EXCHANGE RATE REGIMES AND ECONOMIC PERFORMANCE: A COMPARATIVE ANALYSIS

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DEDICATION

This Thesis is Dedicated to

My Parents

ELIJAH KOLADE AND ELIZABETH AGBEKE AKINLADE
For Inspiration and Support

My Husband

MATHEW OLUFEMI ADEGBITE
For Understanding and Endurance

My Children

ADEFUNMINIYI, ADEDEJI AND ADETOLA
For their forbearance.

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For everything - to **JEHOVAH** be the **GLORY.**

ABSTRACT

In 1973 the industrial countries of the world abandoned the Bretton - Wood adjustable - peg exchange rate system as a means of international payments, and embraced a floating exchange rate system. By the beginning of the 1980's some developing countries of the world joined the league of exchange rate-floaters. It was thought that a floating exchange rate system is intrinsically superior to a fixed one because it not only insulates an economy from the events in other economies but also provides automatic adjustment of the trade balance and the balance of payments.

From the mid 1980's however there have been calls in the industrial countries for yet a change in the international payments system from a floating one back to the Bretton-Woods fixed system (Marris, 1984; Dunn, 1983) or to some other variant of a fixed system. The questions then are - is there an ideal exchange rate regime? - is there reason to believe that a given exchange rate regime enhances the performance of an economy better than another?. These questions form the focus of this study.

There have been several positions in the literature. While Mundell-Fleming (1960, 1962) maintain that a floating exchange system is better than a fixed one if a country tends to depend more on monetary policy, but that a fixed exchange rate regime is ideal when fiscal policy is the major instrument employed in an economy, Sohmen (1965) maintained that a floating regime is superior whatever the more dominant economic policy (fiscal or

monetary). Dernberg (1970) maintained that the performance of an economy does not depend on the exchange rate regime per-se but rather on the optimal mix of fiscal and monetary policy. In the developing world there is fear that a floating exchange regime would aggravate rather than reduce the problems of inflation, debt-service burden and balance of payments disequilibrium (Olofin, Akinkugbe, Ajayi 1986). This study therefore attempted to find out which of the positions in the literature really holds in the case of developing African economies.

To find answers to the issues raised we chose three african economies who had experienced both fixed and floating exchange rate systems, namely, Ghana, Nigeria and Uganda. We built a model of each economy in the manner of Rhomberg (1964) and Tullio 1981. Each model has two versions. The shorter version has seven stochastic equations and tries to capture the economy under a fixed system, while the longer version added two additional stochastic equations to the first set and endogenizes exchange rates and interest rates as obtains under a floating exchange system. Utilizing quarterly data for 1977 to 1990 for Nigeria and Ghana, and for 1981 to 1990 for Uganda and employing the Ordinary Least Squares technique we estimated the shorter version of the model for the period 1977:1-1990:4 and the longer version for the period 1986:4-1990:4 for Ghana and Nigeria. In the case of Uganda we estimated the longer version for the period 1981:1 to 1990:4 and the shorter version for 1987:2 to 1990:4.

Beyond the statistical tests of the individual equations and parameters, we attempted to carry out rigorous tests of the validity of our model(s) through dynamic simulation. Thus we solved our model(s) using the Time Series Processor (TSP) econometric Software (Version 4.0) developed by Hall in 1983. When we solved each model using the Gauss - Seidel iterative technique, each converged for each endogenous variable and for each year demonstrating that each model is internally consistent.Utilizing different policy scenarios we tried to find out the effects of monetary, fiscal and exchange rate policy changes on internal sectors' macroaggregates of prices, real demand for money and money supply, as well as on external sector's macroaggregates of exports, imports and the trade balance.

The results of our estimation exercises reveal that in Ghana a floating exchange rate system does not fuel inflation as is suggested by casual empiricism; rather it is the money supply that is the major propeller of domestic prices, given an exchange rate elasticity of domestic prices of 2% which is statistically insignificant at the 5% level and a money supply elasticity of domestic prices of 19% that is statistically significant at the 5% level. In Uganda there is a remarkable pass through from nominal exchange rates onto prices which contradicts Elbadawi's (1990) position, that it is not nominal exchange rates that fuel inflation in Uganda but fiscal deficits. The exchange rate elasticity of domestic prices in Uganda is 11% and this is statistically significant at the 5% level. However even in Uganda, nominal money supply and nominal rates of interest proved to be greater propellers of prices hence they have more dominant impact on inflation than the nominal exchange rate. In Nigeria there is some degree of pass through from nominal exchange rates onto prices given an exchange rate elasticity of domestic prices of 5%, which is statistically significant at the 5% level. However as in Ghana and Uganda money supply was the greater propeller of prices in Nigeria. What is more- the estimation results also showed that nominal exchange rates in the three countries follow the money supply. This goes to show that the behaviour of the money supply and hence monetary policy influences the direction and degree of variability in nominal exchange rates under a floating system. Hence it shows that monetary policy is crucial to the success of the floating exchange rate system. Further the money supply was shown to vary in response to government fiscal deficits which makes fiscal prudence or otherwise the major determinant of exchange rate movements.

For the simulation experiments we tried to find in what ways our endogenous variables change if a given macroeconomic policy varies while the others are kept constant. Thus we increased the rate of growth of government expenditure while keeping monetary policy and exchange rate policy constant. Similarly when we increased the rate of growth of the money supply we assumed fiscal and exchange rate policies to be constant. Our results show that in the long-run (over a period of at least ten years) a floating exchange rate performs better than a fixed one in terms of ensuring expanded output which ensures declining prices which in turn results in rising real demand for money and hence in rising rates of interests. A floating exchange rate regime also expanded exports and higher positive trade balance. Overall however the success of the floating system depends on coordinated and prudent macroeconomic policies; in the words of Goldstein (1984) "the capacity of the exchange rate system per-se to do good or harm should not be overestimated... the importance of discipline and coordinated macroeconomic policies for the successful operation of floating exchange rate regime should not be underestimated".

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INTRODUCTION

"... In the quarter Century Since World war II The Growth in Prosperity-or In some Instance - The Aspiration for Prosperity - of Peoples Around The World Has Become Increasingly Dependent Upon The International Flows of Commerce"
Kvasnicka (1969)

"The Specification of Equilibrium in The World Economy Depends On The Exchange Rate Regime".
Frenkel and Razin (1987)

1.1 The Problem

Trade and investment flows at the international level have become virtually indispensable to the economic growth and prosperity of nations today. This is more so in the developing countries of the world, where revenues from import tariffs and export duties constitute a major source of government finance and where imports of intermediate goods and machinery oil the industrialisation wheel of these economies. That exchange rates - the means of effecting these international flows should be of tremendous importance to the world economy is underscored by Frenkel and Razins's assertion quoted above.

Exchange rates have been variously defined in the literature. Exchange rate is said to be the relative price of two national monies[1] or, the relative price of two national outputs[2] or the relative price of tradeables to non-tradeables that results in simultaneous equilibrium in the internal and external sectors of an economy.[3] Whatever definition one adopts the important issue is that exchange rates influence directly trade flows and indirectly capital flows between nations. Given the above therefore the factors determining the level of exchange rate, its degree of variability, its medium and long-run behaviour etc become of crucial importance, to economists, policymakers, and investors alike.

The world has known several exchange rate systems beginning with the pre-World War-I fixed gold standard. During the first world war the international payments system in form of the fixed gold standard collapsed. The fixed gold standard exchange rate regime was one in which national currencies were tied to specific weights of gold, and were convertible into gold, and hence exchanged with each other depending on the gold content of each currency. Though exchange rates were fixed under the gold standard, there were however, margins of variation known as "gold-points." When a given country's exchange rate depreciated to such a level that it paid arbitrageurs to buy gold in domestic money and export it to foreign country to earn foreign exchange, the exchange rate was said to have reached the "gold-export" point. When on the other hand the exchange rate had appreciated so much that it paid to convert domestic currency into foreign exchange and then use the proceed to purchase gold from foreign country for the purpose of importing into the domestic economy, then the exchange rate was said to have reached the "gold-import" point. At the gold-export point attempt is made by arbitrageurs and/or the monetary authorities to protect the value of domestic currency and prevent its depreciating unduly. At the gold-import point attempt is made to prevent domestic currency from appreciating unduly and thereby losing its competitiveness. The gold import and export points were functions of the available supply of gold (as each currency had full gold convertibility) and the cost of transporting gold[4]. Mining gold and transporting it were very cumbersome, As mentioned earlier this gold standard broke down during the first World War.

After the First World War attempt to put in place an international payments system was left in the hands of individual governments. Most countries, then chose exchange rates in such a way that they did not acknowledge the fact that an exchange rate involves more than one currency. Exchange stabilization was carried out as an act of national sovereignty. There was no regard for the resulting interrelationship of currency values in comparison with the cost and price levels. Stabilization was perceived in terms of gold only and not in terms of other currencies. Britain in 1925 and France in 1926 were the major culprits whose exchange stabilization attempts led to considerable disequilibrium in the exchange rate system.[5]

This "national-sovereignty" in exchange rate policy led to exchange rates being manipulated for beggar-my-neighbour purposes as evidenced by the massive devaluation of the 1930s. Though any given devaluation improved the balance of trade of the country concerned and increased its volume of domestic employment-these gains were necessarily at the expense of other countries and thus invited retaliation. Thus by the onset of the Second World War it was abundantly clear that a "new" and more-closely-regulated exchange arrangement had to be put in place. This desire could not be satisfied during the war and so nations had to wait until after the Second World War to put a new international payments system in place.

In 1944 at Bretton Woods nations of the world met to design a new exchange rate system. First they formed an international clearing house known as the International Monetary Fund (IMF). In the light of the experience of the 1920s and 1930s the architects of the Bretton Woods system could not place much confidence in national governments to unilaterally determine their own exchange rates and decide "if" and "when" change was needed and in "what direction." What is more-the architects of Bretton Woods did not have much faith in the market either, because they thought reliance on the market would generate uncertainties with respect to the exchange rate level and variability which would necessarily imply increased risk in international exchange, and thus reduction in the volume of international trade. The system put in place at Bretton Woods variously known as the "adjustable-peg", the "adjustable-parity" or "par-value system" was a fixed exchange rate system determined by national governments subject to the approval of the IMF. The system allowed a one percent margin of variation for any exchange rate (half a percentage point either side of the parity).

Under the Bretton Woods system nations fixed their exchange rates in terms of gold, and in some instances in terms of the United State's dollar. When a new monetary unit known as the Standard Drawing Right (SDR) was evolved in the late 1960s nations also had to redefine the exchange parity of their currencies both in terms of gold, the SDR, and for some countries in terms of the dollar as well. The United State of America, had as of 1945 agreed to convert holdings of dollars by foreign countries into gold. Governments were required to notify the IMF before any change could be effected in their exchange rates. Also nations were prohibited from making large exchange rate changes without the consent of the IMF. These requirements reflect the fact that the architects of Bretton Woods gave a vote of no-confidence in national governments when it came to managing their exchange system for the good of the international community. What is more, the IMF also insisted that the only justification for an exchange rate change was a "fundamental disequilibrium"[6] in a country's balance of payments. What constituted a fundamental disequilibrium was not spelt out, it was left to the discretion of the IMF. Temporary deficits were to be financed by drawing down reserves with the IMF.

Three main problems plagued this adjustable peg system and finally led to its demise. In the first instance, U.S.A.'s commitment to convert dollar holdings of other countries into gold, could not be indefinitely sustained. In a way this commitment led to a veiled perception of the degree of available international liquidity. Thus the commitment left unresolved the problem of providing in some reasonably rational way for an adequate secular growth in international liquidity.

Secondly the role of exchange rate in balance of payments adjustments created a lot of troubles. Because of its political implications, most nations running balance of payments deficits refused to devalue their currencies, because devaluation would often mean, cut in real wages, shift in production from domestic consumption market to export markets, restraint on monetary and fiscal expansion etc. Thus nations usually postponed devaluation of their exchange rates until it was too late. The result then became excessively biting. Thus the issue of exchange rate in the adjustment process became in the words of Coombs "a political problem of appalling complexity."[7]

Even for surplus countries needing to make adjustments the fear of harming their export-industries made them shy away from revaluation. What is more - the IMF agreement itself failed to specify on whom the onus for taking corrective action rests - whether the surplus or the deficit country. Thus the Bretton Woods system led to appreciable surpluses in the balance of payments of some countries and considerable deficits in those of others. As countries felt the need for some exchange rate adjustment without bearing the full brunt of its results, the search for alternative regimes began.

Some economists advocated what is known as "Crawling - Peg system.[8] A crawling peg system is essentially an adjustable peg system, the difference being that instead of waiting for two years for instance to make a 2% change in exchange parity, the country needing to adjust would be adjusting every three months by one-quarter of one percentage point, and in two years an adjustment of two percentage points in parity would have been achieved. This system it was thought reduced considerably the adjustment costs. Some countries actually practiced this system in the dying years of the Bretton Woods system (i.e. late 1960s-early 1970s) and some still do today.

Another regime advocated and practiced by some countries was the "Gliding -

Parities" system[9]. This system involved changing the parity of an exchange rate continuously at very short time intervals and at very small rates. For instance the exchange rate may be varied weekly by some .05 percentage point all throughout the year. It was felt that this system reduced speculation against a currency as uncertainties regarding exchange rate movements were reduced. This system was also a variant of the adjustable-peg.

By 1971 the stress of inflationary pressures being transmitted from countries with huge deficits to surplus countries, along with huge balance of payments deficits gave the first major crack to the adjustable - peg system (in whatever version). In 1971 the United State of America announced its intention to discontinue convertibility of dollars into gold for foreign countries holding dollars. By December of that year the Smithsonian agreement was reached by the major industrial countries of the world, realigning their rates by declaring new parities. In spite of the above attempt, by mid 1973 most industrial countries of the world started to float their currencies. A floating currency essentially implies that the exchange rate of a currency is determined in the market by forces of demand for, and supply of, that currency.

Long before 1973, there have been calls for the adoption of floating exchange rate regime, as being intrinsically "better" or "superior" to any fixed regime[10]. Three main reasons were advanced in favour of floating rates. The first is that "exchange rates are prices" and as such they should be determined by forces of demand and supply and not by administrative fiat. Secondly it was argued that the par-value or adjustable peg system necessarily exposed any given economy to the real and monetary disturbances of other economies; floating rates however would supposedly insulate the economy from such external shocks. Thirdly, the insulation property of floating rates, would mean that, countries could now enjoy autonomy in their design and pursuit of monetary and fiscal policies. Thus the authorities of any given country would be free to pursue the maximization of its people's welfare free from unwanted shackles imposed by other economies.

Against the adoption of floating exchange rate system were three main arguments. First that a floating exchange rate creates uncertainty and hence risk, this risk tend to discourage international trade. Though the risk can be covered by hedging operations, the price of hedging, itself, is an additional cost of international trade and hence reduces the volume of trade. Secondly, floating rates, it was argued, would lead to constant shifts in labour and other resources between production of nontradable goods and production of tradable goods as the exchange rate is used to adjust the balance of payments. Such constant shift in labour and other resources would tend to aggravate frictional unemployment, and could be quite wasteful if the exchange market condition that called for them are temporary. Thirdly it was argued that the exchange rate could not be relied upon to promote adjustment. Any appreciable movement of the exchange rate in a given direction was likely to generate anticipation of a further movement in the same direction. This would likely lead to speculative capital transfer of a disequilibrating type. Such kind of capital transfer would intensify the initial disequilibrium and produce "explosive conditions of instability".[11] This third argument was buttressed by the floating experience of France between 1924-1926. In spite of the arguments against floating exchange rate system however, developed industrial countries of the world still embraced the system in 1973 having been disillusioned with the Bretton Woods system.

After almost a decade of floating exchange-rate experience in the developed industrial countries of the world, the developing countries of the world too joined the floating exchange-rate-regime nations. Among the fifteen such developing countries identified by Quirk et al., (1987)[12] were nine African countries, namely Gambia, Ghana, Guinea, Nigeria, Sierra Leone, South Africa, Uganda, Zaire and Zambia. The following events led these African countries to the adoption of this international payments system by the beginning of the 1980's.

Throughout the 1970s, Africa, particularly sub-Saharan Africa, experienced a deterioration in all major economic and social indicators. The GDP grew at an average annual rate of only 3% percent between 1970 and 1980, thereafter the rate persistently declined, and by 1983 it was negative. On the other hand population consistently rose at about 3 percent per annum all throughout the 1970s and into the 1980s, consequently per capita income declined and by the mid 1980s it was already below its 1970 level.

One of the major factors responsible for the poor performance of these African economies was their poor production structure. Production in most African economies was heavily dominated by export - oriented agriculture e.g 94% of Uganda's exports was made themselves in a debt-trap.

With the advent of the debt crisis came the need to drastically cut down on imports. The drastic reduction in imports soon led to the collapse of the socio-economic infrastructures, machineries broke down for want of spare-parts, health and educational facilities got into a state of disrepair, development programmes were virtually halted. Soon industries had to retrench their staff, as most operated at less than 50% capacity. Massive unemployment resulted. Besides, basic goods became scarce and this provided a good excuse for prices to shoot up.

What is more-nature itself seemed to have conspired against these economies as most of them were ravaged by drought in the early years of the 1980s. The drought led to population displacements, as food shortage became acute and the need to import food became critical. Thus in the words of Adedeji "... the economic and social transformation of Africa which started in the 1960s is not only coming to a halt but is gradually reversing"[13]. Given such bleak prospect, the United Nations Organization, the World Bank, the International Monetary Fund and their different agencies came together to seek solution to the "developmental crises" in Africa. These bodies jointly and severally came to the following conclusions among others - first, that export earnings of African countries have to be enhanced, second, that the international monetary arrangement must be improved upon, third that there should be increased flow of resources to Africa from the developed industrial countries of the world, including increases in multilateral concessionary financing arrangements. Lastly that measures must be found to curb the persistent upward movement in interest rates in the world market.

To deal with the first two propositions, exchange rate liberalization was introduced to these countries within a broader package of relief measures known as Structural Adjustment Programmes (SAP). The African countries that were most adversely affected by the tripartite problems of worsening terms of trade, worsening climatic conditions and heavy external debt burden opted for the structural adjustment programmes with the floating-exchange-rate system implicit in the package. Among others, the floating exchange-rate system is supposed to help find the realistic values of these countries' currencies. Given that the currencies of most of these economies were overvalued, a realistic exchange rate for them, implicitly imply a devaluation of their currencies. Such devaluation supposedly would encourage exports and discourage imports. Enhanced revenue from exports were also supposed to encourage increased search for potentially exportable commodities thus helping to diversify the export base of these economies. Increased domestic prices of imports, it was hoped, would discourage imports while encouraging the inward search for raw materials and other inputs for domestic industries. Such increased dependence on local resources would promote economic self-reliance and promote sustainable pattern of consumption.

Furthermore, it was argued that, substantial depreciation that usually followed the floating of an overvalued currency would encourage repatriation into the economy of earnings by economic agents that have substantial foreign exchange earnings abroad. It would also discourage the existence of parallel market for foreign exchange, which had thrived in these economies in the days of exchange control and had been ready conduits for capital flight.

In addition to the nine African countries enumerated by Quirk et al (1987) as having adopted floating exchange rate system, were other developing countries of Asia and America. These were, Bolivia, Dominican Republic, Jamaica, Lebanon, Phillipines and Uruguay; of the nine African countries that adopted floating rates, Zambia had since abandoned the system. Uganda abandoned the system in 1987 but returned to it years after.

One interesting point about the issue of exchange rate regimes, is that since about the mid-1980s there have been calls from the developed countries of the world requesting for yet a change in the international payments system from floating-exchange-rate system. In the words of Devarajan and Rodrik (1991) "... by the mid-1980s the tide turned. Floating exchange rates began to lose much of their lustre in the eyes of industrial-country policy-makers. The wide gyration of the dollar during the 1980s and the short-term volatility of the key-currencies eroded confidence in markets' ability to foster adjustment with no (or little) tears. The Europeans linked their currencies tighter and proposals to limit flexibility became widespread. In many parts of the developing world, exchange rate flexibility became another name for inflation."

Also recently some IMF Staff[14] reporting on the reports of the Group of Ten (representing the industrial countries participating in the General Arrangements to Borrow) and the Group of Twenty Four on International Monetary Affairs (an intergovernmental group) said "...Prior to the advent of floating some of its supporters anticipated that stabilizing speculation would smooth exchange rate movements and prevent abrupt increases in variability. Thirteen years of experience has proved otherwise".

The questions then arise - is there an ideal exchange rate regime? Is there any reason to believe that one exchange rate regime enhances the performance of an economy better than the other? Given that the goals of most governments as contained in their stabilization policies are the attainment of high rate of growth in output and in employment, maintenance of fairly stable price levels and balance in the international payments account; is there an exchange rate regime that ensures the attainment of these stabilization objectives better than the other? These are the questions that form the main focus of this study. We hope to answer these questions using data for three, of the nine developing African countries enumerated in the list above, i.e. Ghana, Nigeria and Uganda.

1.2. Need For The Study

Given the four major problems faced by African countries since the 1970s right up to the 1980s namely, their poor production base, the hostile international economic environment as evidenced by declining terms of trade, the incidence of natural disasters such as droughts and cyclones, and lastly the debt fatigue, some African countries sought solution to these problems by the adoption of the IMF/World Bank (IMF/WB) supported structural adjustment programs. These countries were Gambia, Ghana, Guinea, Nigeria, Sierra-Leone, South-Africa, Uganda, Zaire, and Zambia. A very key and crucial element of these structural adjustment packages is the change of exchange rate regimes from fixed to floating. Among others, adoption of floating exchange rate regime by these crises-ridden economies was supposed to help achieve the following; first, a massive devaluation of their hitherto overvalued currencies[15], second, an improvement in exports performance consequent on the massive devaluation, third, an improvement in the trade balance given a reduction of imports, fourth, broadening of the production base given that higher import prices would force domestic producers to produce locally, goods that were previously imported. In addition high import prices would also force domestic producers to source raw-materials locally, thus encouraging the development of backward linkages in the economy. As exports become diversified given the boost in exporter-income arising from the massive devaluation of domestic currencies, the economies would no longer be monocultural, thus having greater bargaining power in the international market place and thus being in a position to stem the tide of declining terms of trade.

Whether these hopes have materialised after about half a decade to almost a decade of the adoption of floating exchange rate system is worthy of investigation. Also, where the above improvements in the economic performance of these countries have not materialized, it is important to find out whether the structures put in place are actually the necessary frames for such improvements to take place. The tables below reveal what has obtained since the beginning of the 1980s.

Table 1.1 reveals that in the first half of the 1980s per capita income for all the countries except Gambia and Uganda was on the decline as they all recorded negative growth rates of per capita income. Even after the adoption of floating exchange rate regime which was implicit in the structural adjustment packages, some countries still experienced declining per capita income notably, Nigeria, Sierra-Leone, Zaire, and Zambia. The case of Nigeria is particularly striking as its per capita income declined from a high of US$1117.0 in 1982 to a low of US$368.0 in 1987, thus making her qualify for the United nations "Low-Income-Economies" classification. That per capita income was declining is no surprise given the performance of the sectoral value-added and hence of the GDP as ,shown in Tables 1.2 and 1.3 respectively. Table 1.2 reveals that in the agricultural sector, performance kept on deteriorating in Ghana and Nigeria in the first half of the '80s, as evidenced by declining growth rates of value-added in this sector. In Guinea and Sierra-Leone the agricultural sector was almost stagnant as evidenced by growth rates of less than 1% i.e 0.3. and 0.7 respectively.

Table 1.1

Per Capita Income(GNP)* of Selected African Countries
(In US Dollars)

										AVERAGE ANNUAL GROWTH RATE (%)	
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1980-85	1987
GAMBIA	384	341	318	293	252	228	211	219	240	0.7	2.4
GHANA	404	408	375	345	366	369	391	393	390	-3.8	0.7
GUINEA	303	307	299	293	299	315	310	316	430	-1.4	3.3
NIGERIA	1021	1090	1117	987	902	950	704	368	250	-6.0	-7.7
S. LEONE	317	367	382	388	366	352	325	300	220	-1.3	-2.2
UGANDA	280	220	240	220	220	230	230	260	250	0.1	0.1
ZAIRE	434	399	343	294	204	160	149	153	260	-3.9	-1.8
ZAMBIA	598	718	658	571	472	381	253	232	390	-4.1	-2.4

Source: 1. World Bank/UNDP (1989) African Economic and Financial Data
2. World Bank (1991) World Bank Development Report

Note: Growth rates spanning more than one year are calculated using Least-square method: single year growth rates are percentage changes.

