337.16068	867.50181	13.67899
1997	15981.57544	15294.94606	263490.26711	1812.52756	152.52201	-2439.01882	907.00073	14.25611
1998	16927.94653	16249.67902	286803.06571	1865.24081	162.50469	-2536.17389	955.31420	14.85969
1999	18036.32237	17330.34966	328063.36611	1929.21804	174.75399	-2628.22784	1013.18397	15.49088
2000	19295.92303	18562.20792	363835.36863	2005.76579	189.45715	-2714.75583	1081.40181	16.14019

	LWIS	CPR	CGR	IPR	FDSR	DEPR	DPR	DGR
1984	4.96665	9326.29415	1072.55855	1127.21735	0.16265	2341.32216	1085.58223	1255.73993
1985	5.17301	9485.92485	1112.01299	1081.09200	0.14238	2396.12838	1087.66398	1308.46441
1986	7.59255	9451.41469	753.65662	1222.35742	0.28888	2435.75917	1087.33536	1348.42380
1987	9.29417	9469.88757	724.81525	943.80567	0.29241	2495.82022	1094.08646	1401.73376
1988	9.76266	8544.46282	733.16391	932.96402	0.26554	2543.98064	1086.57240	1457.40824
1989	9.17326	9185.57108	834.27418	973.27362	0.19731	2594.47725	1078.89197	1515.58527
1990	9.50027	9562.13064	848.13810	1154.75847	0.19177	2649.85500	1073.61104	1576.24396
1991	10.01524	9832.30030	856.17812	1232.34634	0.18795	2717.21676	1077.66840	1639.54836
1992	10.43366	10195.03987	873.27688	1283.78968	0.18083	2791.00064	1085.40229	1705.59835
1993	10.36125	10583.32438	889.62701	1355.20502	0.17572	2869.82180	1095.32165	1774.50015
1994	11.31027	11041.27128	908.30158	1435.08420	0.17043	2954.68618	1108.31580	1846.37038
1995	11.79021	11560.36952	929.26570	1528.37688	0.16526	3045.97279	1124.65421	1921.31858
1996	12.27223	12143.56256	952.54751	1635.47038	0.16025	3144.31115	1144.84033	1999.47082
1997	12.78713	12796.01351	978.28467	1757.12651	0.15539	3250.33491	1169.37182	2080.96309
1998	13.32563	13530.71564	1006.99219	1894.60477	0.15045	3364.68516	1198.75954	2165.92562
1999	13.93491	14350.50249	1039.43196	2051.01682	0.14565	3488.04549	1233.55179	2254.49370
2000	14.65914	15270.95678	1073.73198	2226.99841	0.14099	3621.24739	1274.42503	2346.82236

APPENDIX C (CONTINUED)

	GDRC	GMTC	GSRTC	GITC	GDTC	GXTC	GEXPC	GDMC
1984	968.0d375	1511.G3684	1448.61973	2463.47947	5555.87562	954.34263	19638.79377	787.68072
1985	1309.68638	1748.65066	1956.29279	2961.67203	7913.72698	1212.91137	23273.70824	1065.98916
1986	1408.59519	2023.10363	2164.13804	3363.65050	4248.42203	1340.44687	28254.21412	1103.87128
1987	1535.51534	1905.93270	2293.91407	3374.41825	4323.55736	1468.38555	31513.64337	1191.70625
1988	1662.64823	1862.93928	2484.57758	3429.09031	4168.47915	1566.05103	34341.16606	1289.25574
1989	1917.02613	1857.76038	2867.21543	3629.64074	6781.89928	1761.78036	38008.56218	1509.78659
1990	2097.13615	1941.17074	3123.94340	3861.34131	7242.64948	1920.06457	41107.93267	1647.81675
1991	2234.29940	1927.87269	3346.35244	4058.56854	7638.49846	2060.59595	44267.77669	1761.88305
1992	2407.83213	2067.34335	3609.21000	4291.25105	8198.91789	2223.80270	47700.04919	1899.39024
1993	2621.64445	2161.59937a	3962.47325	4563.69127	8737.23628	2406.90149	51383.95095	2053.34286
1994	2823.11353	2276.65346	4239.33742	4892.33532	9322.48514	2615.58187	55385.69433	2231.15745
1995	3074.25225	2413.01919	4624.05161	5246.17651	9959.09740	2853.05733	59743.49635	2435.92246
1996	3363.13737	2576.24315	5064.55343	5693.24690	10652.03895	3122.89875	64491.71064	2671.16922
1997	3692.25427	2748.25135	5563.73754	6177.87227	11407.57566	3429.52091	69662.62191	2941.34092
1998	4070.25732	2943.24407	6149.28934	6728.31402	12234.41611	3779.96995	75297.34774	3253.83129
1999	4502.93293	3171.89672	6815.53261	7351.27264	13139.39703	4179.27592	81441.78074	3613.56544
2000	4957.96949	3422.49469	7580.05289	9056.33873	14131.68971	4633.75405	88285.36765	4027.91993