Table 1.2

SECTORAL VALUE ADDED FOR SELECTED AFRICAN COUNTRIES
(In millions of constant 1980 US Dollars at Producer Price)

									AVERAGE ANNUAL GROWTH RATE (%)	
	1980	1981	1982	1983	1984	1985	1986	1987	1990-85	1987
Agriculture										
GAMBIA	63	56	69	83	78	82	91	94	7.6	3.3
GHANA	2575	2509	2372	2207	2421	2436	2517	2517	-1.3	0.0
GUINEA	748	757	765	755	698	805	-	-	0.3	-
NIGERIA	26186	21875	22547	22565	21063	24070	24070	26292	-1.5	-7.7
S. LEONE	334	337	348	345	346	346	344	343	0.7	-0.3
UGANDA	1216	1299	1430	1503	1343	1294	1231	1266	1.3	2.9
ZAIRE	2916	3040	3102	3164	3257	3362	3575	3686	2.5	3.1
ZAMBIA	552	597	527	572	304	625	681	674	2.1	-1.0
Industrial										
GAMBIA	27	40	43	41	40	40	46	49	5.8	7.2
GHANA	528	443	368	324	353	416	447	498	-5.6	11.3
GUINEA	400	388	693	415	404	387	-	-	0.1	-
NIGERIA	41890	37645	36837	31383	29418	32253	31361	29889	-6.1	-4.7
S. LEONE	222	216	216	186	203	198	191	183	-2.5	-4.1
UGANDA	76	77	77	84	89	81	76	89	2.2	14.2
ZAIRE	2969	3134	2134	3180	3490	3571	3685	3719	3.8	0.7
ZAMBIA	1605	1684	1684	1623	1587	1600	1574	1585	-0.6	0.7

Sources: 1. World Bank/UNDP (1989) African Economic and Financial Data
2. World Bank (1991) World Development Report

Even after the adoption of floating exchange rates value-added in the agricultural sector still went on declining in some countries i.e. Nigeria, Sierra-Leone, and Zambia. The performance of the industrial sector is also crucial here, given the fact that it is now an undisputable fact that rapid industrialisation is a key element of economic growth and development. In the first half of the 1980s the industrial sector was on the decline in four out

Table 1.3
GROSS DOMESTIC PRODUCT FOR SOME SELECTED AFRICAN COUNTRIES
(In millions of Dollars at Purchasers Values: Current Prices
(CURRENT PRICE SERIES)

								AVERAGE ANNUAL GROWTH RATE (%)	
	1980	1981	1982	1983	1984	1985	1986	1980-85	1987
GAMBIA	237	236	207	213	210	237	275	4.8	5.8
GHANA	4445	4222	4036	4057	4504	5727	5075	-0.6	4.4
GUINEA	176410	1756	1749	1912	1982	1916	2166	0.9	5.9
NIGERIA	3312	95229	93130	89770	90232	46613	24840	-3.2	-4.6
S. LEONE	1101	1192	1335	1486	1375	1229	895	0.7	-2.0
UGANDA	1724	1370	1893	2283	3797	4442	3895	3.6	4.1
ZAIRE	10281	9089	9065	7708	4462	5566	5774	1.0	2.7
ZAMBIA	3885	4014	3872	3343	2597	1773	2034	-0.2	-0.2

Sources: 1. World Bank/UNDP (1989) African Economic and Financial Data
2. World Bank (1991) World Development Report

of the eight countries in Table 1.2 i.e. Ghana, Nigeria, Sierra-Leone, and Zambia. Even after the adoption of floating rates Nigeria and Sierra-Leone still experienced a high rate of de-industrialization as evidenced by negative growth rates of over four percent(4%) in each country.

The GDP for Ghana, Nigeria and Zambia recorded declining growth rates which is to be expected given the performance in the industrial and agricultural sectors of these economies. The GDP in Nigeria, Sierra-Leone and Zambia still continued to decline up to 1987. Table 1.4 is a reflection of the extent of these countries need for foreign assistance. The "Resource-Balance" measures the divergence between gross domestic saving and gross domestic investment as a fraction of GDP. This balance was also negative for all the years in all the countries. It is not surprising therefore that the external debts table (Table 1.5) reveals a continuously increasing level of external debt for all the countries. Table 1.6 shows that for some countries the per capita debt was greater than the per capita income notably Nigeria, Sierra-Leone and Zambia.

Taking a close look at the external sector's aggregates on which exchange rates impact directly, it is clear that their performance had not been different from that of the rest of the economy. Table 1.7 reveals that for almost all the countries, exports were declining in the years 1980-85 while they started improving from 1986 for the countries of Gambia, Ghana and Zambia all of which had adopted floating exchange rates by that time. Table 1.7 also shows that imports declined continuously in the first half of the 1980s, this decline continued well into the era of floating exchange rates for Nigeria, Sierra-Leone and Zaire. The extent of the hostility of the international economic environment in the decade of the '80s is reflected in the declining terms of trade of the countries as shown in Table 1.8. The case of Nigeria is particularly remarkable where the terms of trade index declined from 108.7 in 1981 to 43.9 in 1986.

Table 1.4

RESOURCE BALANCE AS PERCENTAGE OF GDP FOR SELECTED AFRICAN COUNTRIES

									AVERAGE ANNUAL GROWTH RATE (%)	
	1980	1981	1982	1983	1984	1985	1986	1987	1980-85	1986-87
GAMBIA	-21.4	-3.2	-19.1	-12.4	-12.2	-16.3	-16.0	-24.9	-19.0	-20.5
GHANA	-0.7	-0.6	0.4	-3.1	-0.3	-1.9	1.4	-3.0	-1.0	-0.8
GUINEA	5.8	3.2	2.6	2.0	3.6	3.6	-2.6	0.4	3.5	-1.1
NIGERIA	9.1	-3.5	-6.1	-3.4	1.7	3.3	-1.8	4.1	0.2	1.1
S. LEONE	-14.1	-15.1	-10.6	-10.8	-1.3	-0.4	-0.3	3.3	-8.7	1.5
UGANDA	-1.4	-6.1	-3.5	-3.4	-0.3	-2.3	-2.6	-7.2	-3.0	-4.9
ZAIRE	-1.2	-5.6	-5.7	-2.7	-3.5	-4.6	1.0	3.2	-1.2	-1.1
ZAMBIA	-4.0	-12.5	-8.8	-1.2	-3.8	-2.3	-4.4	4.6	-3.4	0.1

Source: World Bank/UNDP (1989) African Economic and Financial Data.

Table 1.5

TOTAL EXTERNAL DEBT FOR SELECTED AFRICAN COUNTRIES (In million of current US $)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
GAMBIA	137	176	208	212	230	245	271	319	-	-
GHANA	1312	1460	1397	1600	1900	2176	2656	3124	3099	3078
GUINEA	1117	1356	1356	1368	1293	1466	1568	1784	2563	2176
NIGERIA	8888	12039	12908	18586	18664	19522	24470	28714	20178	32832
S. LEONE	443	480	512	531	437	540	595	659	727	1657
UGANDA	730	768	922	1019	1043	1157	1260	1405	1925	1800
ZAIRE	4824	4916	4750	5111	5066	5885	6932	8630	8475	8843
ZAMBIA	3253	3624	3705	3784	3847	4641	5625	6400	6498	6874

Sources: 1. World Bank/UNDP (1989) African Economic and Financial Data
2. World Bank (1991) World Development Report

Table 1.6

PER CAPITA GNP AND PER CAPITA DEBT IN 1989
FOR SELECTED AFRICAN COUNTRIES

(In US Dollars)

	PER CAPITAL GNP	PER CAPITA DEBT
GAMBIA	240	-
GHANA	390	214
GUINEA	430	389
NIGERIA	250	289
S. LEONE	220	264
UGANDA	250	108
ZAIRE	260	256
ZAMBIA	390	881

Source: World Bank (1991) World Development Report

Table 1.7
AVERAGE ANNUAL GROWTH RATES, OF EXPORTS, IMPORTS
AND CONSUMER PRICE INDEX FOR SELECTED AFRICAN COUNTRIES IN PERCENTAGES

	EXPORTS		IMPORTS		CONSUMER PRICE INDEX	
	1980-85	1987	1980-85	1987	1980-85	1987
GAMBIA	-2.5	32.2	-5.9	40	13.6	23.5
GHANA	-10.3	29.4	-11.1	63.1	57.3	39.8
GUINEA	2.6	-	6.2	-	-	-
NIGERIA	-12.5	-12.6	-13.4	-2.5	19.9	10.2
S. LEONE	-7.7	-20.8	-32.9	-2.9	51.7	178.7
UGANDA	-	-	-	-	-	238.1
ZAIRE	3.8	-13.3	-5.9	-5.9	47.3	19.4
ZAMBIA	-3.7	11.3	-11.0	9.1	19.6	43.0

Source: World Bank/UNDP (1989) African Economic and Financial Data.

Table 1.8
TERMS OF TRADE INDEX FOR SELECTED AFRICAN COUNTRIES 1980-1987

									AVERAGE ANNUAL GROWTH RATE (%)	
	1980	1981	1982	1983	1984	1985	1986	1987	1980-85	1986-87
GAMBIA	100.0	104.0	86.0	91.6	92.4	109.7	109.3	98.4	0.5	-10.0
GHANA	100.0	81.4	73.1	88.1	98.1	90.3	97.2	89.2	0.7	-8.2
GUINEA	-	-	-	-	-	-	-	-	-	-
NIGERIA	100.0	108.7	100.9	96.6	97.2	88.5	43.9	48.1	-2.8	9.7
S. LEONE	100.0	93.1	92.1	94.0	98.6	94.6	93.1	88.5	-0.2	-4.9
UGANDA	100.0	80.6	88.6	84.1	99.7	96.1	116.2	57.4	1.3	-42.0
ZAIRE	100.0	83.5	78.9	83.5	84.4	82.1	80.4	73.0	-0.5	-9.2
ZAMBIA	100.0	79.8	70.9	77.9	70.1	71.5	71.4	79.3	-5.5	11.1

Source: World Bank/UNDP (1989) African Economic and Financial Data

That there is urgent need for investigating the role of the exchange rate regime in the performance of these economies is further buttressed by the fact that while income was declining as shown in Table 1.1 and 1.3, the rate of growth inflation was rising as shown in columns six and seven of Table 1.7. In some countries, the rate of flow of domestic prices was as high as 50% e.g. Ghana and Sierra-Leone. Even after the adoption of floating rates inflation still remained high as evidenced by an annual growth rate in consumer price index of 238% in Uganda and 90% in Zaire. What role the exchange regime played in this inflation-behaviour is worthy of investigation. Given that one of the major reasons for opting for the floating exchange rate regime is to help these countries resume on the growth path by adjusting underlying export and import structures the results so far as indicated from all the tables give no cause for cheer; it then becomes quite timely and quite relevant to find out if really there is an "ideal" exchange rate regime that ensures "external" equilibrium, "internal balance" and economic growth.

Furthermore, today, the World Bank staff and the IMF staff are confronted largely with problems arising from exchange rate behaviour - such problems include those of misalignment of real exchange rates, effects of exchange rate policy on the agricultural sector, effect of devaluation on the ability of a developing country to service its debts etc. It has thus become difficult if not impossible to tackle macroeconomic problems in the developing countries without addressing the exchange rate issue.[16]

In spite of the seeming overwhelming importance of the exchange rate policy to developing countries there have been very few empirical studies that have attempted to investigate the problem in all its ramifications. This study is an attempt to fill that gap.

1.3. Objectives of the Study

Prior to the 1980s, concern of economists was whether monetary policy or fiscal policy was more effective in achieving the goals of stabilization (i.e. high rate of growth in output, full employment, fairly stable price level and balance of payments equilibrium). Since the 1980s however the focus has shifted from monetary and fiscal policy per se; the question now asked is whether the objectives of stabilization can best be achieved under a fixed exchange rate regime, or under a floating one, irrespective of the policy instruments adopted.

The answer to this question in essence is what this study is about.

We hope to employ an eclectic model that takes cognisance of both monetary and real factors in the determination of the exchange rate. The model shall borrow from the works of Rhomberg (1964), Tullio (1981), Khan and Knight (1981, 1986) Jebuni, et al (1990). There shall be two versions of the model, the first assumes exchange rates to be fixed as obtains under a fixed exchange rate regime. The second is an extension of the first and adds two stochastic equations to the first version; these two additional equations endogenise exchange rates and interest rates as obtains under a floating exchange rate regime.

Using quarterly data for the years 1977-1990 for Ghana and Nigeria we hope to specifically do the following:

(1) Estimate our model for each country for all the years 1977-1990 under the assumption of fixed exchange rates in order to be able to observe the behaviour of imports, exports, the trade balance, the net foreign reserves, the net capital inflow, and the growth rate of domestic prices.

(2) Estimate the expanded model for each country for only the years a given country has floated.

(3) Keeping fiscal policy constant, while varying the money supply we hope to simulate the effects of monetary policy change on trade-flows, net foreign reserves, balance of payments and inflation under the two versions of the model i.e under a fixed exchange rate regime as well as under a floating

regime.

(4) Keeping monetary policy constant while varying the level of government expenditure, we also hope to simulate the effects of this policy change on the external sector's macroaggregates, and on inflation rates under both fixed and floating exchange rate regimes.

(5) With the results from (3) and (4) above examining the performance of the external sector, of real income and of inflation both under a fixed as well as under a floating exchange rate regime when different policy instruments are applied.

For Uganda the study shall cover the period 1981 to 1990 for which there is data. The extended model shall be estimated first, because in the available data series the period of floating comes first i.e. 1982-1987. Thus, result of the estimation of the extended model shall form the benchmark. Then the shorter model shall be estimated for the third quarter of 1987 through to fourth quarter of 1990.

Similar simulation exercises as in the case of Ghana and Nigeria shall also be conducted. From all of the above, we hope to be able to come to a definite conclusion as to which exchange rate regime has proved more useful in achieving external balance and maintaining stable prices irrespective of policy instruments employed. And as such which exchange rate regime is to be preferred.

1.4. Scope and Organisation of the study

In this study we shall collapse all the known exchange rate regimes into two broad categories - fixed and floating. The rational for this is not far fetched. The main yardstick for this division is that while the adjustable-peg, the crawling-peg, the gliding-parities and the gold standard all have formal parities the free-float and the managed-float do not. Hence we hope to lump all those with formal-parity together as fixed exchange rate system, and those without as floating exchange system Table 1.9 adapted Katz (1992) shows the characteristics of the different exchange regimes.

Table 1.9

Rate Flexibility Under Six Alternative Exchange Rate Arrangement

Characteristics	Exchange Rate System					
	Free float	Managed float	Gold standard	Adjustable- peg	Crawling- peg	Gliding-parties
Formal Parity	None	None	Formal	Formal	Formal	Formal
Formal Conditions for change in parity	None	None	Last resort	Fundamental Disequilibrium	Any Disequilibrium	Any Disequili-brium
Exchange Values in the short Run	Flexible	Flexible	Fixed	Fixed	Less Fixed	Less Fixed
Desired Exchange Value in the Long Run	Flexible	Flexible	Fixed	Internationally agreed Flexibility	Slightly Flexible	Slightly Flexible

Source: Adapted from Katz S.I. (1972) "The Case for the Par Value System: 1972" Essays in International Finance, No. 92, March 1972 (Princeton University: International Finance Section).

The rational for the choice of the three countries of Ghana, Nigeria and Uganda is not far fetched. In the first instance the three countries have experienced both fixed (in almost all its varieties) and floating, exchange rate regimes. Secondly they are all chronic debtors needing some growth oriented economic package to get out of the woods. Thirdly, they all have high degree of openness[18], and they are all monocultural economies, whereby a greater percentage of their export earnings comes from only a single commodity. Table 1.10 below gives the general features of the countries used in the study.

Table 1.10

Features of Focus Countries for 1985

Country	Per Capita GDP[a] at Official Exchange Rate	Degree of Openness[b]	Degree of Import Dependence[c]	Export Concentration[d] (Percentage)
GHANA	467	24.4	13.9	Cocoa (65.2)
NIGERIA	854	44.0	14.9	Petroleum (98.4)
UGANDA	129	41.0	23.3	Coffee (93.5)

Source: Adapted from Table 6 pp 35-36 of Quirk P.J., Christensen B.V., Hug, K-M, Sasaki T. (1987) "Floating Exchange Rates in Developing Countries: Experience With Auction And Interbank Markets." Occasional Paper No. 53, May 1987 (IMF).

Notes:

[a]Per capita GDP in U.S. dollars

[b]Degree of Openness is measured by the ratio of total trade in goods and non-factor services to

[c]Degree of Import Dependence, is the ratio of Import of goods and non-factor services to GDP

[d]Export Concentration is a measure of the country's ability to earn foreign exchange, and it is in percentage.

In this study we shall be concerned with both real exchange rates and nominal exchange rates. This is because real exchange rates reflect better the degree of a country's competitiveness in the international markets, than do nominal exchange rates.

We shall study the economies of Ghana and Nigeria over the period of 1977-1990 and over 1981-1990 for Uganda. We shall use quarterly data on exports, imports, trade balance net foreign reserves, net capital inflows and prices, to enable us have fifty-six observation points for the countries of Ghana and Nigeria and forty points for Uganda. For Ghana and Nigeria who are the most recent floaters, there shall be 17 observation points of floating experience. The number of years of fixed or floating-experience would defer for each country, because the onset of floating regime was not uniform across countries. We hope however that this slight variation in timing will not detract from the necessary economic insights we hope to gain from the study.

The current chapter is the introductory chapter which describes the problem we hope to look into, why there is need for such an exercise, and the goals we hope to attain from the study. Chapter two provides a review of the case economies. Chapter three is a review of the literature on exchange rates in general and on the performance of the macroeconomy under floating-and/or under fixed-exchange rate regimes in particular. While chapter four describes the methodology of the study, chapter five is a descriptive analysis of the data. Chapter six gives the result of the model(s) estimations and empirical validation of the models, while chapter seven discusses the result of the simulation exercises. Chapter eight gives a summary of the findings, the conclusions, recommendations and areas for further research.

ENDNOTES

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17. A managed float is a system where though the exchange rate is determined by forces of demand and supply, government sometimes intervenes in the market to prevent excessive exchange rate variability.

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CHAPTER TWO

REVIEW OF CASE ECONOMIES

"The Most Important Market In This Economy Is The Market For Foreign Exchange"
Elbadawi (1990)

"The Naira Exchange Rate Has Since 1986 Emerged As Perhaps The Most Dynamic and Controversial Instrument of Economic Policy In Nigeria"
Omoruyi (1989)

The positions of Elbadawi and Omoruyi cited above succinctly illustrate the importance of exchange rate policy and hence exchange rate regimes in sub-Saharan African countries generally and in the focus countries of this study in particular, especially since the onset of structural adjustment programme, with its implicit exchange liberalization strategy. Below we attempt to provide a brief background information regarding the economies of Ghana, Nigeria and Uganda with particular emphasis on their exchange rate management policies since the 1970s.

2.1 Exchange Rates and Exchange Rate Policy in Ghana 1971-1990

Prior to 1983 Ghana adopted a fixed exchange rate system of the Bretton-Woods variety. Between 1967 and 1970 the exchange rate was 1.20 per $1. By 1971 the cedi ( ) was devalued to 1.28 per $1. By 1972 the exchange rate appreciated to 1.15 per $1 and remained so until June 1978.

Prior to 1977 the pound sterling was Ghana's intervention currency. However from

1977 the US dollar became Ghana's intervention currency and had remained so ever since. Between June to August 1978 the exchange rate was made to crawl, according to Ameyaw[1] from 1.15 per $1 in June to 1.30 per $1 in July and to 1.60 per $1 by August 1978. From August 1978 the monetary authorities decided to fix the exchange rate permanently once again. Thus the exchange rate was fixed at 2.75 to $1 until 1983.

Throughout the 1970s Ghana's inflation rate far exceeded those of her trading partners. According to Chhibber and Shafik (1989) the Ghanaian inflation rate between 1973 and 1980 was about 60.3% per annum. Thus the real exchange rate during this period continuously appreciated, in fact some economists have claimed that between 1970 - 1982 the real exchange rate in Ghana appreciated by over 500%. The real appreciation of the cedi encouraged black marketeering in foreign exchange as parallel market premium soared with increasing appreciation of the cedi. The parallel market premium is said to have risen from 8% in 1976 to 4264% in 1982 (Dordunoo, 1992)

The above scenario encouraged capital flight throughout the 1970s and early 1980s. In addition to increasing appreciation of the domestic currency, other factors that contributed to capital flight were the inappropriate policy stance of government, and the overdependence of the economy on a regulatory framework. For example the policy stance of government in the early 1980s that (i) Bank deposits of individuals greater than 50,000 be frozen pending investigation for tax liability or fraud and (ii) Requirement that business transactions exceeding 1,000 (cedis) be conducted by cheque. Similarly the continuous ceiling on deposit rates kept bank deposits rates ridiculously low while lending rates were exorbitantly high. Domestic saving and investment were impaired by this regulatory framework in addition to encouraging capital flight. What is more - the lowered level of investment affected production both for domestic consumption and for export. Borrowing from the banking system to finance imports became unprofitable in the face of exorbitant lending rates. Thus, imports of essential consumer goods and producer inputs also fell sharply. This had negative multiplier effects on the economy, as production in both the agricultural and industrial sectors declined sharply thus exerting greater pressure on inflation.

Declining production, declining income, and increased external borrowing soon contrived to make Ghana one of the greatest debtors in the world in the manner of sister African countries like Nigeria and Uganda. Inability of Ghana to service its external debts as, and, when due, led to the drying up of external credit lines. By 1983 Ghana's external debt was put at some $600 million, and so it decided to overhaul her economy and start all over. Thus in 1983, Ghana adopted an IMF/World Bank supported Economic Recovery Program (ERP), one of the cornerstones of this program like others of its kind was the adoption of a flexible exchange rate system in order to be able to correct for the overvaluation of the domestic currency, encourage exports and discourage non-essential imports. Other elements of the ERP were trade liberalization, public-enterprises reform, fiscal reform such as reduction of subsidies and rationalisation of the public expenditure program.

In April 1983 when the ERP was adopted the exchange rate was devalued from its level of 2.75 per $1 to 14.53 per $1 a depreciation, of about 81% in one fell swoop. As part of the adoption of a flexible exchange rate system were some new forex measures. The first was the Bonus and Surcharge Scheme, whereby exporters were granted bonuses on forex receipts and importers were surcharged for forex payments. Under this scheme exports was divided into two categories, the first category was that which allowed an exporter to obtain a bonus of 9.9 times the domestic value of forex earned, and the second category was that which entitled the exporter to 7.5 times the domestic value of forex earned. For instance if an individual has exported goods worth $1,000, and if the exchange rate is 14.53 cedi to $1, then instead of earning 14,530, the exporter would earn (14,530 x 9.9) cedis, if the item falls under the 9.9 category[2].

As for the surcharge, anytime an individual or firm imports through the banking system he is surcharged. In effect there was a multiple exchange rate system with a weighted average of 30 to $1. This multiple exchange rate system was rather cumbersome to handle, so by October 1983 the system was abolished and the exchange rates were unified to 30 per $1. By 1984, a real exchange rate rule under the framework of purchasing power parity was put in place, whereby the exchange rate was adjusted quarterly, based on the inflation differential between Ghana and her major trading partners. This real exchange rate rule was in place until the second quarter of 1986, by which time the exchange rate has reached 90 per $1, the government then fixed the exchange rate at 90 per dollar until September 1986 when government decided to float the exchange rate independently.

During the period April 1983 - August 1986 the black market premium remained high standing at about 183% which indicated the rationing of forex from official sources. Imports remained controlled within the framework of an annual import programme. There was a scheme for producers to utilize Special Unnumbered Licenses (SULS) which were mainly a channel for remittances from Ghanaians abroad (Dordunoo, 1992). In September 1986 the government decided to float the exchange rate independently, using the Dutch Auction System (DAS). Government opted for independent floating of the exchange rate supposedly to depoliticize the issue of exchange rate adjustment, and, secondly, to enable the authorities ensure an exchange rate that is in line with the fundamental forces of demand and supply (i.e an equilibrium exchange rate). Further it was believed that floating the exchange rate minimized capital flight and prevented foreign exchange dealers (mainly the commercial banks) from collusive behaviour.

When the auction system started in September 1986 there were in fact two-tiers of exchange rates in the system. On the first-tier or the first-window the exchange rate was administratively determined. It was pegged at 90 to $1. This exchange rate was used for the importation of "essential goods and services". Such essential goods and services included crude oil imports, import of petroleum products, drugs and loan - amortization. On the second exchange window the exchange rate floated, being determined by the amount of forex supplied by the BOG, and that, demanded by the dealers on behalf of their customers. Licenses were issued to determine on which window an individual or firm could transact business. There were three categories of licenses - 'A' 'S' and 'G'. The 'A' license category qualified an individual for participation in the auction. The 'G' license category qualified the holder to source his forex needs on the first window. While an 'S' license meant that the holder should source for his forex resources autonomously (i.e outside the official window and outside the auction market).

By February 1987 the two windows were merged and all items qualified to come under the "Auction" system. By January 1989 import-licensing system was completely abandoned. Import declaration forms which remained in place were meant only for statistical purposes. While the two exchange windows lasted i.e between September 1986 to February 1987, the surrender of exchange earnings to the Bank of Ghana was effected at two rates. Earnings from exports of cocoa and residual oil products were to be surrendered at window 1 exchange rate, while all other transactions were at window 2 exchange rate. Transactions on window 2 made up about 66% of all external payments and receipts.

The auctioning system adopted in 1986 was of the 'retail' type wherein the BOG was empowered to sell forex to "final users" only. Thus the commercial banks (or dealers) had, a very limited intermediary role to play in the system. Their main functions were to collate the bids for auction funds from their clients and then channel these bids to the BOG. Every Friday at the BOG each dealer bid on behalf of its customers. The point where the supply of forex by the BOG becomes exhausted becomes the "marginal rate". In the very first auction this marginal rate was adopted as the forex 'price' at which every bidder bought forex. Subsequently however the pricing system was changed to the Dutch Auction System (DAS) whereby each bidder bought forex at the rate at which he bid. The DAS remained in use till April 1990 when the Modified Dutch Auction System (MDAS) was introduced.

As an epilogue one may point out here that by April 1991 an "interbank forex market was put in place whereby banks traded in forex among themselves, the sources of their forex being the fraction of their export proceeds that the BOG allows them to keep, and other forex resources from autonomous sources. By March 1992 the BOG stopped the auction system completely leaving only the "interbank market" in place. Under this interbank market system the BOG maintains what it calls a Dealing Desk wherein banks needing more forex resources than they can get from fellow dealers buy from the BOG at the Dealing Desk. Also under the platform of the "Dealing Desk, the BOG buys and sells forex at prices close to those obtainable at the interbank market and at the parallel market[3].

In order to ensure that a single bank does not corner the whole interbank market the BOG had an "opening-balance" rule which stipulated the maximum amount of forex any bank must have as its opening balance, any excess above the "opening-balance" required by the BOG has to be sold to other banks, anyone violating this rule was banned from purchasing from the BOG's Dealing Desk whenever the need arose.

Within the period of this study however i.e between 1977-1990 it is important to point out an interesting development. In February 1988 the "Foreign Exchange Bureau De-Change System was approved in principle. By April 1988 the bureaux came into operation. The bureaux were meant to cater for the needs of small buyers and sellers of forex, and, to try and, absorb the parallel market into the official market thereby expanding the officially available forex, and for purposes of control.

According to Chhiber and Shaffik (1989), and Fosu (1990) non-traditional exports have been given a boost since the onset of floating rates. This improved performance of non-traditional exports is said to be due to the boost in exporters income as a result of the devalued currency. Secondly the fact that exporters could now retain a significant fraction of their export earnings also encouraged exports. Also Chhibber and Shaffik maintain that whereas inflation rate in Ghana between 1973 - 1980 was about 60.3% annually, by 1985 (two years after the onset of ERP) the inflation rate came down to some 10% per annum, and even though it has risen to almost 30% by 1988, inflation rate is still far less than what obtained prior to the adoption of the ERP with its attendant flexible exchange rate system.

Though import bills have gone up, a lot of the increased import is in the productive sector of the economy hence it is potentially useful for economic growth and development. And the increased imports (if Khan and Knights' 1986 thesis holds) will definitely improve export performance as most productive sectors, even agricultural sector, depend on imported inputs and equipment. Also fiscal performance is said to have improved in Ghana, given the inflow of adjustment grants and aids.

2.2 Exchange Rates and Exchange Rate Management in Nigeria Before and After SAP

In the 1970s Nigeria adopted a single currency peg. As of 1973 it pegged its currency to the US dollar and the exchange rate was ₦0.65 to $1, and when the dollar was devalued in 1973 Nigeria also devalued the naira in sympathy. By 1974 however it became obvious that pegging to the US dollar which then had become very weak was inadvisable. Thus the country adopted a new system whereby it pegged either to the US dollar or the pound sterling depending on which one proved stronger in the world forex market.

As a result of the boom in petroleum prices between 1973 and 1974, Nigeria had huge and persistent external surpluses. Inflationary pressures mounted and the naira started to appreciate relative to the US dollar and soon the naira became overvalued. Appreciating the naira was thought to be helpful in that it was thought to make "import-substitution-industrialization" realizable, and further, that, naira appreciation was anti-inflation. In 1976, half-hearted attempts were made at depreciating the naira, and later, it was decided to peg the naira to a basket of currencies. A basket made up of the currencies of seven major trading partners of Nigeria was chosen, and between 1976 and 1985 Nigeria experimented with the basket peg. Though the naira was stable it was however considered overvalued in both nominal and real terms (relative to the US dollar). By 1980 the exchange rate stood at #0.54 per $1.

In the 1970s Nigeria maintained a regime of trade and exchange controls. There were also several administrative devices to pep up the trade controls. Among these controls were.

(i) The requirement for "approval" by importers from the Central Bank of Nigeria in order to purchase forex.

(ii) Compulsory surrender of forex receipts by importers.

(iii) Channelisation of all forex transactions through the authorized dealers (i.e commercial and merchant banks.

Administrative and quantitative rules to pep up the trade and exchange controls included, import licensing, form 'M', and Comprehensive Import Supervision scheme.

As a result of the 1973/74 oil boom and the attendant surge in Nigeria's international reserves, the country opted for forex management through portfolio diversification (Ojo, 1990). Given that this period coincided with the adoption of floating rates by the developed - industrialized countries of the world, there was a general instability in the global monetary system. So, Nigeria had to distribute its forex assets in order to reduce the risk of capital loss. To achieve the aim of asset diversification an Investment Management Committee was established in December 1974 charged with the responsibility of investing in securities of varying degrees of maturity denounciated in major international currencies. By the end of 1976 the Central Bank of Nigeria's external assets were held in nine convertible currencies.

From February 1978 to August 1986 the exchange rate of the naira was based on import-weighted basket of currencies supplemented by such factors like "reserve-level" "cross-rate-considerations", "relative-rates-of-inflation" and discretional judgement of the perceived relative strengths of various currencies of major trading partners" (Ojo, 1990). The actual determination of the naira exchange rate appeared to have been largely influenced by the level of forex inflow and reserves. As a rule, naira exchange rate was appreciated with an increased inflow of forex, but a corresponding depreciation never took place with a reduced forex flow. On the whole, because the exchange rate policy encouraged appreciation rather than depreciation of the naira, it became counter productive, undermining the incentives to produce for export, encouraging imports, sustaining overdependence of manufacturers on imports and encouraging the growth of parallel forex markets and capital flight. By 1985 the exchange rate stood at #0.89 per $1.

The Second-Tier Foreign Exchange Market (SFEM) came into operation on 26th of September 1986. In this market, the naira was floated independently. The second-tier exchange rate applied to all transactions except debt-service payments, embassy expenses, subscriptions to international organisations, and settlement, of transitional or pre-SFEM transactions. Dealers (made up mainly of commercial and merchant banks) were required to bid for foreign exchange subject to a maximum of 10% of available forex by big banks and 7% for small banks. Their bidding would be at prices that appeared to them to approximate the market perception of demand for and supply of forex. Under this arrangement some banks did not win at the auctions. So the banks were classified into 'big' , 'medium' and 'small' and each category was entitled to a maximum of 5%, 2% and 1.5% respectively. In the first two auctions, the exchange rate was determined by averaging the successful bid rates. After the first two biddings the average-rate method was replaced with the marginal-rate-pricing-method, which, it was believed, had the advantage of reducing the continuous depreciation of the naira. By April 1987 when the exchange rate continued its downward slide a supposedly more professional system was introduced i.e the Dutch Auction System. Under this system dealers were allocated funds at their bid rates. The objective was to reduce the propensity for high bids. The result was multiplicity of bid rates, but the official exchange rate was determined at the margin. Further the bidding period was revised from once a week to once in two weeks.

By July 1987 the first tier market (where the exchange rate was fixed by administrative fiat) and the second-tier market were merged to produce just one exchange market known as FEM (Foreign Exchange Market). The essence of the merger was to eliminate the implicit subsidy on first tier transactions, rationalise the allocation of forex, and eliminate multiple currency practices. There was introduced in 1988 what was known as the "autonomous" market or the interbank market. Under this arrangement banks were free to source for foreign exchange independently of the central bank, and sell to each other at rates determined by themselves subject however to a maximum spread of one per cent. The objective was to encourage non-oil foreign exchange inflow to banks and thereby relieve the pressure on the official market. By January 1989 the "autonomous market" and the FEM were merged, and the Inter-bank Foreign Exchange market (IFEM) was born. The essence of this merger was to unify the rates in the official and the autonomous segments of the market in order to eliminate distortions in the exchange market.

The operations in IFEM were conducted on a daily basis, the exchange rate was determined by using one or a combination of the following

(i) Weighted average of all quotations submitted by banks:(i.e individual bank's quotation weighted by amount demanded).

(ii) Simple average of all quotations submitted by banks

iii) Highest and lowest banks' quotations provided the latter does not depreciate by more than 2% when compared with the rate that emerges in (ii) above, and

(iv) Intelligence reports on exchange rate movements during the previous day both in interbank market and in some world financial centres. (Olisadebe 1991).

From 1989 for purposes of forex allocation all dealing banks were classified into four categories ranging from biggest to smallest. The classification was based on the weighted average of a number of factors which included

(a) the level of a bank's net assets

(b) level of its net profits

(c) level of its loans and advances

(d) level of its deposit liabilities.

The proportion of total allocations that went to each group was a function of, the total number of banks falling into a particular group, the amount of forex government was willing to put into the market, and the stock of contingent liabilities of the central bank.

At the onset of IFEM the practice whereby dealers bought forex on behalf of their clients was abolished. So that dealers now bought forex on their own account. After the allocation has been taken up, each bank's account with the Central Bank was debited with the naira equivalent of the allocations. For this purpose the CBN's selling rate which was usually 0.5% above the market rate was applied. On a daily basis dealers submit bids on their own account to the CBN. The bids were arranged in descending order of value, the bid rate that cleared the market represented the marginal rate. Though the bid rates influenced the determination of the CBN's "effective" rates, the criteria for determining the naira exchange rate were not unique. However, once the rate was determined the CBN's selling rate was regarded by the banks as the "base" rate.

When the exchange rate was floated in 1986 some complementary measures had to be taken, which among others were

(i) the dissolution in December 1986, of the Commodity Boards which had hitherto been responsible solely for marketing non-oil agricultural exports.

(ii) abolition of imports and export licensing.

(iii) establishment of foreign exchange bureaux in 1989 to handle small cale forex transactions based on non-official funds.

The first of these measures was meant to encourage individual exporters. More importantly the creation of "Foreign Currency Domicilliary Accounts", and the permission granted exporters to retain 100% of their forex receipts were aimed at reinforcing the effects of the dissolution of the commodity boards. The third measure was aimed at reducing pressure on official forex resources and reducing illegal forex practices. Institutional facilities to further encourage the promotion of non-oil exports included

(i) New Shipping Policy under the aegis of the newly established National Maritime Authority. The policy was based on a 40-40-20 formula whereby Nigerian vessels were allowed to lift 40% of the value of trade while trading partners and third party vessels were allowed to lift 40% and 20% respectively.

This policy was meant to enhance Nigeria's forex earnings in the maritime trade.

(ii) Other export incentives were the Rediscounting and Refinancing Facility (RRF) meant to induce authorized dealers (mainly commercial and merchant banks) to go into export financing. Loans given to exporters by the dealers can be refinanced by the CBN at its minimum Rediscount rate thus providing a good margin to the dealers who lend at commercial rates.

(iii) Also established was the Nigerian Export Credit Guarantee and Insurance Corporation (NEXIM) which was meant to provide further incentives to exporters through credit guarantee, loan guaranteeand insurance. To keep forex expenditure within reasonable limits, a strict forex budget control system was designed.

As earlier mentioned, in August 1989 in order to further combat the issue of excessive parallel market premium, the government approved the establishment of "Bureaux De Change". These are institutions specifically licensed to undertake forex transactions on a relatively small scale. The bureaux were believed to be capable of broadening the scope of legitimate foreign exchange transactions by providing free access to forex to small users in a convenient and informal manner. On 14th December 1990, the Dutch Auction System was reintroduced to check foreign exchange hoarding by banks, and submission of multiple bids (which inflated the demand for forex). With the reintroduction of DAS banks were regrouped into six categories with the largest banks being entitled to 4.70% each, of total forex available and the smallest banks being entitled to 0.45%. The marginal rate continued to be used to determine the official rate i.e the rate that exhausted the supply of forex. This rate was marked up by 1% to determine the effective rate.

In order to re-align the demand for with the supply of forex certain complementary measures were taken between 1986 and 1990. Among others these included the lowering of prescribed ceiling on credit expansion in January 1989. The commercial and merchant banks cash reserve requirements and the Central Bank's Minimum Rediscount Rate (MRR) were revised upwards. Further, banks and other financial institutions, were, from April 1989, prohibited from granting loans denominated in naira on the guarantee of foreign assets, failure to comply with this regulation meant the offending bank had to deposit an amount equal to the principal of loan so granted to the CBN. In June 1989 all deposits of the Federal and State governments and those of their agencies were required to be transferred from the commercial banks to the CBN. By July 1989 deposits so transferred totalled N8.5 billion. From August 1989 stabilization securities were issued by CBN, and, banks thought to possess excess liquidity are forced to purchase such stabilization securities. On the supply side government continues to encourage non-oil exports and earnings therefrom. As an epilogue one might add that from March 1992 government had adopted the use of forex bureaux rate as its own selling rate and authorized dealers are free to purchase their forex needs from the CBN on a fortnightly basis.

On the very first quarter of floating in 1986 the exchange rate depreciated by about 63% to stand at N3.6 per $1. By the time the forex bureaux were established in 1989 the exchange rate had further tumbled, depreciating by some 52% from its early floating period and some 82% from the pre-float era to stand at N7.5 per $1. By the end of 1990 the exchange rate was N8.3470 per $1. As an epilogue one might add that by the end of 1992 exchange rate had reached the rate of N20.5 per $1.

Government officials have since the onset of floating rates maintained that non-oil exports have expanded. Olisadebe (1991) claimed that the share of non-oil exports to total exports increased from 3.2% in 1981-85 to 6% in 1986-1990. Ojo (1990) maintained that the value of non-oil exports averaged N2.7 billion between 1987-1989 as against N0.4 bill between 1984-1986. Growth in the value of imports in dollar terms has been much less than its growth pre-floating, although in naira terms imports value increased substantially. Ojo further maintained that the structure of imports has shifted slightly from consumer goods towards capital goods and raw materials. Official foreign exchange reserves have increased from N3.3 billion in 1988 to N13.8 billion in 1989. At this level the reserve level could cover 3.8 months of forex commitments at the prevailing rate of disbursement as against 1.3

months at the end of 1988.

Olisadebe has further maintained that the current account deficit as a percentage of GDP which averaged 5.6% per annum in the years 1981-1985 has now improved to an average surplus of 3.4% in 1986 - 1990. To what extent these improvements are real or illusory will be determined in this study.

2.3. Exchange Rates and Exchange Rate Management in Uganda.

In the 1970s Uganda operated a fixed exchange rate system. The exchange rate by the mid-1970s was seven Ugandan shillings to one United states dollar (Ush7 per $1). At this time there was no active exchange rate management policy. There were however three series of external shocks in the 1970's which Uganda ought to have reacted to, in terms of its exchange management policy, but which, it failed to react to. These were the oil crisis of 1974, whereby the price of crude petroleum shot-up by over 400%, then another oil-price hike in 1978, and then the commodity price collapse of 1979, whereby the price of coffee (the main export crop of Uganda) came tumbling down.

In spite of these external shocks the exchange rate remained fixed at Ush7 per $1. What is more - there were political upheavals in Uganda in the 1970s some of which brought sanctions against Uganda by the international community. The political upheavals in Uganda involved the expulsion of the major operators of the economy from the country. This expulsion, without adequate replacement, led to declining production from 1972 - 1979.

Inflation rate soared, exchange rate remained fixed and the economy had to rely heavily on the country's external reserves to sustain the exchange rate at Ush7 to $1. Sanctions against Uganda led to the blockage of capital inflow in terms of aids, grants and loans at concessionary rates. It also led to the drying up of credit - lines, and imports had to be on cash-and-carry basis.

In time real GDP declined to negative levels, budget deficit was increasing at an annual rate of 23% and was financed by simply printing new money. Triple digit inflation resulted, and soon a thriving parallel market for foreign exchange known as the "Kibanda" resulted. Before the end of the decade of the 1970s the differential between the official exchange rate and the parallel market rate was about 1:30[4].

In the face of acute foreign exchange shortage in the official sector, recourse was had to external borrowing at commercial rate. In time the country got cut in a debt-web. Meanwhile efforts at home were concentrated at fighting the parallel market. In 1979 there was a civil war, and in 1980 there was another political crisis both succeeded in weakening the economy the more.

As external debt piled up, external reserves got depleted to unbearably low levels, gross domestic product fell, per capita income fell, inflation rate soared, the government then decided in 1981 to take a drastic step to arrest the situation. Thus in 1981 the government devalued the exchange rate. Between June 1981 and 1982 greater efforts were put at making the exchange rate system more flexible hence series of devaluations took place during this period, with the exchange rate moving from Ush8.12 to $1 in May 1981 to Ush76.75 per $1 in June 1981 and to Ush80.52 per $1 in September 1981 and Ush86.03 per $1 by June 1982.

By 1982 the government decided to float the exchange rate independently. The government adopted a two-tier foreign exchange system whereby at one level foreign exchange was administratively fixed by government and this rate was used for government imports and external loan repayment, while at the second level forex was bought and sold according to the forces of demand and supply. The rate at the second window was made as high as that in the parallel market in an attempt to eliminate the parallel market. This attempt however did not succeed. Attempts to eliminate the parallel market did not succeed for two reasons. First the officially generated forex resources was not sufficient to meet total demand for forex in the economy. Secondly the bidding system was slower relative to the parallel market system due to bureaucracy.

In order to promote exports government decided that exporters could retain their forex earnings. However these exporters preferred to siphon such forex earnings to the parallel market rather than to the official market. What is more - government usually guaranteed loans to exporters of coffee, tea, and a few other export commodities. However revenues from these exports do not find their way to the BOU rather they found their way to the parallel market. So in order to bring exporters to the official market the Ugandan government permitted the opening of "Foreign Currency Domicilliary Accounts" and allowed the financing of imports through these accounts.

When the bidding sessions started in June 1982 it was financed by the IMF while the BOU supervised the weekly auction. In 1984 the IMF standby arrangement from which the auction was financed came to an end and Ugandan monetary authorities had to fund the forex market themselves. While the IMF standby arrangement lasted it pumped in about \$2m weekly into the auction market. Between June 1981 and December 1984 the exchange rate moved from Ush76.75 per \$1 to Ush551.57 per \$1, a depreciation rate of about 86%.

At the onset of floating exchange market in 1982 there were two official exchange rate windows. Window 1 was where the exchange rate was administravely fixed, and the rate obtainable here was used to finance essential imports, such as, crude oil and petroleum products; it was also used for external loan repayments. Window 2 was the auction system where the rate determined by market forces prevailed. By the end of 1984 the two windows were merged to produce one door.

By June 1985 the exchange rate had reached Ush.600 per \$1. By October of the same year the government went back to operating two windows once again, on one window, the exchange rate was determined by administrative fiat on the other it floated independently. By June 1986 the exchange rate on the first window was Ush1,400 to \$1 and that on the second window was Ush5,000 to \$1. According to Dr. Kiggundu[5], the dual exchange rate system was problematic in one great respect, and that is, a lot of "non-priority" imports found their way into the first window of the official exchange rate market. Thus the BOU lost money. By May 1987 there was about Ush850 billion in circulation. So a currency reform was put in place and a new Ugandan Shilling was introduced. The old Ugandan shilling exchanged for the new one at the rate of 100 old shillings to 1 new shilling. Thus money supply came down to Ush.8.5 billion. To impact prices a 30% conversion tax was introduced so that the money supply came down to new Ush.5.95 billion, then the exchange rate was fixed at new Ush60 to $1. For two months prices actually fell, but government expenditure just started to skyrocket. The exchange rate remained at Ush60 : $1 until June 1988.

By June 1988 the World Bank and the IMF had mounted so much pressure on the monetary authorities calling for a devaluation. So a series of devaluations started in July 1988, and by June 1989 the exchange rate has depreciated to Ush200 per $1. From June 1989 in order to siphon money from circulation the monetary authorities decided to sell forex at the rate of Ush 400 : $1 as an interim measure under what was known as a Special Import Program. Thus while the official rate still remained at Ush 200 per $1, the special Import Rate was Ush400 to $1. This move helped to siphon about Ush12 billion from circulation. Once again prices went down. As pressures on the monetary authorities from the Bretton woods institutions asking for further devaluation continued, the exchange rate was fixed again at Ush300 per $1. Thereafter, a real exchange rate rule was put in place based on purchasing power parity framework. This rule required that the monetary authorities adjust the Ugandan exchange rate in line with the inflation differential between uganda and her five major trading partners. Following this rule the exchange rate moved to about

Ush380 per $1 by April 1990. By December 1990 following the real exchange rate rule the exchange rate stood at some Ush540 per $1.

As an epilogue one might point out that between 1990 and 1991 the exchange rate management was no longer based on relative prices, rather the official exchange rate was negotiated between the IMF/WB on the one hand and the monetary authorities of Uganda on the other hand, in order to bring the official exchange rate up to the more depreciated level obtainable at the forex bureaux. By *1991* the bureaux rate was *about Ush1,300 per $1* while the official exchange rate was Ush960 per $1. By beginning of 1992 the Ugandan authorities decided to go back to floating the exchange rate once again through the auction system. The commercial banks bid on behalf of their customers at the BOU; however, there is a floor rate (or price) below which the BOU does not allow this authorized dealers to go. While the official exchange rate has depreciated to Ush1,100 per $1 there is still a premium maintained by the bureaux who sell at Ush1,300 per $1.

The return, of the exchange rate from floating to fixed in 1987 was said to be a result of the thinking of those at the helm of monetary affairs in 1987, that the fixed exchange rate was a catalyst to rapid growth and development of local industries such as soap and sugar factories. Under the fixed system, priority industries were put on "Open General License (OGL) so that they could get foreign exchange automatically (though this allocation system had the snag that it could (and did) result into rents for a privileged few rather than improving economic efficiency). Another reason for abandoning the floating rate in 1987 was that the floating rate went along with trade liberalization; trade liberalization allowed foreign goods to flood the domestic market, which not only destroyed local entrepreneurial incentives but also negated the effects of changing structure of relative prices which floating regime is supposed to bring about. Further the monetary authorities believed that the multiplier effects of free trade and liberalized exchange rates were taking place abroad rather than in the domestic economy, so that while the foreign economies "got the jobs" the domestic economy "got the goods". It is interesting to note however that some people have argued that in fact the 1988 and 1989 years witnessed impressive growth of the GDP. Elbadawi (1990) claimed that the GDP growth rate over this period was 6% annually, while inflation rate was about 150% per annum during these two years. The unduly high inflation rate Elbadawi maintained was not due to whatever was happening to the official exchange rate, rather it was due to government fiscal indiscipline. Some people have argued that the export-stimulation goal of floating rates has not materialized in Uganda. However others contest this claim. For instance Obidegwu[6] maintained that non-traditional exports have expanded in Uganda growing at about 30% per annum. Such non-traditional exports according to Obidegwu now bring in some $60m to $70m annually. What is more - there is great potential for growth in this non-traditional exports especially for products such as vanilla, chilleys and pineapples and even in the traditional exports too such as tea and cotton.

ENDNOTES

1. Mr. Ameyaw, S is thē Head of Research Department, Bank of Ghana, the report is from the interview he granted the Researcher while on data collection trip in Accra in May 1992.

2. See Endnote 1.

3. So far, this account has benefitted tremendously from an interview with Dr. Louis Kasekende, The Deputy Director, Research Department, Bank of Uganda. The Interview was granted while this Researcher was on a data-gathering trip to Uganda in June 1992.

4. See Mbire and Watuwa (1992): "Exchange Rate Policy And Inflation: The Case of Uganda" (Report Prepared For The African Economic Research Consortium Workshop May 1992, Nairobi, Kenya).

5. Dr. Kiggundu was the governor of the Bank of Uganda from 1986-1990. This part of the report is from the interview he granted this Researcher while on a data-gathering trip to Kampala in June 1992.

6. Dr. C. Obidegwu is the World Bank Resident Economist in Uganda. What is here reported is from an interview he granted this researcher while she was on a data-collection trop to Kampala in June 1992.

CHAPTER THREE

LITERATURE REVIEW

"Theory is Inspired By History But Good Theorists Do Not Always Have Long memories."

Kenen (1985)

This chapter is devoted to a survey of the several theories of exchange rate determination, and a survey of the models of the workings of the macroeconomy under different exchange rate regimes. The chapter also considers the various empirical investigations of the validity of exchange rate determination theories, and the different macroeconomic models of the workings of the economy under different exchange regimes.

The earliest theories of exchange rate determination focused on, the current account balance, price elasticities and propensities. Today focus has shifted to the bond and money markets as reflected in the monetary approach and the asset market (or portfolio balance) approach to exchange rate determination. Of the very early theories of exchange rate determination the most enduring has been the purchasing power parity (ppp) theory. Others are the Interest Rate Parity Theory and the Balance of Payments Approach. Below we briefly review each of these theories in turn.

3.1: Theories of Exchange Rate Determination

3.1.I Purchasing Power Parity Theory (PPP)

The PPP has its antecedents in the 19th century works of Ricardo, Mill, Goshen and Marshall (Dornbusch, 1988). In fact Myhrmann (1976) and Einzig (1970) have even traced the PPP back to eighteenth century Sweden and 16th century Spain. Whatever or whoever be its forebears the theory had a rebirth during World War I when Gustav Casell (1916, 1918) turned it into a paradigm and christened it.