	GPDRC	GDOC	POM	GNDRC	GDPOR	NYC	HLGC	GNPR
1984	7777.46780	5168.13491	4.53496	5669.87367	12152.53501	59673.53935	17948.56406	13518.57506
1985	1931?.80647	6647.73783	5.60796	7293.64036	12135.93400	80756.75472	20188.03816	14505.47892
1986	4725.13727	3144.55075	6.53216	7980.35500	11603.37378	83626.61259	24439.29117	12559.46983
1987	4705.93199	3131.85112	6.71821	8395.55390	11519.11697	90280.77667	27275.78986	12483.72825
1988	5229.93760	3473.22342	6.90909	8865.57195	11678.28472	97670.88968	29625.30868	12765.33785
1989	7934.22634	5272.11269	7.10496	9523.66389	12499.37966	114377.77278	32226.39107	14033.22137
1990	8420.99825	5594.83274	7.30597	10720.28762	12927.91219	124834.60271	34520.72055	14575.26320
1991	8946.02262	5876.61541	7.51224	11401.10253	13192.33177	133475.98936	36991.13876	14934.65493
1992	9483.91953	6299.52764	7.72393	12207.68343	13560.34661	143893.20109	39608.04997	15433.57444
1993	10063.67322	6693.89342	7.94113	13125.55182	13997.13444	155556.27787	42364.15017	15991.42379
1994	10673.22306	7091.32769	8.16404	14184.51072	14516.62189	169027.08041	45296.95943	16643.38202
1995	11329.59601	7523.17494	8.39278	15401.01284	15123.77622	184539.58163	48429.24574	17391.55517
1996	12019.95586	7980.86973	8.62748	16792.26297	15823.75902	202361.30527	51776.06601	18241.44518
1997	12752.05185	9466.23474	8.86834	19380.20500	16624.69066	222828.85911	55348.86963	19201.91134
1998	13527.96722	3990.59483	9.11550	20201.69197	17543.73434	246502.37147	59151.92323	20294.63209
1999	14350.25531	9525.83159	9.36913	22283.26362	18587.59297	273754.95910	63203.58198	21524.06887
2000	15222.01322	10123.76978	9.62276	24662.28104	19781.35898	305145.45120	67656.02961	22917.07042

APPENDIX C (CONTINUED)

	TOR	EOC	ETGR	ENOR	EAOR	ECR	ETGSR	MCR
1984	1766.51433	9622.57166	1306.85289	42.33856	-31.67271	74.01127	1986.85289	675.19907
1985	2325.36101	11031.80507	2397.60480	71.24378	-11.37622	82.62000	2577.60480	636.94416
1986	1087.56505	5437.82526	1221.83771	134.27266	47.82190	86.45076	1401.83771	568.01315
1987	1033.31675	5416.58376	1240.41563	157.09888	56.27877	100.82011	1420.41563	480.17079
1988	1199.52028	5937.60139	1394.79468	195.27440	76.01148	119.26292	1574.79468	424.49428
1989	1799.28042	8996.40208	1993.38173	194.10131	82.21318	111.88813	2173.38173	390.82436
1990	1937.23723	9536.19617	2113.11352	205.87629	88.41489	117.46139	2293.11352	376.25083
1991	2001.45962	10007.49809	2219.17457	217.67495	94.61660	123.05835	2399.17457	369.48303
1992	2143.97263	10714.86441	2375.36976	233.89587	104.20105	129.69482	2556.86876	350.13449
1993	2271.55153	11357.75763	2517.36692	246.31540	110.96655	135.34884	2697.86692	347.64756
1994	2407.34709	12033.23535	2672.13210	264.29503	122.24238	142.04264	2852.13210	350.00075
1995	2552.30933	12761.54656	2835.71954	283.41024	134.64580	148.76444	3015.71954	356.33015
1996	2705.41858	13527.07040	3004.54469	303.12661	147.61301	155.51360	3188.54469	365.73240
1997	2867.73315	14336.91573	3191.21897	323.43583	161.14400	162.29182	3371.21897	377.59431
1998	3039.04435	15193.22173	3389.69347	349.84913	174.67500	175.17412	3569.69347	391.80920
1999	3222.24115	16111.20575	3603.22262	377.98147	189.89737	188.08410	3780.22262	408.09029
2000	3415.57394	17077.86971	3823.60543	408.03149	205.11975	202.91175	4003.60543	426.59745

	KPR	KGR
1984	21711.64432	25114.79820
1985	21753.27919	26159.29773
1986	21745.70657	25968.47562
1987	21891.72879	28034.67481
1988	21731.44716	29148.16437
1989	21577.83913	30311.70502
1990	21472.22054	31524.87868
1991	21553.36773	32790.96665
1992	21708.04543	34111.96651
1993	21906.43259	35490.00254
1994	22166.31570	36927.40702
1995	22493.08386	38426.37095
1996	22896.90627	39989.41571
1997	23387.43607	41619.26110
1998	23975.19049	43318.51166
1999	24671.03545	45089.87340
2000	25488.50021	46936.44658

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