In essence the PPP maintains that across countries there is commodity arbitrage, such that prices of commodities are equal across countries when expressed in one given currency. Thus the exchange rate is what "equates the prices of traded goods in alternative currencies."

In its strong form, the PPP makes no allowances for tariffs, transport costs and other restrictions, hence

$p_i = ep^*_i$ -------------------------- (3.1)

where p_i = Domestic currency price of good i

P_i^* = Foreign currency price of good i

e = Nominal Exchange rate in units of domestic currency per unit of foreign currency

Summing over all commodities in each economy gives

$P = f(p_1 \ldots\ldots\ldots\ldots p_i \ldots\ldots\ldots p_n)$............(3.2)

$$P^* = f(p^*_1 \ldots\ldots\ldots\ldots p^*_i \ldots\ldots\ldots p_n^*) \ldots\ldots\ldots\ldots (3.3)$$

$$P = eP^* \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.4)$$

Equation (3.4) implies that

$$e = \frac{P}{P^*} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.5$$

Expressing the price ratios in just one currency (say the domestic currency) gives

$$\frac{P}{eP^*} = 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.6$$

In its weak form the PPP doctrine admits of impediments

to trade, and this is represented as a constant, as shown in equation (3.7).

$$e = \frac{P}{P*} \quad \text{--------------------} \quad (3.7)$$

Where θ is the constant representing all obstacles to trade.

Several studies have attempted to refute or validate the PPP theory. Among others Yaeger (1958), Balassa (1964), Harrod (1930) have looked into the issue; the conclusion has been that as a short-run theory of exchange rate determination, the PPP is inadequate; however, in the long run, it could provide a "useful though not exact description of exchange rate behaviour" (Dornbusch 1988 p.265).

3.1.II Interest Rate Parity Theory (IRP)

Traced to the 1923 work of J.M. Keynes - A Treatise on Money, the IRP theory of exchange rate determination maintains that, a significant force on both the spot and forward exchange rates, in addition to speculation, is the movement of short-term capital for the purpose of interest arbitrage. Such movement ensures that a country with a higher domestic rate of interest relative to her trading partners' will witness continuous inflow of funds as arbitrageurs try to take advantage of a higher rate of return on their funds. Such movement of funds continue until the exchange rate in the low-interest country appreciates so much as to ensure equilibrium in the capital market, whereby returns from both domestic and foreign investment are equal. (Kindleberger, 1939; Jasay, 1958; Austen, 1961; and Sohmen, 1965). Given that one unit of domestic currency will with a domestic interest rate of i_d grow to $e^{i_{dt}}$ by time 't' (where e is the basis of the natural logarithm) when invested at home; then if capital movements between countries are unrestricted, funds can alternatively be transferred abroad. Given spot and forward exchange rates of r_0 and r_t respectively, and a foreign rate of interest of i_f, and assuming initially that transfer is costless, covered interest arbitrage will yield

$(r_t/r_0)e^{i_{ft}}$ units of domestic currency at time t for every

units invested abroad. If δ is the expected percentage change in the spot exchange rate 't' period from now, i.e

$$\delta = \frac{r_t - r_0}{r_{0.t}}, \ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.8)$$

then, in equilibrium returns from investment at home and broad would be equal,

$$r_t/r_0 = 1+t\delta = e^{t(i_d-i_f)} \quad \ldots\ldots\ldots\ldots\ldots(3.9)$$

Equation (3.9) can be reduced to

$$\delta = i_d - i_f \ldots\ldots\ldots\ldots(3.10)$$

Thus the spot exchange rate 't' period from now ($r_0.t$), is determined by the interest differential between the domestic economy (i_d) and the foreign country i_f (Sohmen, 1965).

The underlying assumption in the IRP theory is that there are no capital controls, so that capital is perfectly mobile and securities denominated in different currencies are perfect substitutes. Transfer of funds across national boundaries is costless. These assumptions seriously limit the usefulness of IRP as an adequate explanation of the behaviour of the exchange rate in the short, medium and long run (Isard, 1987).

3.1.III: Balance of Payments Approach - (BOP)

The BOP approach to exchange rate determination maintains that the exchange rate between two currencies is determined by the demand for and supply of each country's currency brought about by the need to make payments to each other for goods and services exchanged (Wilby, 1981). The country that demands more of its trading partners goods and services than the trading partner does of its own, drives the value of the foreign currency up and that of the domestic currency down (i.e. foreign currency appreciates while domestic currency depreciates). In the process of settling the payments and receipts for imports and exports the exchange rate is determined.

There are two variants of the BOP approach to exchange rate determination. The first variant emphasizes changes in the terms of trade as being the major determinant of shifts in the balance of payments and hence of the determination of equilibrium level of the exchange rate. This variant analyzes the importance of elasticities of demand for imports and exports, as well as the elasticities of export supply, as being critical in determining "desirable" terms of trade. Proponents of this variant include Machlup (1956) and Harberler (1949).

The other variant of the BOP approach to exchange rate determination emphasizes the importance of the relationship of domestic output to domestic absorption in the determination of the current account balance and hence of exchange rate movement. This variant maintains that expenditure reduction in the face of trade deficit is crucial to restoring external balance. Thus, in order to avoid inflationary pressures in the face of trade account deficit, an economy must reduce the level of its domestic absorption to that of domestic output. Among others Alexander (1952), was one of the proponents of this variant.

The two variants of the BOP approach were however merged by Alexander (1959)

Tsiang (1961) and others. They showed that for both internal and external balance the process of adjusting the balance of payments and hence of determining equilibrium exchange rates must necessarily involve both expenditure switching (i.e. switching domestic expenditures away from imports to home produced goods) and expenditure reduction in a country running trade deficits.

The BOP approach has being criticized for narrowly focusing on the international transactions in goods and services while overlooking international transactions in financial assets which are included in the capital account.

3.1.IV The Monetary Approach (MP)

The monetary approach to exchange rate determination contends that demand for foreign exchange arises as a result of attempts to equilibrate the net stock demands for monies of different countries. It assumes that a country's price level is pegged to the world price level and must move rigidly with it - in other words that the law of one price holds (Wilby, 1981; Boughton, 1988).

Thus the monetary approach posits that disparities in nominal money supply relative to real demand for money cause shifts in prices which disturb the maintenance of purchasing power parity. Attempts to bring about equilibrium in the money market therefore leads to changes in the exchange rate. The exchange rate is finally decided when the nominal money supply has equalled money demand and parity has been restored in the two trading countries.

The real demand for money it should be noted, is however, a function of real income as well as of nominal interest rates. Hence the monetary approach equations are essentially four

$e = p - p^{*}$ 3.11

$p = m^{*} - ky + hi$ 3.12

$p^{*} = m^{*} - ky^{*} + hi^{*}$.....................3.13

$\bar{e} = m - m^{*} + h(i - i^{*}) - k(y - y^{*})$... 3.14

where * indicates the foreign country's variables.

e = nominal exchange rate

m = the nominal money supply

y = real income

i = nominal interest rate

$\bar{e}$ = long-run nominal exchange rate

k, h = adjustment operators.

(All variables are in small letters indicating that they are in logarithm form.)

Bearing in mind that the real demand for money is a function of real income, y, and nominal interest 'i'; equation 3.14 is the exchange rate equation, and it maintains that relative changes in money supply, in interest rates and in real income affect the exchange rate. Thus an increase in money supply not matched by an equiproportionate increase in money demand will all things being equal lead to an equiproportionate increase in the exchange rate (i.e. exchange rate depreciation). Increase in domestic real income however leads to a fall in domestic prices and hence to an appreciation of the exchange rate. Higher interest rates relative to a country's trading partners' result in excess money supply as real demand for money falls thus bringing about exchange depreciation.

There are empirical and theoretical weaknesses inherent in this approach. First, according to Dornbusch (1980) there is ample evidence that the assumption of PPP is not warranted, "... not only does the short-term exchange rate deviate from a PPP path but there are also cumulative deviations from that path that show substantial persistence". Using the case of the United States of America, 1973 - 1979 as an example, Isard, (1987) maintained that, in spite of the USA running an inflationary rate that was at least one percentage point less than those of her five major trading partners, and as such ought to have had a real exchange appreciation of about one percentage point over the period 1973 - 79, if PPP holds, the USA rather had a real exchange depreciation of over 2 percentage points over the period. Other econometric evidence reveal that the monetary approach is an unsatisfactory theory of exchange rate determination (Isard, 1987) Essentially the monetary approach is a partial equilibrium approach hinging on the premise that exchange rates are determined by the conditions of stock equilibrium in the asset markets.

3.1.V Portfolio Balance Theory of Exchange Rate Determination

This approach is also known as Asset market approach and has a long list of advocates (Branson, 1977; Boyer, 1977; de Macedo, 1978; Allen and Kenen, 1980; and Adler and Dumas, 1983;) among others.

The portfolio balance theory of exchange rate determination maintains that exchange rate is determined in the short-run equilibration process of financial markets, given supplies of domestic and foreign assets. Money is regarded as one of several financial assets in an economy. The exchange rate, though determined in the process of the demand for and supply of financial assets, is itself a principal determinant of the current account in the balance of payments. Under a system of floating rates the current account is the net rate of accumulation of foreign assets whose accumulation moves the exchange rate. This gives a dynamic system of exchange rate adjustment which includes asset markets, the current account, and foreign asset accumulation.

The portfolio approach assumes that if there are J income earning assets in an economy plus one money stock then in all there are (J+1) financial assets and for two economies there are (2J+2) assets. Demand and supply for all these assets determine their rates of return and hence their prices and since the exchange rate is the price of money, and money is one of the financial assets in the portfolios then the exchange rate is also determined by the demand for and supply of the financial assets in the two economies.

The weaknesses of this approach are the same as those of previous approaches which it incorporates. For instance portfolio balance theory assumes the existence of the law of one price, as well as of interest rate parity, which assumes that securities denominated in different currencies are perfect substitutes. The existence of purchasing power parity is still being debated in the literature, while the reality of capital controls make perfect substitutability of securities of different currencies impossible.

3.2: Review of Models of the Workings of the Macroeconomy Under Different Exchange Rate Regimes

Irrespective of how exchange rates are determined one issue that has bothered economists and policy makers alike, since the end of the second world war has been thatof deciding the "ideal" exchange rate regime for all nations of the world as a whole, in order to ensure domestic internal balance, external balance, and global balance (global balance as reflected in improvements in global welfare as a whole).

In between the two world wars there was no unique exchange rate system. Prior to the first world war nations of the world maintained a fixed exchange rate system known as the "fixed gold standard" During the first world war this system broke down. Criticised for being too rigid and too dependent, in that no nation could pursue completely autonomous monetary, fiscal, or other macroeconomic policies without interference from real and monetary events of the rest of the world, the system could no longer survive when the world was no longer united. After the first world war some nations went to freely fluctuating exchange rates, others still tried, half-heartedly, the fixed gold standard system but it did not work. There have been myriads of arguments for and against the fixed as well as the floating exchange rate regimes. Different models were developed which tried to highlight the performance of an open economy under one or the other of those two exchange rate arrangements. Among the earliest models in this area was the Mundell-Fleming model (MFM) (Mundell, 1961, 1962, 1968, Fleming ,1962). The essence of the Mundell - Fleming model was to show that under a system of floating exchange rates monetary policy tends to be quite effective in improving economic performance. Under a system of fixed exchange rate regime however it is only fiscal policy that can be relied upon to uplift the economy.

Dernberg (1970) however hypothesized that the efficacy of both monetary and fiscal policy does not depend on the type of exchange rate system in use. He went on to show that given the right policy mix, effects of monetary and fiscal policies could be identical under the different exchange rate regimes. This study attempts to investigate whether the Demberg hypothesis is valid or not. Below is a review of a few of the models of the workings of the macroeconomy under different exchange rate regimes.

3.2.1. The Insular-Economy-Model

Prior to the Mundell-Fleming-Model was the model termed by Kenen (1985) the Insular-Economy-Model. The Insular-Economy-Model essentially derives from the Keynesian income determination model which was basically a closed economy model. However the closed economy was opened in the works of Machlup (1943) Metzler (1943) and Meade (1951) to produce the Insular-Economy-Model. This model essentially adopts a balance of payments approach to exchange rate determination. It assumes away the capital account and concerns itself with the trade and current account balances only. The model assumes that wages are fixed over the period relevant to policy. Money supply a potent policy instrument is assumed to be exogenous. All balance of payments flows are sterilized by government policy actions or open market sales and purchases of securities. Other than money, there is only one asset in the financial market which is treated implicitly,

In the insular-economy-model total demand for the output Y, of the economy is made up of private domestic expenditure Z, government expenditure G, and the balance in the import - export trade or trade balance, B.

$Y = Z + G + B$ ....(3.15)

The private domestic expenditure Z, is itself a function of

domestic income Y, the nominal rate interest r, as well as real wealth A/P,

Letting A/P = a, then

$Z = Z(Y,r,a)$.............(3.16)

$0 < Z_y < 1$

$Zr < 0$

$Za > 0$

The trade balance, B, depends on domestic private expenditure, Z, foreign expenditure Z^*

and the terms of trade P/EP* where P is the domestic price level, P* the foreign price level and E the nominal exchange rate in terms of units of domestic currency per unit of foreign currency

Letting $P/EP^* = t$, then

$B = B(Z, Z^*, t)$................(3.17)

$-1 < B_Z < 0$

$B_Z^* > 0$

$B_t < 0$

The trade balance is assumed to be negatively related to the terms of trade, $B_t < 0$, so that devaluation will lead to reduced volume and value of exports (Marshall - Lerner - Robinson condition).

Output supply is assumed to be inversely related to the real wage rate. At lower wage rates producers employ more resources and output rises.

$Y = \theta\ (P/W)$..............................(3.18)

In the monetary sector of the insular economy model, money supply is exogenously determined. Demand for real money balances is however a function of domestic income, Y, nominal rate of interest, r, as well as real wealth, 'a', (or A/P)

$M/P = M(Y, r, a)$..............(3.19)

$M'y > 0$

$M'r < 0$

$M'a \leq 1$

Finally foreign exchange can only be accumulated in this economy via the trade balance, given that there is no capital account, hence

$E\dot{F} = B$ ....(3.20)

where F is the foreign exchange reserve of the economy. Given equations (3.15) to (3.20) the economy's performance will vary depending on the exchange rate regime in place.

A: Flexible Exchange Regime

Under a regime of flexible rates equation (3.20) determines the exchange rate. Given that there is no capital account, the balance of payments consists only of the trade balance and the exchange rate must adjust to keep this balance at zero level i.e.

$B(Z, Z^*, t) = 0$ ....(3.21)

Once the trade balance is zero then equation (3.15) reduces to

$Y = Z + G$ ....(3.22)

This implies that once the trade balance is zero then all other macroeconomic aggregates become independent of the exchange rate. Expansionary fiscal policy given a constant monetary policy stance will lead to increased output and income

$$\frac{dY}{dG} = \frac{1}{1-Zy} > 0 \quad \text{.....................(3.23)}$$

A similar result is got from varying monetary policy while keeping fiscal policy constant.

B: Fixed Exchange Regime

Under a regime of fixed rates there is a leakage into imports from increased domestic expenditures so that expansionary fiscal or monetary policy has an effect on output, that is less than what can be had under a regime of flexible rates. Expansionary fiscal policy while monetary policy is constant will from equation (3.15) result in

$$\frac{dY}{dG} = \frac{1}{(1-Z'y)(1+B'z)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.24)$$

and

$$\frac{1}{(1-Z'y)} < \frac{1}{(1+B'z)(1-Z'y)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.24B)$$

Further a rise or fall in foreign output and price also impact on domestic output via the trade balance.

Equation (3.24B) implies that the expansionary effect of fiscal policy under fixed rates is less than under floating rates. Since a similar result is got even for expansionary monetary policy then the conclusion of the insular - economy - model is that an economy performs better under a system of flexible rates than under a system of fixed rates provided, there are no capital flows.

3.2.II: Mundell - Fleming Model (MFM)

Described as the "workhorse of traditional open economy macroeconomics (Frenkel and Razin, 1987), this model has been extended in several different directions over the years. There has been the portfolio specification of capital mobility in the traditional MFM by McKinon (1969), Floyd (1969), Frenkel and Rodriguez (1975). There has also been the introduction of debt - revaluation effects into the main MFM by Boyer (1977) Rodriguez (1979), and the introduction of expectations and its effects on the performance of the macroeconomy under different exchange regimes (Dornbusch, 1976; Kouri, 1976; Mussa, 1976).

The Mundell - Fleming model with some adaptations remain the backbone of macroeconomic models of the exchange rate. The assumptions of this model include:

(i) Fixed domestic prices, which by implication means that the exchange rate is equal to the terms of trade

(ii) Full or perfect capital mobility, which thereby allows for assumption (iii)

(iii) Perfect substitutability of domestic securities with foreign securities

(iv) Interest rate parity existence, given that arbitrageurs are assumed to ensure that interest rate differentials across countries are quickly eliminated.

(v) Real income or output is demand determined.

Under this system an increase in money supply not backed by an equiproportionate increase in money demand leads to falling interest rates which result in incipient capital outflow. As capital flows out the domestic nominal exchange rate depreciates, and assuming elasticities conditions are satisfied demand will shift towards home produced goods in the face of a depreciating nominal exchange rate. The induced increase in output leads to a rise in income and hence in the demand for money. The rise in money demand continues until it equals the money supply and the rate of interest rises until it equals the foreign rate of interest. In the end the economy settles at a higher level of output but a lower real exchange rate (i.e. a depreciated real exchange rate).

An expansion in demand for home output as a result of fiscal policy stance such as an increase in government expenditure or an exogenous shift in demand, leads to an increase in income which is accompanied by an increase in money demand and hence a rise in interest rates. As interest rates rise there follows incipient capital inflow which result in appreciation of the nominal exchange rate. As the nominal exchange rate appreciates the country loses its competitiveness hence a deterioration will occur in the current account balance and this dampens or offsets the expansion.

The MFM has the following system of equations. First is the income equation wherein national income Y, is the sum of private domestic expenditure X, government expenditure S, and the trade balance or net exports, B.

$$Y = X + S + B \quad \text{..............(3.25)}$$

Total expenditure Z, is the sum of private plus government expenditures

$$Z = X + S \quad \text{........................(3.26)}$$

Given the money stock M, then income velocity, V, in the economy is

$$V = Y/M \quad \text{.............................(3.27)}$$

While private disposable income N, is

$$N = Y - T \qquad \ldots\ldots\ (3.28)$$

where T is the lump-sum tax and is itself a function of the level of income

$$T = T(Y) \qquad \ldots\ldots\ (3.29)$$

Private expenditure X, then depends on the disposable income N, and the rate of interest, R.

$$X = X(N, R) \qquad \ldots\ldots\ldots\ldots\ldots\ (3.30)$$

$$O < X_n < 1$$

$$X_r < 0$$

The rate of interest, R, is a function of the income velocity of money

$$R = R(V) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (3.31)$$

$$R_v > 0$$

While the trade balance depends on total expenditure, Z, and the nominal exchange rate F, where the exchange rate is in terms of units of domestic currency per units of foreign currency

$$B = B(Z, F) \qquad \ldots\ldots\ (3.32)$$

$$O < -B_z < 1$$

$$B_f > 0$$

Finally net capital inflow is a function of the rate of interest

$$C = C(r) \qquad \ldots\ldots\ (3.33)$$

Given the set of equations (3.15) to (3.33) therefore, the economy behaves in the following ways under different exchange regimes.

A1:Flexible Exchange Regime

Under a flexible exchange rate system increased government expenditure representing expansionary fiscal policy in the face of a constant monetary policy will lead to increased output as shown below:

$$\frac{dY}{ds}_{10} = \frac{1}{(1-Xn)(1-Ty)-(Xr-Cr)Rv/m} > 0 \qquad (3.34)$$

where the subscripts 10 after dy/ds implies that the exchange rate system is flexible while the monetary policy is constant (or fixed). The increased output will however be dampened as increased capital inflows in response to rising interest rate, appreciates the exchange rate thus reducing the economy 's competitiveness and resulting in a worsening current account.

$$\frac{dy}{ds}_{10} \longrightarrow 0, \text{ as } Cr \longrightarrow \infty$$

An increase in money supply while fiscal policy remains constant results in reduced income velocity of money which implies reduction in the rate of interest. The reduced rate of interest will generate increased domestic investment expenditure but it also leads to increased capital outflow, which depreciates the nominal exchange rate thus helping to keep external transactions in balance and the increased output and income arising from increased investment expenditure is sustained

$$\frac{dy}{dm}_{11} = \frac{RvY(Cr-Xr)}{M^2} \cdot \frac{1}{1-Xn(1-Ty)+\frac{Rv(Cr-Xr)}{M^2}} > 0 \quad ..(3.35)$$

where the subscripts 11 after dy/dm implies that the exchange system is flexible and monetary policy is also varying

B1: <u>Fixed Exchange Regime</u>

Expansionary fiscal policy in the form of increased government expenditure will lead to increased output and income. The increased income means increased tax revenue, however this leakage into the tax revenue falls considerably short of the increase in output

$$\frac{dy}{ds}_{00} = \frac{1+Bz}{1-(1+Bz)[Xn(1+Ty)] + \frac{XrRv}{M^2}} > 0 \quad ...(3.36)$$

where the subscripts 00 after dy/ds imply that the exchange regime is fixed and monetary policy is also fixed (or constant).

When monetary policy is employed, the rise in money supply reduces income velocity thereby reducing rate of interest. The reduced rate of interest generate increased expenditure, a lot of which leaks into imports thus leading to a deterioration of the trade balance and dampening the output expansion. The increased capital outflow arising from decreased rate of interest is not allowed to depreciate the nominal exchange rate as would have happened under flexible rates as the government is committed to keeping the exchange rate at a fixed level. Hence the effect of an expansionary monetary policy under fixed rate is

$$\frac{dy}{dm}\bigg|_{01} = \frac{-XrRvY}{M^2} \cdot \frac{1}{\frac{1}{Bz+1} - Xn(1-Ty) - \frac{XrRv}{M}} > 0 \quad ..(3.37)$$

It is important to note that equation (3.37) is less than equation (3.35) implying that the rise in output and income as a result of expansionary monetary policy is less under fixed rates than under floating ones. While equation (3.36) is greater than equation (3.34) implying that the rise in output and income with an expansionary fiscal policy is higher under fixed than under floating rates, provided capital is perfectly mobile.

The conclusion of the MFM therefore is that floating rates are ideal for uplifting the economy if monetary instruments are employed, while fixed rates are more effective if fiscal instruments are employed (Fleming, 1962).

The weaknesses of the MFM are many. First it assumes that purchasing power parity holds, and there is no conclusive evidence that purchasing power parity holds either in the short or long run (Marwah and Bodkin, 1984; Balassa, 1964). Second the MFM also assumes interest rate parity, which by implication means perfect mobility of capital. That, there is interest rate parity, is, itself, a subject of controversy (Isard, 1987).

3.2.III. The Modified Mundell-Fleming Model (MMFM)

This is an eclectic approach to the several modification of the Mundel- Fleming model in the manner of Frenkel and Razin (1987). The modifications introduced into the traditional MFM are in three respects. (i) The modified Mundel - Fleming model assumes continuous full-employment (ii) It assumes complete price flexibility and (iii) It explicitly recognises the budget constraints that influence government policies.

In the MMFM production of output, y, in an economy, gives rise to income from labour y^{o} and income from

capital v

$$y = y^{0} + v \text{ ....(3.38)}$$

The disposable income, Z, is a function of labour income, yo, permanent real income streams, 'a', and a lump sum tax T

$$Z = yo + a - T \text{ ....(3.39).}$$

Asset preferences between money and equities are characterised by the demand for real balances L . The demand for real balances L, is a fraction d, of the real wealth, W, and what this fraction d, will be, depends on the rate of interest, r .

$$L = d(r)\, W \text{ ....(3.40)}$$

Real wealth , W, is the sum of real money balances, M, and real equity holdings, a/r

$$W = M + a/r \text{ ....(3.41)}$$

Saving is proportional to the excess of target wealth, $\bar{W}$ over actual wealth, W

$S = \lambda(\bar{W} - W)$

Target wealth is itself proportional to labour income, y^0, less lump sum tax, T

$\bar{W} = \theta(r)\ (y^0\text{-}T)$.........(3.43)

$\theta_r > 0$

from equation ((3.40) and (3.41) real money balances M, equals

$M = \dfrac{\delta(a/r)}{1\text{-}\delta}$ ....(3.44)

so that actual wealth becomes

$W = \dfrac{a/r}{1\text{-}\delta}$ ....(3.45)

substituting equations (3.43) and (3.45) into the savings function,(3.42) gives

$S = \lambda\ \phi(r)(y^0\text{-}T) - \dfrac{a/r}{1\text{-}\delta}$ ....(3.46)

Equation (3.46) essentially implies that saving is a function of the rate of interest, permanent real income streams, and the tax level. If government is operating a balanced budget then total government expenditure G, should be equal to the sum of its tax revenue T and its holding of real income streams

$G = T+g$.........(3.47)

If government is a debtor then g is negative.

If purchasing power parity holds then the general price level in the domestic economy P, should be the same as that in the foreign economy P^* in domestic currency terms.

$P = eP^{*}$.............(3.48)

Where e is the nominal exchange rate. The trade balance surplus B, would be the excess of domestic output over domestic absorption

$B = y - \{(Z-S)-G\}$........(3.49)

Where (Z-S) is private expenditure. The current account surplus C, is the trade balance surplus plus the service account surplus

$C = B + (a + g - v)$.........(3.50)

$B + (a + g - v) = S + (T + g - G)$...........(3.51)

Equation (3.51) maintains that the current account surplus is also equal to the rate of saving plus the government budget surplus. Since under flexible rates the current account surplus equals capital account deficit, then the rate of capital outflow is fully specified by the saving function, equation (3.46)

The world supply of securities Q is equal to the number of claims to income from capital in each country, V and V^{*} respectively, less their respective governments' holdings of claims g and g^{*}. It is assumed that the foreign country has similar behavioural equations

$Q = V + V^{*} - g - g^{*}$ ....(3.52)

For equilibrium in the short and long run, both under floating and fixed exchange regimes the following conditions must hold

Short Run Equilibrium Conditions

The short run equilibrium conditions are given by

$$M = \frac{\delta}{1-\delta^*} (a/r) \text{ ....(3.53)}$$

$$M = \frac{\delta}{1-\delta^*} (a^*/r) \text{ ....(3.54)}$$

Equation (3.53) and (3.54) maintain that actual money balance held in each country depend both on the domestic and the foreign proportion of real wealth held δ and the δ^* respectively and also on the rate of interest (r) assumed to be the same in both countries given interest parity.

Total world saving will therefore be

$$S(r, w) + S^* (r, w^*) = 0 \text{ ....(3.55)}$$

Long Run Equilibrium Condition

$$(1-\delta)W + (1-\delta^*)W^* = Q/r \text{ ....(3.56)}$$

Equation (3.56) implies that in the long run whether a country adopts a floating or a fixed exchange rate regime there can not be any autonomy in a country's use of monetary and fiscal policies because capital mobility implies that all policies have repercussions throughout the world and floating rates not withstanding inflation rates are interdependent. This conclusion, it should be noted removes the bottom from the arguments of the advocates of floating exchange rates that its main advantage lies in its insulating an economy from disturbances of variations in foreign monetary and fiscal polices.

3.3 Review of Empirical Literature

There have been several empirical studies attempting to find out the performance of the macroeconomy under different exchange rate regimes.

Rhomberg (1964) looked at the Canadian economy under fixed and under floating exchange rate systems, Rhomberg's study was based on the Mundell - Fleming model. Canada had in the period 1950 - 1962 adopted a floating exchange rate system. Prior to 1950 Canada maintained a fixed exchange rate system of the Bretton woods variety. By May 1962, Canada went back from a floating to a fixed exchange system. Rhomberg maintained that this continuous shift of exchange system by Canada is a reflection of the "difficulties encountered by an internationally dependent economy in its attempt to pursue independent monetary and fiscal policies"

Rhomberg built a model of the Canadian economy with three variants. The first version was an economy with freely fluctuating exchange rates, the second was an economy with a fixed exchange rate system but where changes in the balance of payments are neutralized and not allowed to influence the money supply. The third is a situation of fixed exchange rates but where changes in the balance of payments impact on the money supply, thus making the money supply an endogenous variable.

Employing seventeen behavioural equations and using the Limited Information Method, Rhomberg tried to determine the behaviour of real income, balance of payments, domestic prices, exports and imports under fixed and under floating exchange regimes. Rhomberg divided the economy into three sectors, the real sector made up of the consumption function the investment function and the income equation; the foreign trade sector, which was a sector hinging mainly on the balance of payments identity and being linked to the real sector through import demand and export supply equations. The third sector was the financial sector where interest rates are determined. The financial sector is linked to the real sector through the effects of long-term interest rates on investments and linked to the foreign trade sector through the effect of changes in interest rates on capital movement.

Rhomberg found that what the response of macroaggregates would be under any exchange rate regime would depend on the structure of the economy. Mainly macroeconomic performance under any exchange rate regime would depend on the marginal ratio of imports to gross domestic product, the ratio of real demand for money to gross domestic product and the speculative balance relative to the rate of interest. Rhomberg hypothesized that if responsiveness of capital movements to interest rate differential exceed a certain threshold - value, then the amount of capital attracted as a consequence of budgetary expansion with a constant money supply will exceed the induced increase in imports and therefore result in a gain in reserves (rather than a loss, under a fixed regime, as Mundell-Fleming Model postulated) and in currency appreciation (rather than depreciation, under a flexible regime, as MFM maintained). This part of Rhomberg's results contrasts with the Mundell Flemming one given the "threshold condition" in-built by Rhomberg. He concluded that by 1960 the Canadian economy had reached such threshold and hence the observed appreciation of the Canadian dollar in spite of a floating exchange rate system and continuous fiscal expansion.

Rhomberg found the price elasticity of imports to be -1 and the interest elasticity of money demand to be -0.2 under a floating exchange rate system. On the whole he concluded that in the absence of the "threshold condition", increasing government expenditure as a means of raising output and employment was more effective under fixed than under floating rates, while increasing money supply to increase output and employment was more effective under floating than under fixed rates. These conclusions are similar to those of Mundell and Fleming.

One interesting conclusion of Rhomebrg's however, is that a country operating a fixed exchange rate system can enjoy "financial insulation" if it wishes. Financial insulation is a situation whereby variations in capital movements do not affect income and employment because government neutralizes completely the effects of such capital movements on the money supply. Under a floating exchange rate regime, Rhomberg maintained, financial insulation is not possible.

Tullio (1981) also studied the performance of the Italian economy under floating and under fixed exchange rate regimes. In the 1970s, the Italian economy was characterized by high inflation rate, large depreciations of the exchange rate, unemployment and unstable growth pattern of real GDP. Tullio termed these features "vicious-circle features". He therefore attempted to find out the role of discrete exchange rate changes in Italy and their effects on prices, wages, trade flows and growth of real GDP, under specific policy rules. He also wanted to find out the role of fiscal and monetary policy under different exchange rate regimes. Tullio's model was along the modified Mundell-Fleming framework.

Tullio employed a 29-equation model of the Italian economy specified in continuous time, and estimated with quarterly data for the third quarter of 1960 to the fourth quarter of 1978, using Wymer's (1976) program. Tullio's simulations of fiscal and monetary policies were performed separately under the assumption of flexible rates and of fixed rates to gain useful insights into the efficacy of monetary and fiscal policies in stimulating real growth under the two exchange rate regimes. Tullio estimated two versions of his model, the first for the period 1960 - 1978 with the exchange rate assumed to be exogenous (as obtains under a fixed regime) the second for the period 1973 - 1978 with the exchange rate assumed to be endogenous (as obtains under a floating system).

Tullio found that a 10% devaluation or depreciation of the exchange rate led to a 3% rise in domestic prices after one year. Domestic prices then remain at the new level for the next five years because real output falls as a result of the depreciation, and this fall in real output checks the growth of domestic prices. Real exports grow by about 2% as a result of the 10% exchange rate depreciation, while aggregate imports fall by about 2%. The price of imports in domestic currency grew by the full amount of the devaluation i.e. 10%, while prices of exports in domestic currency grew but at a lesser speed than import prices. The fall in imports and the rise in exports led to rising net international reserves. Tullio thus concluded that the exchange rate is a powerful instrument of external adjustment despite the fact that it worsens the problem of inflation.

For monetary policy simulation, the money supply was made to grow at an annual rate of 30% as against the actual rate of 20% implying that a shock was introduced into the system of 10% growth rate of money supply. It was found that after 10 years the price level had risen by 10% under fixed rates and by 43% under floating rates. The different long - run effect on prices under the two systems was said to be due to the higher rate of growth of import prices under flexible rates. A 10% once and for all increase in government expenditure had the effect of raising domestic prices; this rise was as high as 15% by the 10th year under floating regime and by only 7% in ten years under fixed rates. Also the GDP rose more, under fixed, than under floating rates. Similarly the result of his fiscal policy simulation showed the economy to have performed better under a fixed exchange regime than under a floating one.

Tullio thus reached the conclusion that the economy performed better under fixed than under floating rates irrespective of the policy instrument used (monetary or fiscal). He however, added that the poorer performance under a floating system may not be due to the exchange rate per - se, but it did occur that the economy performed poorer during the era of floating, than fixed, rates.

Bruno and Sussman (1979) also studied the economy of Israel under different exchange rate regimes with a view to finding the effects on the current account and the rate of inflation of large devaluations (under fixed exchange rate regimes) and cumulative small ones (under floating regimes). They came to the conclusion that large devaluations impact more on the current account and on inflation, because of the awareness on both the part of decision makers and other economic agents that certain goals must be achieved as a result of the devaluation. Whereas the small frequent changes may not have the desired effects because of the illusion that government and major decision makers are now free of employing fiscal and monetary policy to achieve the targets of external balance and stable prices.

Otani and Park (1976) built a model of the Korean economy wherein the money stock and real income were endogenized in what otherwise was a monetary model. They were interested in finding out the interplay between the monetary sector and the real sector of the Korean economy. They tested the validity of their model against data for the period 1962-1974 - using quarterly data. Their study tried to examine the effects of alternative policy instruments - exchange rates, monetary policy and fiscal policy - on the macroeconomic aggregates of output, prices and the balance of payments.

In the model the economy was divided into three sectors - monetary sector, real sector (where output supply could be primary or non-primary) and the foreign trade sector.

In the foreign trade sector import demand was assumed to consist mainly of demand for intermediate goods and raw materials rather than demand for consumption goods. Primary output referred to agricultural products, and its supply was assumed to be exogenous, while non-primary output supply was influenced by the price level, real wages, rate of capacity utilisation, and import prices.

Using the two - stage least squares estimator, the results of the estimation of the model included the following:

(i) the current rate of inflation is heavily dependent on past rates of inflation rather than on current variables such as current rate of interest, current real income, etc.

(ii) the demand function for intermediate-goods imports was elastic with respect to real output in the non-primary sector, while the supply of real output in this sector was found to be inelastic with respect to changes in the prices of imported inputs. This shows that the substitution between intermediate imports and domestic inputs is very low.

(iii) The simulation exercise revealed that a change in exchange rate policy has considerable influence on the general price level, real income, volume of intermediate imports and the money multiplier; thus finding exchange rate to be a powerful instrument in influencing the level of economic activity.

Khan and Knight (1981) tried to find out the qualitative effects of stabilization or adjustment policies on the macroeconomic aggregates of output, balance of payments and inflation in developing countries. They pooled a time-series cross-sectional data of 29 developing countries of which Ghana and Kenya were included. Using 8 annual observations on each variable for each country, they used the Full Information Maximum Likelihood (FIML) estimator that allows nonlinear constraints to be placed on parameters both within and across equations.

They used the change in the stock of international reserves as a proxy for the balance of payments, and they did not disaggregate the balance of payments into its current and capital account balances. The balance of payments, they assumed, is a positive function of the excess demand for nominal money balances, and a negative function of the deviation of domestic price level from its purchasing power parity equilibrium.

$$\Delta \log R_t - \Delta \log E_t = \alpha_1 \ \log M^d_t - \log M_{t-1}$$

$$- \alpha_2 \ \log P_{t-1} - \log (E_{(t-1)} \cdot P_{f(t-1)}) - B_0 \quad ...(3.57)$$

where

$\Delta \log R_t$ = Change in log of international reserves

$\Delta \log E_t$ = Change in log of nominal exchange rate

$(\log M^d_t - \log M_{t-1})$ = log of Excess demand for money

$[\log P_{t-1} - \log \ E_{t-1} \ Pf_{t-1}]$ = Purchasing Power Parity deviation.

The rate of inflation was taken to be a positive function of excess supply of real money balances and a negative function of the deviation of domestic prices from their purchasing power parity level.

Khan and Knight came up with the following conclusions.

(i) That excess supply of real money balances results in an increase in the rate of inflation, the excess money supply elasticity inflationary rate is 0.33 . This parameter was significant at 1 percent level.

(ii) Income elasticity of demand for money was found to be 1.2, a result similar to the one generally obtained for developing countries.

(iii) The elasticity of the balance of payments to changes in money supply was found to be 0.49.

(iv) The output elasticity of excess money supply was found to be 0.043, and this was significant at the 1% level.

In their sensitivity analysis a 10% increase in money supply led to an increase in domestic price of about 5.5% after 4 years, under a fixed exchange rate system. The inflation induced by the money supply shock kept the country's exchange rate overvalued for quite some time. Eight years after the monetary expansion, the price level was still some 2.5% above its pre-shock level. The output effect was smaller, output having only increased by ½ of 1% in the second year after the expansion. In all Khan and Knight concluded that stabilization programs designed to achieve quick results on the balance of payments via sharp deflation are likely to have significant and undesirable impact on output employment, and factor incomes, particularly in the short run.

Olofin, Akinkugbe and Ajayi (1986) in an ex-ante simulation analysis of the impact of devaluation on the Nigerian economy employed a model with 104 stochastic equations, and 58 exogenous variables. Known as CEAR-MAC-IV model, the model was estimated using annual data for the years 1961-1981. Their study tried to anticipate the possible effects of a floating exchange rate system with its attendant exchange rate depreciation on the Nigerian economy. Thus, utilizing different rates of devaluation they tried to see how the trade balance and the balance of payments would fare. Olofin et al maintained that the use of devaluation as a means of changing relative price structure and thus improving the current account as well as the overall balance of payments in a developing deficit economy is not unambiguously treated in the economic literature. They claimed that both the elasticities approach, absorption approach and even monetary approach failed to specify by how much a country can devalue in order to improve her external position.

They then went ahead to carry out some ex-ante simulations of the effects of different percentages of devaluation combined with different levels of reduction of government expenditure. In all they had five scenarios. The first was a situation where all exogenous variables were following their trend path without any exogenous variable being consciously adjusted. This scenario provided the baseline solution against which they measured the results of the four other scenarios. The four other scenarios were those of a 50% devaluation being accompanied first with a 20% reduction in the government expenditure, and then in the third scenario being accompanied by a 10% reduction in government expenditure. The fourth scenario was that of a 60% devaluation being accompanied by a 20% reduction in government expenditure and in the fourth scenario by a 10% reduction in government expenditure. They pegged the rate of inflation at 30% and capital expenditure at N4 billion.

Olofin et al came up with the conclusion that all devaluations irrespective of the percentage decline in expenditure, worsened the trade balance and the balance of payments. For instance in the first year after the 50% devaluation the balance of trade deteriorated by about 59% compared to the baseline solution. This poorer performance of the external sector Olofin et al maintained is due to the fact that a bulk of imports mainly machinery and transport equipment as well as raw materials can hardly be adjusted. Also devaluation and expenditure reductio little impact on exports which comprised mainly of petroleum, whose export volume and foreign denominated export price are both exogenously fixed. The export value only change in the second year of the simulation (1987) by only .001%. Though import of food and other consumer goods declined, the decline was more than neutralized by a rise in import bill for capital goods. The level of foreign reserves therefore declined significantly. In terms of the domestic sector the devaluations and reductions in expenditures led to declining growth rates in some sectors of the economy such as mining and quarrying, building and construction. Overall there was a negative growth rate of GNP.

In another study Olofin, Osagie and Phillips (1985) estimated a model of the Nigerian economy which they also simulated for different conceivable rates of devaluation. They found that a 40% devaluation of the naira in 1986 would move the debt service payments of Nigeria from N6.8 bill in 1986 to N9.6 bill by 1995, representing an increase in the debt service ratio from 76.11% to a paralyzing 97.7% by 1995.

It can be concluded that the results of Olofin et al (1985) and Olofin et al (1986) reveal that the performance of the Nigerian economy under a situation of decreasing value of the exchange rates will lead to poorer performance of the economy in terms trade balance, balance of payments, reserve level and debt repayment burden. It will be fruitful and worthwhile to compare the results of these ex-ante simulations with those which we hope to carry out in this study, and find out how much of he Olofin et al's results have materialized. Since the onset of floating rates and the attendant exchange rate depreciation.

Jebuni, Sowa and Tutu (1991) in their study of the Ghanaian economy attempted to find out the relationship between the growth rate of real output and the exchange rate. They were interested in the real exchange rate rather than nominal. They came to the conclusion that the exchange rate exerts a positive influence on real output and that it could also exert a negative influence. They found that exports are positively related to both the real effective exchange rate and total output. They maintained that since devaluations in Ghana had always been part of a package, they are usually accompanied by a considerable amount of external assistance which usually ensured an improved supply of forex, and forex availability exerts a positive influence on imports and hence on exports and real output.

Chibber and Shaffik (1989) in their study of Ghana reached the conclusion that the widely held belief that devaluation of the official exchange rate leads to growing domestic inflation especially in African countries undergoing economic restructuring programmes is wrong. They contended that there is no direct relationship between the official exchange rate and inflation, because the level of domestic prices has often adjusted to the parallel market rates before the official exchange rate devaluation takes place. If anything, Chibber and Shafik maintained, the continuous and continuing depreciation of the exchange rate under a floating system has had a positive effect on the budget. The revenue improvement they contended ensured increased output hence declining domestic prices. The revenue improvement came primarily from two channels.

(i) From higher grants and aids disbursed at a more depreciated exchange rate.

(ii) From reduction in subsidies to importers due to elimination of exchange over-valuation.

Thus the devaluation did not result in increasing budget deficit. This position of Chibber and Shaffik shall be explored in this study.

Olopoenia (1986) also, in an ex-ante study of floating exchange rates in Nigeria found that an equilibrium exchange rate can only emerge in Nigeria by the merger of the official exchange market with the parallel market given that the exchange premium between official market rates and the parallel market rate was as high as 160%.

Ajakaiye (1991) in a study of the effects of exchange rate depreciation on sectoral prices came to the conclusion that even though the essence of exchange depreciation generally is to alter the structure of relative prices in favour of non-tradables, so that the prices of tradeables rise relative to non tradeables, the industries most greatly impacted by the depreciation in the Nigerian economy are precisely those in the non-tradeables sector, so that prices in the nontradeables sector keep rising and thus making the relative price structure unfavourable towards home goods (or nontradeables) still. Ajakaiye then maintained that "dichotomizing the effects of exchange rate depreciation on prices in terms of traded and non-traded goods is irrelevant and misleading in an indecomposable economy like Nigeria which also depends tremendously on imported inputs". In other words the purported change in the structure of relative prices that the adoption of floating rate is supposed to bring and which is supposed to help stimulate exports, stimulate domestic production and reduce imports may not materialize.

Other studies on the exchange rate and the macroeconomy include Olisadebe (1991). Olisadebe studied the Nigerian economy both under fixed and under floating exchange regimes and came to the conclusion that if one took cognisance of certain limitations inherent in attempting to decide the impact of exchange rate policy alone on the economy in the face of several changing policy instruments then one can say that "the exchange rate has had generally positive impact on the economy". Real output which declined by an average of 4% in the first years of floating rates (1981-1985) rose by about 4.8% in the first five years of floating rates (1986-1990), industrial and agricultural sectors' output increased by 9.5% and 6.1% respectively between 1986-1990 compared to an average of 2.8% and

1.2% respectively in the last five years pre - floating. The current account balance as a percentage of GDP recorded an average deficit of 5.6% in the last five years of fixed exchange rate system (1981-1985) contrasting with an average surplus of 3.4% in 1986-1990. This reflected the drop in the volume of imports and the higher relative contribution of non-oil exports to total exports. The contribution of non-oil exports to total exports averaged 6.0% during 1986-1990 indicating an average increase of 2.8% points over the level in the last five years of fixed rates (1981-1995). Along with trade and payments liberalization the floating exchange rate policy has succeeded in eliminating the incidence of payments arrears. Proportion of export earnings repatriated by exporters increased from 73.7% in 1987 to 98.5% in 1990. Diversification of non-oil exports has proceeded smoothly with the exportation of hitherto relatively unknown exports such as peugeot cars, asbestos, cement, charcoal and empty bottles. The parallel market premium has been reduced from 160.6% obtainable in the years of fixed exchange rates (1981-1985) to 54.3% in 1986-1990. This reflects the extent to which the misalignment of the naira exchange rate and distortions in the forex market have been corrected by the adoption of a floating exchange rate regime in Nigeria.

In his study Ojo (1990) concluded that since the onset of floating rates there has been a boost to non-oil exports and to the balance of payments. However the persistent depreciation of the naira exchange rate is a new problem along with the instability of this exchange rate, both coming in the wake of floating exchange rates. Ojo argued that the main problem lies with the weak export base in the midst of a strong demand for foreign exchange. Given the uncertainty with regards to efforts to expand the export base, and the overwhelming debt burden, Ojo contended that the national development strategies have to be reviewed with a view to reducing the dependence of the economy, on external trade in the long-run.

The adoption of a floating exchange system has resulted in a general but positive movement on the balance of payments position and this has had positive effects on the official forex reserves. The official forex reserves, according to Ojo rose from a level of ₦3.3 bill in 1988 to ₦3.8 bill in 1989 while the reserve level could by 1990 cover 3 months imports. In this study we hope to find out how much of this supposed improvement in reserve level is real and how much is illusory.

Elbadawi (1990) had in his study of the Ugandan economy found that the official exchange rate does not directly impact on the rate of inflation in Uganda. Rather he found that the parallel market exchange rate is the major determinant of domestic prices in the Ugandan economy. His finding is similar to that of Chibber and Shaffik for the Ghanaian economy, and even for the Ugandan economy Elbadawi's position has been borne out by the results of Watuwa and Mbire (1992). Hyuha (1991) has gone a step further to posit that the high variability observed in the movement of domestic prices in Uganda since the onset of floating rates is due to the fact that domestic prices are largely influenced by the parallel market exchange rate a market that is known to be highly volatile. Another key factor of the transmission of inflationary process in Uganda is governments fiscal deficit - Elbadawi

(1990), Watuwa and Mbire (1992).

3.4 SUMMARY

Unlike Rhomberg (1964), Tullio (1981) in his study of the Italian economy under fixed and floating rates found that both monetary and fiscal policies perform better under a system of fixed rates than under floating one. Though he was quick to add that the performance may not necessarily be because of the adoption of floating rates, per se, however the fact remains that such poorer performance of macroeconomic aggregates was observed under a floating regime rather than under a fixed one. In other words, Tullio admitted that some other variables might have accounted for the poor performance of the Italian economy under floating rates other than the adoption of floating rates.

In their ex ante analysis of devaluations in Nigeria, Olofin, Osagie and Phillips' (1985) findings imply that in terms of debt repayment burden and external sector's aggregates the economy would be worse off under floating than under fixed rates.

Further Chibber and Shafik had concluded in their study of the Ghanaian economy that the accelerated inflationary rate observed post floating has been primarily a "monetary phenomenon, reflecting as well underlying weakness in the financial system which need to be tackled to sustain the reforms". In this study we would like to find out the response of prices to the exchange rate and to monetary movements and find out which one plays the more dominant role.

END NOTES.

1. Kenen. P.B. (1985) "Macroeconomic Theory and Policy: How the Closed Economy was Opened" in Handbook of International Economics (North Holland Publishers) Chapter 13.

2. See Chapter One, Section 1. above.

3. See Balsaas. B. (1987) "Effects of Exchange Rate Changes in Developing Countries". World Bank Discussion Paper, Report No. DRD 291. May, 1987. Pg.3.

4. See: Rhomberg, R (1964). "A Model of the Canadian Economy Under fixed and Fluctuating Exchange Rates" Journal of Political Economy. Vol. LXXX. No. 1 Feb. 1964. pp.1

CHAPTER FOUR

METHODOLOGY, MODEL SPECIFICATION, THEORETICAL MODEL VALIDATION TECHNIQUES DATA AND DATA SOURCES

"The raison d'etre of the economics profession is not just to satisfy our intellectual curiosity, but to provide the analytical and empirical basis for better policies"

Marris (1984).

4.1 Summary of Issues

So far from the literature review the following issues or testable hypotheses have arisen

(i) That market determined exchange rate fuel inflation. This implies that there is a pass through from exchange rates to domestic prices, such pass through being heightened under market determined rates.

(ii) That market determined exchange rates follow the money supply, so that excessive money supply leads to excessive exchange rate depreciation and hence responsible monetary policy becomes crucial for efficient exchange system performance.

(iii) That altering the structure of relative prices in the export sector through exchange rate depreciation increases export volume and value.

(iv) That imports are crucial to export performance such that expanding imports lead to increasing exports while declining imports compress exports.

(v) That changing the structure of relative prices in the import sector through nominal exchange rate depreciation helps improve the trade balance to the extent that it reduces imports.

(vi) That imports in developing countries depend critically on import - capacity (i.e availability of foreign exchange) as reflected in the flow of international reserves.

(vii) That import - capacity depends on export performance as the level of international reserves depends significantly on net-exports (or trade balance).

(viii) That fiscal deficits rather than nominal exchange rate depreciation is the major source of inflation in developing countries.

(ix) That macroeconomic aggregates perform better under floating than under fixed exchange rate regimes.

4.2 Analytical Framework

In any open economy aggregate production (Y) is essentially for two purposes - domestic use or/and exportation (X) Output utilized in the domestic economy can either be for private consumption (C_p) for private investment (I_p) or for government consumption and investment (G). Thus total aggregate production would be the sum,

$Y = C_p + I_p + G + X$ ------------------------------- (4.1)

However, home or domestic consumption can itself be supplemented by imports, so that aggregate domestic absorption (A) is the sum of the domestic goods used up at home plus imports.

$A = C_p + I_p + G + IM$ ---------------------------- (4.2)

Subtracting equation (4.2) from (4.1) gives

$Y - A = X - IM$ ----------------------------- (4.3)

Whenever domestic absorption is greater than total domestic production then it implies that imports are greater than exports $A > Y \implies IM > X$.

Whenever such a situation arises then the country's external and internal sectors are said to be in disequilibrium. More specially the trade balance (TB (which is the net of exports over imports) is in deficit.

$TB = X - IM < 0$ when $IM > X$ --------------------- (4.4)

The demand for imports depends on the level of aggregate output or aggregate expenditure or income (Y) and the price of imports in domestic currency terms (EPim), where E is the exchange rate in terms of units of domestic currency per unit of foreign currency, and Pim is the foreign denominated price of imports. As for exports, for a small open economy its supply depends on its domestic price (EPx) (where Px is the foreign denominated price of the exports and E, the nominal exchange rate) and the level of aggregate production in the economy.

So that, taking P_{im} and P_x exogenous, than,

$$X - IM = TB = f(Y, E) \quad (4.5)$$

$$\frac{dTB}{dY} < 0 \quad , \quad \frac{dTB}{dE} > 0$$

The first inequality implies that when income is rising import expenditure would be rising too so that the net balance (X-IM) would be falling. The second inequality indicates that when the nominal exchange rate is rising, earnings from exports rise too (in domestic currency terms) thus export volume and value rise too, and the net balance (X-IM) rises. So far we have assumed some given state of tariffs and other impediments to trade.

Whenever the TB is in deficit there are two main instruments for effecting a change. The first is to change the level of absorption (A) the other is to change the exchange rate in order to change the structure of relative prices in the economy.

For any or both of these instruments to be successful certain elasticities' conditions with respect to exports and imports must be met. The elasticities condition is known as the Marshal - Lerner - Robinson condition. Expressed in terms of supply elasticities (ϵ) and demand elasticities (η) for exports and imports, the Marshal - Lerner - Robinson condition requires that

$\Delta TB = d\,[X_0\, Px\, (\eta\text{-}1) + IM.E\, Pim\, (\eta im)]$ ---------- 4.6

where

ΔTB = change in the trade balance

d = Percentage depreciation

X_0 = Original volume of exports

P_x = Price of exports

Pim = Price of imports

IM = Volume of imports

If trade was originally balanced then equation (4.6) simplifies to

$\Delta TB = dX_0.P_x\,(\eta_x + \eta_{im} - 1)$ -------------------(4.7)

If the exchange rate is the instrument employed to correct for a deficit in the trade balance, then the exchange rate has to be devalued. The devaluation will improve the trade balance if

$(\eta_x + \eta_{im} - 1) > 0$ ------------------------------(4.8)

Inequality (4.8) implies that provided the sum of the demand elasticities for exports and imports is greater than unity, then a devaluation will improve the trade balance

$\eta_x + \eta_{im} > 1$ -----------------------------------(4.9)

Inequality (4.9) is the Marshal - Lerner - Robinson condition.

When the exchange rate is devalued as a result of a deficit in the trade balance then the relative price of imports to that of domestic goods rises. The rise in the relative price of imports switches demand away from imports and towards domestic goods (which includes both domestic goods consumed at home and those exported). The increased demand for domestically produced goods raises their production (Y) while a reduction in imports reduces absorption (A) until the excess of A over Y is eliminated and both the external and internal sectors become is balanced again.

The level of absorption (A) can also be consciously reduced through a cut in government expenditures.

In chart 4.1 below the horizontal distance between the AA line and the YY line measures the level of deficit or surplus on the trade account for a given exchange rate.

Any point to the South East of Q within the QYA segment represent the excess of absorption over domestic production and hence a deficit in the trade balance. From any point within the segment QYA equilibrium can be attained either by reducing consumption (i.e bringing down the level of A to equal Y) or by moving the nominal exchange rate, E upwards toward E^*. This exchange rate movement has the effect of increasing Y, for as the relative price of imports rises while that of domestic goods falls, thereby increasing demand for domestic goods, the increased production of domestic goods. Changing the exchange rate involves what are known as expenditure-switching policies, while cutting the level of absorption involves expenditure - reducing policies. Under floating exchange rates the exchange rate automatically depreciates in response to a deficit in the trade balance, so that equilibrium in the external sector is restored via the exchange rate as demand for imports fall while that for domestic goods rises.

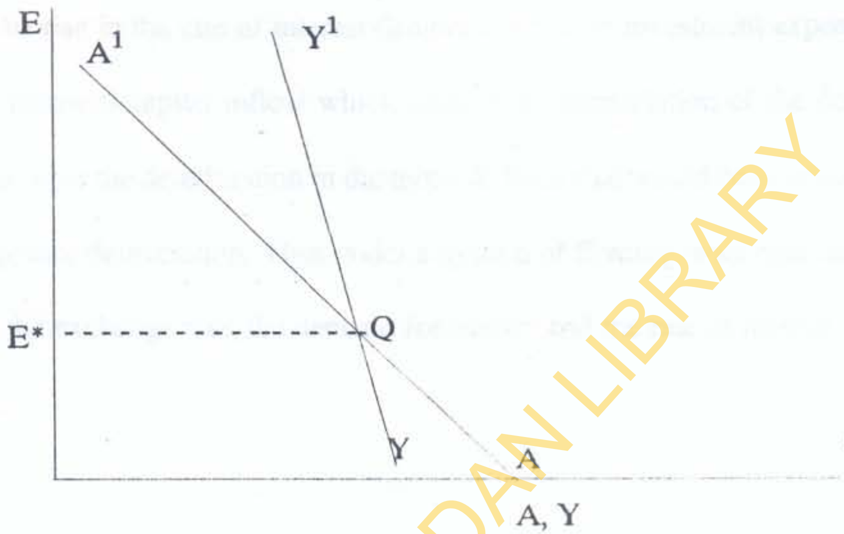
Under fixed rates the government is obliged to defend the par value of the exchange rate. Hence to prevent an exchange rate depreciation in response to a deficit in the trade balance the government draws down on the level of international reserves to finance the deficits. In addition government cuts down the level of absorption both through indirect measures that may result in a cut in private expenditures and through a reduction in money supply that may result in a cut in private expenditures as well.

If initially the money supply was rising in response to increased aggregate demand in the economy (which led to the excess of absorption over production in the first instance) then the following will happen in the economy. Under a system of fixed exchange rates the increased supply of money will further aggravate the increased demand for imports and the government will be forced to use the international reserve to finance the deficit. The use of the international reserve to pay for the excess of imports will lead to a reduction in the monetary base of the economy and hence a fall in the money supply. As the money supply falls, demand for money falls and the level of absorption and hence as imports fall too.

Under a system of floating rates however the increased demand for foreign exchange to finance increased imports raises the price of foreign exchange, hence the exchange rate automatically depreciates. Exchange rate depreciation alters the structure of relative prices in the economy in favour of domestic goods but worsens the terms of trade and reduces the gains from trade. The increased demand for domestic goods raises domestic production and

CHART 4.1

INTERNAL AND EXTERNAL SECTORS' DISEQUILIBRIUM



hence domestic income. As income rises demand for money also rises thus pushing up the rate of interest. The rise in the rate of interest dampens domestic investment expenditure, and also generate incipient capital inflow which leads to an appreciation of the domestic currency and corrects for the deterioration in the terms of trade that would have arisen from the initial exchange rate depreciation. Thus under a system of floating rates equilibrium is finally restored in the exchange rate, the demand for money and the rate of interest.

4.3 Methodology

This study covers three developing countries of Africa, namely, Ghana, Nigeria and Uganda; all of which in the wake of chronic economic fatigue adopted economic restructuring packages that included as a key element the adoption of floating exchange rate regimes. The study shall cover the years 1977 - 1990 for the countries of Ghana and Nigeria, and the years 1981 - 1990 for Uganda. The difference in the time coverage for Uganda is due to unavailability of data for the years 1977 - 1980. The data for all the countries shall be on quarterly basis. The choice of 1977 was to enable us have at least half a decade glimpse of the era of purely fixed rates when the authorities had not started any serious tinkering with their economies, as it was from 1982 that some serious tinkering started.

The case of Uganda proved very interesting and aptly reflected the dilemma of African governments on the issue of the role of exchange rate regime in their countries' economic growth and development. At the beginning of the 1980s, Uganda adopted a floating exchange rate regime, in 1987 it abandoned this system and went back to the fixed regime (of the Bretton Woods type) and by 1992 abandoned the fixed exchange regime once again and went back to floating system. Uganda proved unique in several respects too. First there was no reliable data for the first four years of the study 1977 - 1980, secondly data on some key variables could not be got from the standard international publications such as the International Financial Statistics and so heavy reliance had to be placed on direct data from the Bank of Uganda and secondary data from the Statistics Department, Ministry of Finance and Economic Planning, especially from the Department's Key Economic Indicators.

In this study we hope to use an eclectic model of the Dornbusch's General Model of the Exchange Rate (1980) variety. The model takes cognisance of both monetary and real factors in the determination of exchange rates. The model borrows heavily from the works of Rhomberg (1964), Tullio (1981), Khan and Knight (1986). There are two versions to our model. There is a short version wherein there are seven stochastic variables and the level of International Reserves is treated as a stochastic variable as obtains under a fixed exchange rate system. There is the longer version which adds two additional stochastic variables to the original set, while eliminating international reserves as a stochastic variable, the longer version treats it as an identity. This longer version endogenizes the exchange rate and the domestic rate of interest as obtains under a floating exchange rate regime.

The shorter model was estimated for the years 1977-1990 for Ghana and Nigeria. The solution of this version of the model was used as the benchmark or baseline solution against which effects of policy variations on the macroeconomy were measured. The longer model was estimated for only the years each country floated i.e. 1986 : 4 - 1990 : 4. In the case of Uganda the longer model was estimated for the period 1981 : 1 - 1990 : 4, and the shorter model for 1987 : 2 - 1990 : 4. It should be noted however, that in the process of estimation a few quarters were lost due to the presence of lagged variables in the system.

In calculating the unit price of imports (PIM), the unit price of exports (PX), and the total foreign price (PF) for each focus country we took cognisance of each country's major trading partners. For Nigeria and Ghana, ten trading partners make up at least 70% of their import and export trade and for Uganda eight trading partners. We calculated the share of each trading partner in the import/export trade of each focus country. In order to have the wholesale price index for each trading partner in dollars, we deflated each trading partner's wholesale price index by the country's dollar, exchange rate, we then weighted the dollar wholesale price index for each country by its share in the export or import trade of the focus country (depending on whether we were calculating unit price of export or of imports) then we summed over all trading partners. Thus for any given focus country its unit price of export was calculated using the formula

$$P_x = K_{X\,USA} \cdot WPI_{USA} + \sum_{j=1}^{9} \frac{WPI_j \cdot K_{xj}}{E_{USA}} \text{------------}(4.10)$$

and for import unit price

$$P_{im} = K_{IM\,USA} \cdot WPI_{USA} + \sum_{j=1}^{9} \frac{WPI_j \cdot K_{IMj}}{E_{USA\,j}} \text{---------}(4.11)$$

where $K_{X\,USA}$ = Share of USA in the focus country's export trade

WPI_{USA} = Wholesale price index of USA

WPI_j = Wholesale price Index of a given trading partner j.

$E_{USA\,j}$ = The Exchange Rate Index between country j and the USA.

K_{xj} = Share of country j in the export trade of the focus country.

$K_{IM\,USA}$ = Share of USA in the focus country's import trade

K_{IMj} = Share of country j in focus country's import trade.

Note that for Uganda, j = 1 ------------------------ 7

And for Ghana and Nigeria j = 1 -------------------- 9

Because Ghana and Nigeria had nine major trading partners less the USA while Uganda had seven major trading partners less the USA.

The total foreign price faced by each focus country is

$$P_f = \frac{P_x + P_{im}}{2} \quad \text{-----------------------------}(4.12)$$

For Ghana the ten major trading partners were USA, UK, Japan, Germany, Netherlands, Switzerland, France, Spain, Italy and Canada. For Nigeria, it was the same set of countries as for Ghana except Canada that was not a major trading partner of Nigeria instead Belgium proved to be a partner in Nigeria's foreign trade.

The table below shows the weighted trade shares of each trading partner for each country.

TABLE 4.1

TRADE SHARES OF GHANA AND NIGERIA'S TEN MAJOR TRADING PARTNERS

Focus Country:	Ghana		Nigeria	
Trading partners	Export	Import	Export	Import
United Kingdom	.2049	.3252	.0452	.2313
United States	.2043	.1798	.4416	.1560
Japan	.1177	.0722	.0026	.1041
Germany	.1604	.1232	.1171	.0573
Netherlands	.1177	.0293	.0945	.0389
Switzerland	.1129	.0293	.0055	.1349
Spain	.0352	.0108	.0580	.1349
France	.0264	.0453	.1322	.0709
Italy	.1750	.1227	.0809	.0709
Canada	.0029	.0357	nil	nil
Belgium	nil	nil	.0225	.0338

Note that the ten trading partners for Ghana and Nigeria, make up about 75% of her export and import trade. For Uganda, her eight major trading partners make up about 75% of their export and import trade; attempts to add two more countries to give Uganda ten major trading partners as the other focus countries was not worth the effort because the next two trading partners added less than half of one percent between them to the import and export trade of Ugandan. Table 4.2 shows the distribution of trade between Uganda's eight trading partners.

TABLE 4.2

TRADE SHARE OF UGANDA'S EIGHT MAJOR TRADING PARTNERS

Focus Country: Uganda

Trading Partners	Export	Import
United Kingdom	.1597	.3506
United States	.2954	.0673
Japan	.0661	.1128
Germany	.0831	.2024
Netherlands	.0921	.0473
Spain	.1098	.0207
France	.1299	.0664
Italy	.0632	.1324

As mentioned earlier our study made use of quarterly variables, however there were some variables such as the Gross Domestic Product (GDP) that were in annual form and so had to be spliced through interpolation. To interpolate annual variables to their quarterly components we used one of Friedman's (1962) approaches. In interpolating a variable that is of interest to us, we selected another variable whose quarterly values are known and whose intrayear movements are believed to be comparable to those of the variable of interest, then we superimposed the intrayear movements in the selected variable on the variable of interest, and then we eliminated the differences between the year to year movements. In imposing the intrayear movements of a chosen variable on a variable of interest we used "geometric operations". More specifically the following formula was used for the interpolation.

$$a_i^* = \frac{(4-i)a_o + ia_4}{4} \cdot \frac{b_i}{\frac{(4-i)b_o + ib_4}{4}} = \frac{Ta_i}{Tb_i} \cdot b_i \quad \text{----------(4.13)}$$

Where a = The series whose quarterly values are not known

b = The series whose quarterly values are known

ai^* = The interpolated value of i in the series a

Ta_i = Trend value of 'i' in the series a

Tb_i = Trend value of 'i' in the series b

i = i --- 4.

The variables that were interpolated were (i) Gross Domestic Product (Y) (ii) Government Revenue (GR) (iii) Government Expenditure (GE) and (iv) Current Account Balance (CUB). Variables believed to exhibit comparable intrayear movements to the above focus variables were

(i) Imports - for Gross Domestic Product

(ii) Exports - for Government Revenue

(iii) Money supply - for Government Expenditure

(iv) International Reserves - for Current Account Balance

The basis for the above assumptions is grounded in economic theory. Imports for instance, has been proved to be a function of income such that the higher the level of income the higher the marginal propensity to import (Oyejide 1992). Also as income falls imports also tend to fall either due to government regulations restraining imports in the face of declining income or due to a fall in people's purchasing power as income falls.

Similarly, the level of government revenue was assumed to be reasonably tracked by the value of exports. This is because empirical research results have shown that for developing countries, particularly primary - producing ones the major source of revenue for government is export - earnings, usually from one major primary commodity. For instance in the case of Ghana, cocoa is the major export commodity and earnings from Cocoa make up a considerable fraction of government revenue, while the same applies to Uganda whose main export is coffee. As for Nigeria over 90% of government revenue comes from petroleum exports (Pinto, 1988; Olopoenia, 1991). Thus in interpolating we assumed that the intrayear movements in the value of exports are comparable with that of government revenue.

As for government expenditure several studies Elbadawi (1990) Mbire and Watuwa (1992) among others have shown it to be closely related to money supply especially in developing African economies. it has been shown that almost always increases in money supply are in response to financing government's expenditure.

Finally, movements in international reserves often are in response to the current account requirements in particular to the trade balance component of the current account as discussed in (4:2). Thus current account deficit is often eliminated by drawing down reserves while a surplus in the current account is reflected in rising level of international reserves. Thus intrayear movements in the level of international reserves were superimposed on the current account balance.

The capital account balance was treated as a residual. Given the change in the level of international reserves (DRE), the capital account balance CAB, is the excess of this change in reserves over the current account balance, CUB.

DRE = CUB + CAB ---------------------------------- (4.14)

DRE - CUB = CAB -----------------------------------(4.15)

The models were estimated using the Ordinary Least Squares (OLS) method. We estimated the shorter version for the years 1977:1-1990:4 for Ghana and Nigeria. This shorter version is the model of the economy under fixed exchange rate system. The longer version was estimated for only the years each country floated i.e 1986:4 to 1990:4; on the assumption that the parameters of the first estimate remain constant.

As pointed out earlier the case of Uganda was slightly different. For the ten years covered for Ugandan, it operated a floating exchange rate system for a greater proportion of the period. So we used the solution to the longer version of the model as the benchmark solution against which we measured the changes in the variables under different policy stance. Thus we estimated the longer version of the model for the years 1981:1-1990:4 and the shorter version for 1987:2-1990:4 for Uganda.

We were also interested in real income and how its value at any time 't' is determined. First we calculated real income by deflating the gross domestic product (GDP) by the domestic price level (PD). We then calculated the trend in real income, which we termed RIS, by the formula.

$$RIS = RI_0 + g(t) \text{ ------------------------------ } 4.16$$

Where RI_0 is real income at initial period, and 'g' was generated in the system. For Nigeria 'g' was found to be -3.25; for Ghana -0.29, and, for Uganda 0.74 .

We then experimented with two ways in which previous level of real income was likely to affect current real income. First, we assumed that the current level of real income would be affected by the difference between the actual real income in the previous period and its trend level in that period.

$$\text{i.e } RI_t = f(RI_{(t-1)} - RI_{(t-1)}) \text{ ------------ } 4.17$$

$$RI_t = RI_{t-1} + \lambda \text{ ----------------------- } 4.17b$$

$$\lambda_t = (RIS_{(t-1)} - RI_{(t-1)}) \text{ -------------- } 4.17c$$

We designated $\lambda_t = (RIS_{t-1} - RI_{(t-1)}$ as RIST

Then we also experimented with the difference between the actual real income level and its mean level in a previous period impacting on the current level of income.

i.e $RI_t = f(RI_{(t-1)} - \bar{RI})$ ----------------4.18

more specifically,

$RI_t = RI_{t-1} - \delta$ ---------------------------4.18b

$\delta = RI_{t-1} - RI$ -----------------------------4.18c

We designated $\delta = RI_{t-1} - RI$ as RISD

With respect to inflation we assumed expectations to be static so that the previous rate of growth of prices (one quarter away) is expected to be its rate of growth in the current quarter.

i.e $\pi_t = \dfrac{PD_{(t-1)} - PD_{(t-2)}}{PD_{(t-2)}}$ -------------4.19

We were also interested in two types of real exchange rates, the real exchange rate in the export sector which is the ratio of the price of exports to that of domestic goods EPx/Pd which we termed ETOT, the real exchange rate in the import sector, which is the ratio of import price to that of the domestic price level $EPim/P_d$, which we termed RPIM.

4.4 Model Specification

In this study we shall divide each focus country's economy into three sectors. The first sector is the Price and Monetary Sector, the second is the Foreign Trade Sector and the third is the Real Sector.

We shall further assume that each economy is small hence it is a price taker both in its import and export market. We further assume that neither imports nor exports are perfect substitutes for domestic non-traded goods. Also that the consumer is rational and hence maximizes utility subject to a budget constraint. Thus when relative price shift makes some goods relatively more expensive less of such goods would be bought. We also assumed that the supplier maximizes profit subject to a cost constraint. Thus given a cost structure the higher the price the more of such goods would be produced.

Given the above assumptions therefore, the structure of our model, in general functional form, is as shown below; we allow the data to determine the specific form. (Note that Appendix I contains the definitions of all variables and terms).

I: Price and Monetary Sector

$Pd_{(t)} = f(RI_{(t)}, MSS_t, EN_{(t)}, RD_{(t)}, \pi_{(t)}, p_{d(t-1)})$ 4.20

$RDM_{(t)} = f(RI_{(t)}, GE_t, RD_{(t)}, RDM_{(t-1)})$ 4.21

$MSS_{(t)} = f(RI_{(t)}, GD_t, DCP_t,$ 4.22

$RD_{(t)} = f(EMSS_{(t)}, \pi_t, Y_{(t)}, RD_{(t-1)},$ 4.23

In the price and monetary sector, equation (4.20) maintains that the domestic price level (p_d) depends on the level of real income (RI) nominal money supply (MSS) nominal exchange rate (EN) nominal rate of interest (RD) inflationary expectations (π) and its own lagged value $p_{d(t-1)}$. 'A - prior' we expect an inverse relationship between domestic prices and output such that expansion of real income should lead to declining prices. Increased money supply is expected to increase the level of domestic prices while a depreciating nominal exchange rate is expected to lead to rising prices. Inflationary expectations which should lead to increased demand for money is expected to also lead to rising prices. Given that prices tend to be rigid downwards there is a threshold of the previous price level below which the current price will not fall according to equation (4.20).

Equation (4.21) maintains that the real demand for money (RDM) is a function of real income (RI), government expenditure (GE) the rate of interest (RD) and its own lagged value (RDM_{t-1}). It is expected that the higher the level of income the higher would be the real demand for money given the classical position that money is demanded for transaction purposes. Government expenditure is a major force determining the level of economic activity in both developed and developing economies, hence the level of government expenditure is expected to have a positive relationship with the real demand for money. As for domestic rate of interest given the keynesian speculative motive for holding money we expect an inverse relationship between the real demand for money and the rate of interest, so that, as the rate of interest rises the real demand for money falls.

The money supply equation (4.22) maintains that money supply (MSS) depends on the level of real income (RI) the government deficit (GD) and the domestic credit to the private sector (DCP_t). The higher the level of change in reserves the more money is available to sustain increased level of domestic activity. As the level of real income rises the more the amount of money needed to sustain the level of transactions in the economy, hence the higher the money supply. The domestic rate of interest (RD) is supposed to depend on the excess money supply (EMSS) according to equation (4.23). The higher the excess money supply the lower the rate of interest becomes. Also the domestic rate of interest depends on inflationary expectations (π) nominal income (Y) and its own lagged value (Rd_{t-1}). As inflationary expectation rises,demand for money rises too, thus pushing up the rate of interest. Also the higher the level of income the higher the demand for money and hence the higher the rate of interest.

II Foreign Trade Sector

$X_{(t)}$ = f($RIS_{(t)}$, $ETOT_{t-2}$, $IM_{(t-1)}$, $DPX_{(t-2)}$) 4.24

$IM_{(t)}$ = f($RDM_{(t)}$, $RPIM_{(t)}$, $DRE_{(t)}$) 4.25

$RE_{(t)}$ = f($EMSS_{(t-1)}$, $TB_{(t-1)}$) 4.26

$EN_{(t)}$ = f($RDF_{(t)}$, $RE_{(t-1)}$, $Y_{(t)}$, MSS_t) 4.27

The foreign trade sector is linked to the monetary sector through the domestic price level which is one of the determinants of relative export price ETOT, and relative import price RPIM. Further in equation 4.24 the value of exports (X) depends on the trend in real income (RIS) the relative price in the export sector or real exchange rate in the export sector with a two period lag ($ETOT_{t-2}$) the value of imports in the previous period (IM_{t-1} and the domestic price of exports with a two period lag (DPX_{t-2}). As the trend in real income rises export volume and hence value tend to rise. Similarly as the relative price of exports

(EPX/Pd = ETOT) with a two period lag, rises, the volume and value of exports tend to rise too because increased relative price of exports encourage increased export production. The value of imports also determine the volume of exports supply to the extent that imports in the previous period (IM_{t-1} enter into the current production for exports. The domestic price of exports also determine the quantity supplied in the light of our assumption that the producer is a profit maximizer, hence the higher the domestic export price the higher the supply and hence the higher the export value.

Equation (4.25) maintains that imports (IM) depend on excess real demand for money, ($RDME_t$) the money supply and the real demand for money link the monetary sector with the foreign trade sector. Thus according to equation 4.25 imports depend on the real demand for money RDM_t, the level of real income (RI) relative price of imports RPIM) and change in reserves (DRE). While equation 4.26 the reserve level is influenced by the excess money supply in the economy. The higher the excess money supply the lower the reserve level is expected to be as the level of reserve is usually drawn down, and monetized to increase the money supply and equation 4.27 the nominal exchange rate depends among others on the nominal money supply. Real income (RI) the relative price of imports or the real exchange rate in the import sector (RPIM = EP_{im}/pd) and the import - capacity as reflected in the change in reserves at a given time (t). The relationship is positive as between imports and real income, and between imports and change in reserves, but negative as between imports and its relative price.

The reserve level itself (RE) according to equation (4.26) depends on the excess money supply in the economy $EMSS_t$, level of government deficits with a one period lag (GD_{t-1}) and the trade balance (or net-export) also with a one period lag. Reserves and government deficit have an inverse relationship, while it has a direct relationship with net exports (or the trade balance) Nominal exchange rates according to equation (4.27) depends on the interest rate differential (RDF) (i.e the differential between domestic and foreign rates of interest (RD - RF) and also on the level of international reserves with a one period lag (RE_{t-1}). It also depends on nominal income (Y) and nominal money supply (MSS). While there is an inverse relationship between nominal exchange rate and the interest rate differential because the higher this differential the more appreciated the exchange rate gets. There is similarly an inverse relationship between nominal exchange rates and the reserve level as well, the higher the level of international reserves the more appreciated the exchange rate becomes also an inverse relationship exists between the nominal exchange rate and the level of income (Y) because the higher the level of income the more appreciated the nominal exchange rate becomes. As for nominal exchange rate and the money supply, if money supply rises without a corresponding rise in the demand for money then the rate of exchange depreciates.

III <u>The Real Sector</u>

$RI_{(t)} = f(RDME_{(t)}; RISD_t, PD_{(t)}, IM_{t-1})$ .... (4.28)

Equation 4.28 maintains that in the real sector the level of real income (RI) is determined by the of excess real demand for money, ($RDME_t$) the differential between actual real income in the previous period and the long run mean income ($RISD_t$) the level of domestic prices (PD) and the value of imports with a one period lag IM_{t-1}. While real income has a positive relationship with excess real demand for money RDME, real income differential (RISD) and imports ($IM_{(t-1)}$) it has a negative relationship with prices. The identities and definitional equations of our system are

$$TB_{(t)} \equiv X_{(t)}, - IM_{(t)}, \quad .... \; 4.29$$

$$GD_{(t)} \equiv GE_{(t)}, - GR_{(t)}, \quad .... \; 4.30$$

$$TDC_{(t)} \equiv DCP_{(t)}, - DCG_{(t)} \quad .... \; 4.31$$

$$EMSS_{(t)} \equiv MSS_{(t-1)}, - RDM_{(t)}, \; .... \; 4.32$$

$$CAB_{(t)} \equiv DRE_{(t)} - CUB_{(t)} \quad .... \; 4.33$$

$$EN_{(t)} \equiv EN_{(t)} + 0 \quad .... \; 4.34$$

$$RD_{(t)} \equiv RD_{(t)} + 0 \; .... \; 4.35$$

$$RE_{(t)} \equiv RE_{(t)} + 0 \; .... \; 4.36$$

Identity (4.29) maintains that the trade balance (TB) is the excess of export value (X) over import value (IM). Identity (4.30) is the government deficit (GD) which equal the excess of government expenditure (GE) over government revenue (GR) which equals the excess of government expenditure (GE) over government revenue (GR). Total domestic credit (TDC) is according to identity (4.31) exactly equal to the sum of domestic credit to the private sector (DCP) and domestic credit to government (DCG).

Our definitional equation (4.32) maintains that excess money supply in the current period 't' (EMSSt) is the excess of money supply in the previous period MSS($_{t-1}$) over the actual real demand for money in 't' (RDM$_t$). The capital account balance (CAB) is according to identity (4.33) the residual of the change in reserves after taking away the current account balance. The nominal exchange rate (EN) is fixed under a fixed exchange system according to identity (4.34), while the nominal rate of interest in the domestic economy (RD) is also fixed under a fixed exchange rate system according to identity (4.35). Lastly the level of international reserves (RE) is non-varying under a floating exchange rate system according to the last identity (4.36).

Beyond the statistical tests of the individual equations and parameters rigorous test of the validity of a model through dynamic simulation is essential (Pindyclc and Rubinfeld 1981). The essence of such simulation is to enable us determine whether the model is reasonable in reflecting economic reality, and to reveal the economic policy control properties of the model so as to be able to determine the extent to which one can rely on the model for forecasting purposes. Also simulation is useful in suggesting problem areas that can be improved for a better specification of the model. Thus we attempted to validate our models through dynamic simulation.

4.5 Theoretical Model Validation Techniques

In this study we were concerned with how well our model tracked the historical data generally and in particular how well it captured turning-points. Also we were concerned with the predictive ability of each of our model(s). Thus in order to determine how well our model(s) tracked the historical data we analysed the Root Mean Square Simulation Error (RMSE) for each of our endogenous variables. For any given endogenous variable Z at time 't' its Root Mean square simulation error is defined as

$$RMSE = \sqrt{\frac{1}{T}\sum_{t=1}^{T}(Z_t^s - Z_t^a)^2} \qquad \text{........(4.36)}$$

i.e. the square root of the sum of squared deviations of

actual values of Z_a from the simulated values Z_b divided by the total number of periods involved. The Root Mean Square Simulation Error is a measure of the deviation of the simulated variable from its actual time path. The magnitude of this error is evaluated by comparing it with the average size of the variable in question (SRMSE). The smaller the size both of RMSE and of SRMSE the better the model.

We also constructed charts reflecting the simulated and the actual values of our endogenous variables for all the sample countries to reveal pictorially how well turning-points are tracked. To test the predictive ability of our model(s) we were interested in the Theil's inequality coefficient. The Theil's inequality coefficient is supposed to range from

0 to unity. When this coefficient equals 0 then it implies that the simulated and actual values of the endogenous variable are exactly equal and hence there is a perfect fit.

i.e. $U = 0 \quad Z_t^s = Z_t^a$ for all t

(Where U = Theil's inequality coefficient).

When the Theil's inequality coefficient equals unity then it shows that the predictive ability of the model is as bad as it possibly could be (Pindyck and Rubinfeld, 1981)

$U = 1 \quad Z_t^s \quad Z_t^a$ for almost all t.

The highest value tolerable for a Theil's inequality coefficient is 0.3. The decomposition of the Theil's Inequality into its characteristic sources - i.e. Bias Proportion, Variance Proportion and Covariance Proportion is also important in determining the validity of a model. The bias proportion is a reflection of systematic error, since it measures the extent to which the <u>average</u> values of the simulated and actual series deviate from each other. Thus the closer this bias proportion is to zero the better. A larger value of the bias proportion is a cause for concern since it means that systematic error is present.

The variance proportion is a reflection of the ability of the model to replicate the degree of variability in the endogenous variable of interest. If the variance proportion is large then this means that the actual series has fluctuated considerably while the simulated series shows little fluctuation or vice-versa. Thus the closer the variance proportion is to zero the better.

The covariance proportion however measures unsystematic error - i.e it represent the remaining error after deviations from average values and average variabilities have been accounted for. The closer the covariance proportion is to unity the better, because, given that predictions cannot be perfectly correlated with actual outcomes, and we do not want bias errors and variability errors, then whatever errors we observe should only be unsystematic. In other words whenever the Theil's Inequality is greater than zero, then the ideal distribution of the errors should be,

for $U > 0$, then, $U^m = 0$, $U^v = 0$, $U^c = 1$

where U^m = Bias Proportion, U^v = Variance Proportion and U^c Covariance Proportion

Results of the estimation, validation and simulation exercises are presented in chapters six and seven.

4.6 DATA AND DATA SOURCES

For this study we collected data on the following variables

(i) Gross domestic Product, (Y)

(ii) Money supply - (MSS)

(iii) Domestic Prices - (PD)

(iv) International Reserves - (RE)

(v) Domestic Rates of Interest - (RD)

(vi) Value of Imports - (IM)

(vii) Value of Exports - (X)

(viii) Nominal Exchange Rates - (EN)

(ix) Unit value of Imports - (PIM)

(x) Unit Value of Exports - (PX)

(xi) Foreign Prices - (PF)

(xii) Home goods' Prices (i.e Non Traded Goods' Prices) - (PH)

(xiii) Domestic Credit to Government - (DCG)

(xiv) Domestic Credit to the Private Sector - (DCP)

(xv) Trade Balance - (TB)

(xvi) Current Account Balance - (CUB)

(xvii) Capital Account Balance - (CAB)

(xviii) Change in Reserves - (DRE)

(xix) Government Expenditure - (GE)

(xx) Government Revenue - (GR)

(xxi) Foreign Rates of Interest (Using USA's as proxy) - (RF)

For each country most of the data were got from the International financial statistics (IFS) of the IMF (International Monetary Fund), the Balance of payments yearbook also of the IMF, and the Government Finance Statistics Yearbook. Among others the following were collected from the IFS' various years, - International Reserves, Domestic Rates of

Interest, Nominal Exchange Rates, Foreign Rate of Interest. (i.e USA's). In the case of Nigeria the following additional variables were also got from the IFS,

- Money supply, Domestic Credit to Government, Domestic Credit to the Private Sector, Export Value, Import Value.

However data on Nigeria's, Government Revenue and Government Expenditure were from the Central Bank of Nigeria's Publications." In particular the Statistical Bulletin of the Central Bank of Nigeria proved invaluable. Similarly, Ghanaian data on Current Account Balance and Government Revenue as well as Government Expenditure were got directly from the Bank of Ghana, Research Department.

As for Uganda the majority of her data were got direct from the Bank of Uganda. The Bank of Uganda's "Monetary-Survey of 1992 provided data on Domestic Credit to Government, Domestic Rate of Interest and Nominal Exchange Rates. Data on Uganda's GDP, were collected from "Key Economic Indicators" of the Statistics Department of the Ministry of Finance and Economic Planning.

CHAPTER FIVE

DESCRIPTIVE ANALYSIS OF DATA

"When moving from the PRECISE formulations and GENERAL PRESCRIPTIONS of economic theory to the real world of policy, it is necessary to remember that we leave the realm of SYSTEM and PRECISION for a world of APPROXIMATION, which operates not by LAW but by TENDENCY"

Scammell (1974)

Some of the key economic aggregates on which the exchange rate impact directly are the value of a country's exports, the value of imports, the trade balance, the current account and the level of international reserves. Also the exchange rate could impact on domestic prices and indirectly on the level of real income. In this chapter we describe with the aid of appropriate charts and tables the behaviour of these macroeconomic aggregates over the period covered by the study both under fixed and under floating exchange rate regimes.

5.1 The Trade, Current and Capital Account Balances

One of the key aggregates of interest to this study is the trade balance (TB) and its behavioural pattern during the period of study. In Nigeria the trade balance in the early years of the 1980s was almost always negative. Out of the 12 quarters of 1981 to 1983 the TB was negative for 9 of the quarters. This probably reflects the squandermania attitude which resulted from the oil boom of the 1970s and the difficulty in stemming the tide when there was a reversal of fortune. This negative trend in the trade balance at this period in time probably explains the adoption of "austerity measures" in 1982 in order to put a brake on import-growth and reduce the level of government expenditures. Among others the "austerity measures" included the banning of certain categories of imports and the reduction of Basic Travel Allowance (BTA) along with other trade controls. The "austerity measures" were officially known as Economic Stabilization Act (1982).

Apparently, the effect of the austerity measures on merchandise trade only came to be felt from 1984 when the trade balance was in surplus and this surplus trend continued until 1990. It is interesting however to note that the current account balance however was negative for a considerable part of 1984 - 1990 in spite of the positive balance on the trade account. In fact out of the 8 quarters of 1986-1987 the current account balance was negative for 7 quarters, this was in spite of the Structural Adjustment Programme (SAP) that had been put in place since the last quarter of 1986. It is only in the last three years of the study (i.e 1988 - 1990) that the current account balance became positive. Given the fact that the trade balance had exhibited a positive trend since 1984, then the negative balances on the current account for all the years of 1984 - 1987 (except for 1985) can only reflect the increasing dependence of Nigeria on the imported skilled labour and other services of her trading partners, such that the services balance ensured that the current account balance was negative. In fact out of the 16 quarters of 1981-1984 the current account recorded deficit balances for 15 quarters. This probably partly explains the need for SAP in 1986.

The capital account balance was positive from 1981 up to 1984:4 reflecting the inflow of external loans. However, from 1984:2 the balance on this account started a declining trend and by the first quarter of 1985 it had become negative. The negative trend on the capital account continued until the first quarter of 1986, thereafter the tide changed again. These negative trend seems to reflect the drying up of external credit lines as the level of Nigeria's external loan skyrocketed, and also reflect the huge repayment burden that Nigeria faced. The inflow of capital peaked in 1983, when for that year alone capital inflow was some ₦1.7 billion, an increase of about 55% over the 1982 inflow of ₦1.1 billion. As credit lines dried up capital inflow also started a downward trend from a level of ₦2.95 billion in the 4th quarter of 1983 to ₦0.32 billion in the 4th quarter of 1984. By the first quarter of 1985 there was no inflow at all, rather there was a net outflow of ₦0.51 billion. With the inception of the structural adjustment program however capital flowed in again, as the country was deluged with all kinds of structural adjustment loans from both the World Bank and IMF and other multilateral financial institutions. A considerable proportion of the old (outstanding) loans were rescheduled by pushing their repayment farther into the future.

Table 5.1

Nigeria's External Balances 1981 - 1990
(In millions of Naira)

Period	Balance of Trade	Current Account Balance	Capital Account Balance
1981 : 1	1239	-3415	3705
: 2	- 372	- 4117	3440
: 3	-1577	- 4384	305
: 4	-239	- 3998	2476
1982 : 1	- 700	- 2161	848
: 2	- 182	- 2294	2139
: 3	- 304	- 2919	2909
: 4	404	- 4875	5081
1983 : 1	- 984	- 5349	5468
: 2	316	- 3518	3116
: 3	- 407	- 5349	5466
: 4	- 267	- 3136	2954
1984 : 1	1494	- 2115	2130
: 2	997	- 1653	1891
: 3	868	- 553	297
: 4	965	45	318
1985 : 1	957	565	- 509
: 2	353	901	- 1043
: 3	614	911	- 1187
: 4	1357	2215	- 1487
1986 : 1	424	6278	- 5039
: 2	598	- 1883	1174
: 3	651	- 8281	8432
: 4	792	- 2999	2703
1987 : 1	2477	- 875	1721
: 2	3278	- 1592	2013
: 3	3522	- 1023	2027
: 4	4605	- 295	776
1988 : 1	2951	680	915
: 2	4198	722	- 203
: 3	5085	1051	237
: 4	201	1448	1289
1989 : 1	8839	868	4067
: 2	10022	2832	- 2390
: 3	6489	4332	- 3036
: 4	7444	6735	- 3354
1990 : 1	8459	17393	-10635
: 2	8908	25897	-21119
: 3	17714	34396	-30200
: 4	31862	41782	-38468

Sources: Central bank of Nigeria - Statistical Bulletin (Various Issues)

By the second quarter of 1989 the capital flow pattern changed again. There was from the second quarter of 1989 an outflow of capital reflecting the expectations of the IMF and the WB and other creditors that after three years of structurally adjusting the economy, Nigeria should by then be able to pay its debts. What is more, repayment on the rescheduled debts had by 1989 started falling due. Thus for seven of the eight quarters of 1989-1990 there was net capital outflow. Table 5.1 bear out these facts.

In Ghana the Economic Recovery Program (ERP) took off in 1983. Prior to 1983, especially in the 1970's the performance of the Ghanaian economy had been particularly poor. This is reflected in the fact that of the 8 quarters of 1977 and 1978 the Trade Balance (TB) was negative for 6 of the quarters. Similarly the TB was negative for all the four quarters of 1981. After the onset of the Economic Recovery Program in 1983 there was a marked improvement in the merchandise trade as reflected in the TB for 1983 up to 1986. Of the 16 quarters in this period the trade balance was only negative for about 5 quarters. From 1986:4 when the country adopted a floating exchange system the performance of the TB was not particularly impressive compared to the early years of adoption of ERP. In fact of the 17 quarters of floating exchange rate experience covered in this study (i.e 1986:4 - 1990:4) the TB was negative for about 9 quarters. This is quite in contrast to what obtained immediately after the onset of ERP wherein for the 8 quarters of 1983 and 1984, the TB was positive for 6 quarters. The Current Account Balance (CUB) even proved to be a greater enigma than the Trade Balance. The CUB was negative for all the 24 quarters before the onset of ERP (i.e 1977:1 - 1982:4) except for 2 quarters. In spite of the onset of ERP in 1983 and floating exchange rate system in 1986, the CUB continued to be negative throughout, i.e. from 1983:1 to 1990:4. The phenomenon seems a little hard to explain. It probably reflects the complete dependence of the Ghanaian services sector on external services in terms of skilled labour, shipping and maritime services insurance services etc. In contrast with the CUB performance the Capital Account Balance of the Ghanaian economy proved to be positive throughout the 56 quarters covered by the study except for 4 quarters. This capital Account Balance (CAB) reflects the inflow of capital in form of loans and grants prior to the onset of ERP in 1983 and in form of structural adjustment loans from the IMF and the World Bank since the onset of ERP. That there has not been any marked outflow of capital probably reflects how sympathetic Ghanaian external creditors had been with her. Table 5.2 shows Ghana's external balances.

As for Uganda it embarked on an Economic Recovery Program (ERP) in 1982 to correct for the deteriorating economic performance of the 1970s. Unfortunately, meaningful data are not available on the '70s for Uganda. Thus the study covers only the ten year period 1981-1990. During this ten year period the merchandise trade of Uganda revealed an interesting trend. Just after the adoption of the ERP in 1982 the TB performed beautifully as revealed by the positive balance on the trade account for almost all the 16 quarters immediately following the adoption of the ERP. However from 1987

Table 5.2

Ghana's External Balances 1981-1990 (In Millions of cedis)

Period	Balance of Trade	Current Account Balance	Capital Account Balance
1981 : 1	-30	-236	201
: 2	-29	-218	118
: 3	-29	-802	794
: 4	-28	-1160	1152
1982 : 1	302	-998	1013
: 2	84	-794	827
: 3	243	-489	460
: 4	-166	-205	160
1983 : 1	-126	-863	1531
: 2	503	-1416	1843
: 3	392	-1513	1493
: 4	2510	-1384	1196
1984 : 1	-2199	-1669	4018
: 2	1309	-2114	4849
: 3	1406	-1958	2664
: 4	2726	-2753	6863
1985 : 1	2333	-5099	12031
: 2	354	-6339	9166
: 3	-2092	-7429	9935
: 4	-4530	-8508	11279
1986 : 1	3266	-11050	26329
: 2	3545	-7365	-1136
: 3	4537	-7224	12077
: 4	-3242	-7609	15727
1987 : 1	-2500	-18706	55529
: 2	5082	-24584	24138
: 3	5764	-13156	-35162
: 4	-3247	-15066	11238
1988 : 1	5680	-15500	20736
: 2	-3886	-16301	23970
: 3	-4400	-11461	22752
: 4	5174	-13537	24605
1989 : 1	-19150	13844	20736
: 2	-16934	-13875	15495
: 3	-20836	-13017	10959
: 4	-19680	-25245	71490
1990 : 1	30831	-39962	54403
: 2	39834	-51029	54064
: 3	33473	-62677	67735
: 4	30539	-71108	86108

Source: Bank of Ghana: Research Department's "Balance of Payments Documents"

Table 5.3

Uganda's External Balances 1981-1990
(In millions of Ugandan shillings).

Period	Trade Balance	Current Account Balance	Capital Account Balance
1981 :1	1872	29	252
:2	471	4	-157
:3	-16	9	937
:4	-6175	14	3353
1982 :1	-1613	-7	-6
:2	318	-63	3926
:3	5441	-102	-1838
:4	-3255	-66	-4085
1983 :1	-2745	-6700	10580
:2	2272	-13328	14069
:3	1214	-11751	9316
:4	6655	-11124	10116
1984 :1	4971	3275	-25973
:2	14910	19361	-20659
:3	11003	24112	-26258
:4	-5340	38524	-26724
1985 :1	12539	29559	-38368
:2	11760	44578	-27274
:3	26367	75009	-39852
:4	10776	51746	-77175
1986 :1	34	565627	-570817
:2	508	24903	17657
:3	860	189760	-160227
:4	580	72240	-157500
1987 :1	-637	3184	-41838
:2	-3385	866	-1778
:3	-3464	-1795	9027
:4	-4255	-44319	46149
1988 :1	-3038	-24038	23462
:2	-3497	-12551	11921
:3	-9465	-35041	4131
:4	-6511	-20380	193151
1989 :1	-4106	-10116	4997
:2	-8103	-38543	42206
:3	-6759	-49311	15511
:4	-31124	-58712	61369
1990 :1	-26084	-123302	127949
:2	-22843	-130136	130278
:3	-31825	-122857	122087
:4	-53892	-114886	116272

Source: IMF's Balance of Payments Yearbook (Various Years) when the country went back to a fixed exchange rate system the Trade Balance (TB) became negative and remained so until the end of the study period. (i.e 1987-1990). Table 5.3 reveals these points.

It is interesting to note that except for 1983 the Current Account Balance (CUB) was also positive for all the years that the TB was positive; what is more, as the TB turned negative from 1987, the CUB also became negative in particular from 1987:3 up till 1990:4 (see Table 5.3). This trend probably implies that the merchandise trade is the more predominant in Uganda's merchandise and services trade. Thus the CUB seems to move in the same direction as the TB, signifying that the services balance is not as dominant as the merchandise trade balance.

The capital Account Balance (CAB) between 1981-1983 was more positive than negative probably reflecting the inflow of loans and grants in an attempt to assist Uganda restructure its economy. From 1984 however there seemed to have been a reversal as capital flowed out for almost all the quarters of 1984:1 to 1987:2. This is probably a reflection of Uganda's attempts to repay some of its huge outstanding external debts. From 1987:3 however up to 1990:4 there seemed to have been continuous capital inflow again. This shows how the IMF and the WB have responded to the distress call of the United Nation especially the Economic Commission for Africa for an urgent and substantial inflow of capital into distressed African economies (Adedeji, 1985). The IMF standby arrangement which Uganda used in funding its exchange market between 1982-1984 ended in 1984. The increasing pressure of debt repayment in the next ten quarters must have revealed the need for development aids and grants, the response by the developed countries is reflected in the capital account balance of Uganda for the period 1987:3 - 1990:4. These facts are shown in Table 5.3 .

5.2 International Reserves and the Balance of Payments

The behaviour of Nigeria's international reserve level is worthy of examining. By the first quarter of 1981 the level of international reserves in Nigeria peaked to stand at ₦5.9 billion, thereafter, it started a downward trend, and by 1983 it stood at some ₦0.7 billion which is only some 12% of its peak level. By 1984 the level of international reserves picked up again, but very marginally. By 1986 the increase in the level of international reserves became noticeable and by 1989 it had even surpassed its peak level of ₦5.9 billion of the first quarter of 1981. By 1990 fourth quarter the level of international reserves (RE) was some ₦31.1 billion. It is important to take note however that the level of RE is here reduced to its naira equivalent. Thus the naira value of RE may be reflecting more the depreciation of the naira exchange rate rather than the rate of reserve accumulation. Thus, in dollar terms, the growth of RE may not be as outstanding as it seems. In fact a quick conversion of the level of RE into dollars reveals that at its peak in 1981 the level of RE was some US $9.7 billion, whereas in 1989 the highest level was only US $1.8 billion and by the fourth quarter of 1990 it was US $3.7

Table 5.4
International Reserves and Balance of Payments for Focus Countries (1981:1 - 1990:4)

Period	Nigeria (In millions of Naira)		Ghana (In millions of Cedis)		Uganda (In millions of Ugandan Shillings)	
	RE	BOP	RE	BOP	RE	BOP
1981 1	5887	709	506	-35	409	281
2	5211	-676	406	-100	255	-154
3	3879	-1332	415	9	1201	946
4	2357	-1522	407	-8	4568	3367
1982 1	1044	-1313	432	-25	4555	-12
2	889	-155	465	33	8419	3863
3	879	-10	436	-29	6478	-1941
4	1086	207	392	-44	2328	-4150
1983 1	1205	119	1062	670	6208	3880
2	803	-402	1487	425	6949	741
3	925	122	1467	-20	4514	-2434
4	743	-182	1279	-188	3506	-1008
1984 1	758	15	3627	2348	32754	-29248
2	996	238	6362	2735	31455	-1298
3	759	-237	7067	705	29209	-2247
4	1122	363	11177	4110	41009	11800
1985 1	1178	56	18109	6932	32199	-8809
2	1035	-143	20936	2827	49504	17304
3	760	-275	23442	2506	84660	35156
4	1488	728	26014	2572	59231	-25428
1986 1	2727	1239	41293	15279	54040	-5191
2	2018	209	32791	-8502	96600	42560
3	2169	151	37644	4853	1261440	29540
4	1873	-296	54761	4117	880	29540
1987 1	2719	846	82585	36824	2226	-38654
2	3146	427	82140	-445	1314	-912
3	4144	998	33821	-48319	1446	132
4	4624	480	29993	-3828	3276	1830
1988 1	4859	235	35228	5235	2700	-576
2	3933	-926	42897	7669	2070	-630
3	3112	-821	33711	-9186	8460	6390
4	2953	-159	44779	11068	7395	-1065
1989 1	7888	4935	47952	3173	2277	-5118
2	8330	442	49572	1620	5940	3663
3	7626	1296	47520	-2052	2140	-3800
4	13007	3381	93771	46251	4794	2654
1990 1	19765	6758	108212	14441	9442	4648
2	23543	3778	111246	3034	9584	142
3	27738	4195	116304	5057	8814	770
4	31058	3320	131305	15001	10200	1386

Sources: (1) Central Bank of Nigeria's Statistical Bulletin (Various years).
(2) Bank of Ghana, Research Department's 'Balance of Payments Documents
(3) IMF's Balance of Payments Yearbook (various years)

billion which is only about 38% of its 1981 peak level.

Be that as it may, it is important to note that the level of RE by the late 1980s was quite an improvement over what obtained in the last four years of fixed exchange rates (i.e 1982 - 1985). As for the balance of payments it was in deficit for eight of the twelve quarters of 1981 -1983; and for four out of the eight quarters of 1985 - 1986. By 1987 the balance of payments became positive and remained so till the end of 1990. Table 5.4 reveals these facts.

The behaviour of the International Reserve level (RE) in Ghana is also of great interest. Beginning from a low level of about ¢154 million (cedis) in the first quarter of 1977, the level of international reserves rose gradually until the second quarter of 1980, thereafter it started a gradual decline until the onset of the Economic Recovery Programme in 1983, when the level of reserves suddenly shot up by over 270% between 1982:4 and 1983:1. The rise in the level of RE continued up until the second quarter of 1987, which was three quarters into the floating exchange rate system. Between 1987:2 and 1987:3 the level of reserves fell by over 142%. However, from 1988:4 the level of reserves started an upward climb again beginning with ¢44.8 billion in 1988:4 the RE level stood at some ¢131 billion by 1990:4 an increase of over 290%.

It is important to note that as in the case of Nigeria the performance of the RE in dollar terms may not be as remarkable as it looks if one takes cognisance of the enormous depreciation of the cedi from 1983 when the ERP started. Hence a lot of the growth in the level of reserves might simply be reflecting the extent of cedi exchange rate depreciation rather than anything else. For instance the highest level of RE, pre-1983 was about ¢999 million (which obtained in 1980:2) if converted into US dollar at the then cedi exchange rate of ¢2.75 per $1, it becomes about US $363 million. However the value of RE after the onset of ERP by 1983:4 of ¢1278 million only amounts to some $88 million at the on-going exchange rate of ¢14.5 per $1. Be that as it may, the level of RE grew at an average quarterly rate of 38.9% in the last 17 quarters before floating exchange rates, and at an average quarterly rate of 13.7% in the first 17 quarters since floating. Note that the last 17 quarters of fixed rates was characterized by what can be termed a jumping - peg system, which is as flexible as any floating system except that it is administratively determined. Table 5.4 contains necessary information about Ghana's international reserves' behaviour.

As for the balance of payments it was more negative than positive for the period 1977 to 1982. In fact of the 24 quarters making up this period the balance of payments was negative for 14 quarters. After the onset of the economic recovery program however, the balance of payments position became positive, and it remained positive for the next 12 quarters except two. In the year following the onset of floating rates however the balance of payments was negative for three of the four quarters of that year (i.e 1987). From 1988 however, up to the end of the study period (1990:4) the balance of payments remained positive except for one quarter. This performance is quite remarkable and probably has implication for the worthiness or otherwise of a floating exchange rate regime. This Ghanian performance compares favourably with the Nigerian situation where the balance of payments had also been positive from the second quarter of floating exchange system till the end of the study period.

In Uganda, the level of international reserves showed no discernible pattern as between the era of floating rates and that of fixed one. Except for one exceptional quarter during the floating exchange era when the level of international reserves skyrocketed it was otherwise oscillating both under fixed and floating systems, within moderate amplitudes. The performance of the balance of payments was also mixed. There were as many incidents of negative balances as there were of positive ones, both under floating and under fixed exchange regimes. Table 5.4, columns six and seven reveal these points.

In Nigeria since the onset of the structural adjustment program (SAP) and its main baby - floating exchange rate system, there has been a marked improvement in export performance. In fact by the tenth quarter of floating exchange rates the growth rate of exports as between the 9th and 10th quarter was about 150%. Though there were still negative growth rates of exports in some quarters after floating, these were not as marked as before the floating exchange system. Before the floating system there were periods when the growth rate of exports was as poor as - 60%. On the average, exports grew at a quarterly average of 3.4% in the last 17 quarters of fixed rates (i.e 1982:2 - 1986:3) and at 27.8% in the first 17 quarters of floating rates (i.e 1986:4 - 1990:4) chart 5.2 bears testimony to these facts.

As for imports chart 5.1 reveals its performance. Import growth improved markedly after the onset of floating rates. This is a surprise in the light of the fact that one of the purposes of floating the exchange rate is to ensure a depreciation of the naira which was to help discourage imports. However, because of the easier access of actual importers to forex in the era of floating rates and also less trade controls, import growth rate was sometimes as high as 70%. All throughout the four years of floating period covered by this study, import performance seemed to have improved compared to the last four years pre-floating. On the whole imports grew at an average quarterly rate of - 1.2% in the last 17 quarters of fixed rates and at an average of 16.7% in the first 17 quarters of floating.

Since import performance has been improving while export performance has also been improving it is interesting to check for the net performance. Chart 5.3 reveals the share of export as a proportion of GDP and the share of imports as a proportion of GDP. The gap in these ratios reveal to what extent the external sector has improved or worsened since the onset of floating rates. Chart 5.3 shows the last 17 quarters before the onset of floating rates ie 1982:3 - 1986:3, and the first 17 quarters after floating i.e 1986:4 - 1990:4. This chart reveals that imports as a proportion of GDP has shown a very gradual increase. Exports as a proportion of GDP has had more fluctuations but had been consistently higher than imports share in GDP. What is more, as the floating exchange system progressed export share seems to be increasing thus the gap between export and import share in GDP has been a positive and increasing one. On the average export share in GDP was 4.7% in the last four years of fixed exchange rate system while import share in GDP was 3.5%, making a net excess of exports over imports as share of GDP of 1.2%. However in the first four years of floating exchange system export share in GDP increased to 8% while imports share increased to 3.8%. thus there is a net excess of export share relative to import share in GDP of 4.2% an increase of over 200% compared with the fixed exchange rate era.

As for the total foreign sector share in GDP, this has also been growing as shown in chart 5.4. Total foreign sector share in GDP is the sum of export value and import value relative to the GDP. The total foreign sector share in GDP has markedly increased since the ninth quarter of floating rates i.e 1988:4. On the whole total foreign sector share in GDP rose to 11.8% after floating, compared with 8.2% in the last 17 quarters of pre-floating era.

The performance of the external sector of the Ghanaian economy can like the Nigerian case be examined further. Chart 5.5 below reveals the behaviour of exports both pre and after floating. Export value recorded an average quarterly growth rate of 22.6% in the last 17 quarters of fixed rates (i.e if one discountenances 1983:1 and 1984:1 when the growth rates were clearly exceptional). Exports however grew at an

Chart 5.1

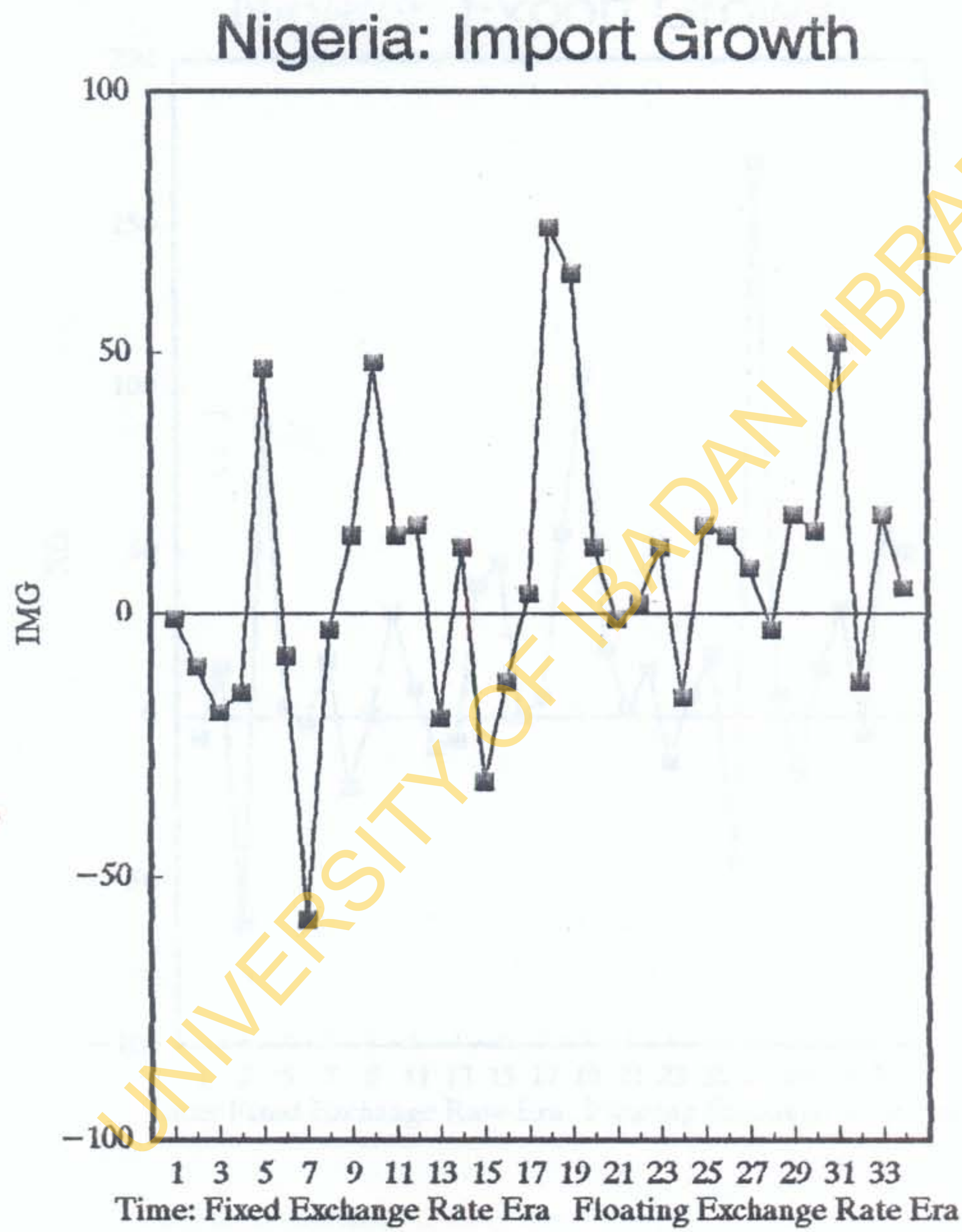

Nigeria: Import Growth
100
50
0
−50
−100
IMG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

Chart 5.2

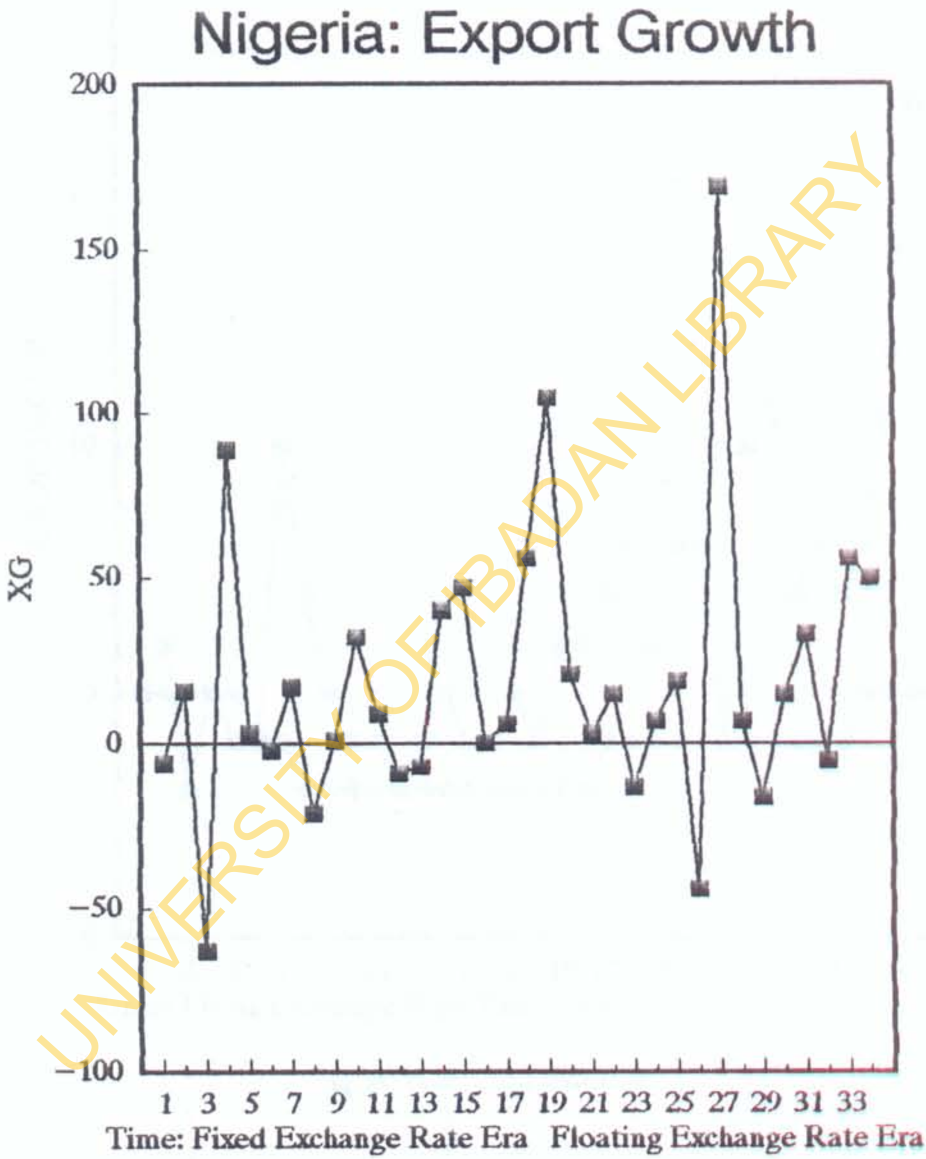
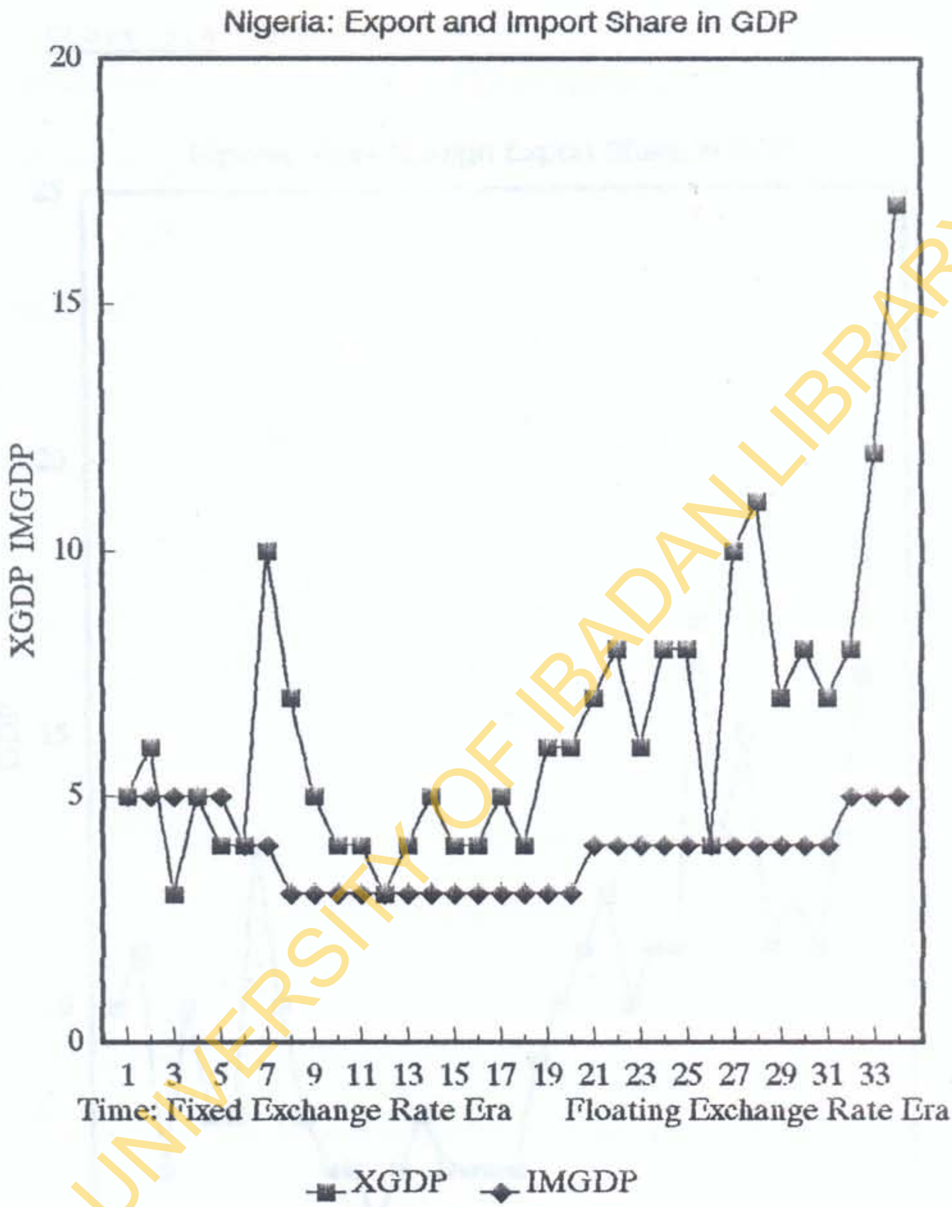
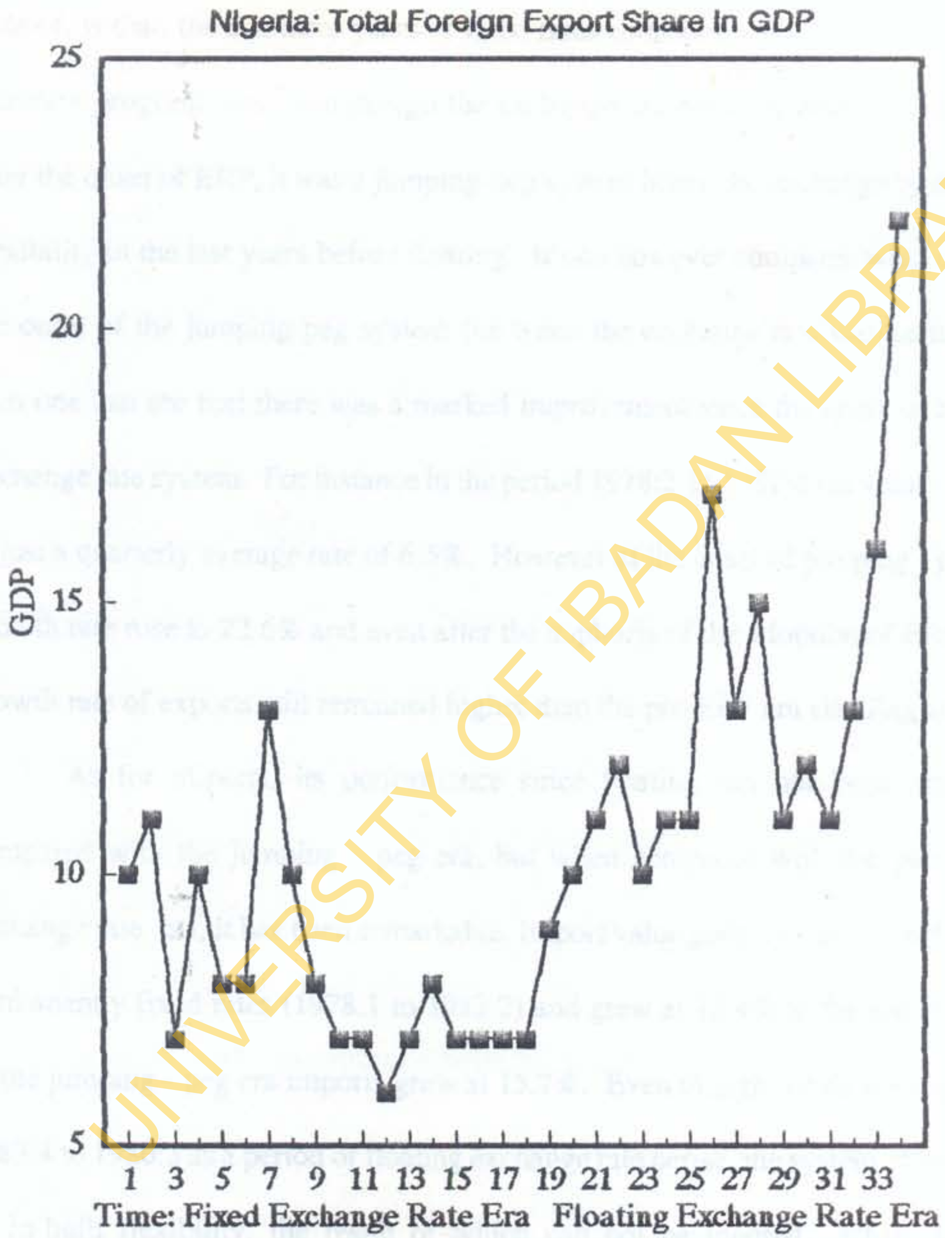

Nigeria: Export Growth
200
150
100
50
0
−50
−100
XG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

Chart 5.3



Nigeria: Export and Import Share in GDP
20
15
10
5
0
XGDP IMGDP
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era
XGDP
IMGDP

Chart 5.4


Nigeria: Total Foreign Export Share In GDP
25
20
15
10
5
GDP
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

average quarterly rate of 9.75% in the first 17 quarters of floating rates. One thing to take note of, is that, the last three years of fixed rates coincided with the onset of the economic recovery program, and even though the exchange rate was not made to float immediately after the onset of ERP, it was a jumping-peg system hence the exchange system had a lot of flexibility in the last years before floating. If one however compares what obtained before the onset of the jumping-peg system (i.e when the exchange rate was permanently fixed) then one can see that there was a marked improvement since the onset of a more flexible exchange rate system. For instance in the period 1978:2 to 1982:4 the value of exports grew at just a quarterly average rate of 6.5%. However at the onset of jumping - peg system this growth rate rose to 22.6% and even after the euphoria of the adoption of ERP had died, the growth rate of exports still remained higher than the pre-ERP era standing at 9.75%.

As for imports, its performance since floating has not been impressive when compared with the jumping - peg era, but when compared with the permanently fixed exchange rate era, it has been remarkable. Import value grew at a rate of 6.4% in the era of permanently fixed rates (1978:1 to 1982:2) and grew at 12.4% in the era of floating rates. In the jumping - peg era imports grew at 15.7%. Even though we do not regard the period 1983:4 to 1986:3 as a period of floating exchange rate per-se, the system of jumping-peg has an in-built flexibility, the result of which can not be ignored. Chart 5.6 reveals the performance of imports in the Ghanaian economy.

In order to know the net performance of exports we compared the share of export in

GDP to that of imports in GDP. Chart 5.7 shows the gap between these two ratios, and shows that for the eight quarters of 1989 - 1990, import share in GDP surpassed export share. For the earlier periods there was no discernible relationship as these ratios fluctuated such that sometimes export share surpassed import share in GDP, at times it is vice-versa. Whatever be the case the total foreign sector share in GDP rose from a meager 1.5% in 1982:3 to 9.8% in 1986:3 and by 1988:2 it reached 19% as revealed in chart 5.8.

In trying to analyze the performance of the external sector of the Ugandan economy under fixed and under floating exchange rates, we found that, exports value grew at a quarterly average of about 10% in the floating exchange era 1982:1 - 1987:1 and at about 7% in the fixed era (i.e 1987:2 - 1990:4 except for the quarters 1987:3 and 1988:3, that were clearly exceptional). As for imports value, it grew at a quarterly average of 14.6% in the era of floating rates and at an average of 19.7% in the era of fixed rates. This is to be expected as exchange rate appreciation in the era of fixed rates encouraged more importation. Also the improved performance of imports in the fixed exchange era may also reflect conscious government efforts to promote imports, believed to be crucial to domestic industrial production and export expansion. Charts 5.9 and 5.10 reveal the performances of exports and imports in the era of floating and of fixed rates. On the whole the net performance is such that in the era of floating rates share of exports

Chart 5.5

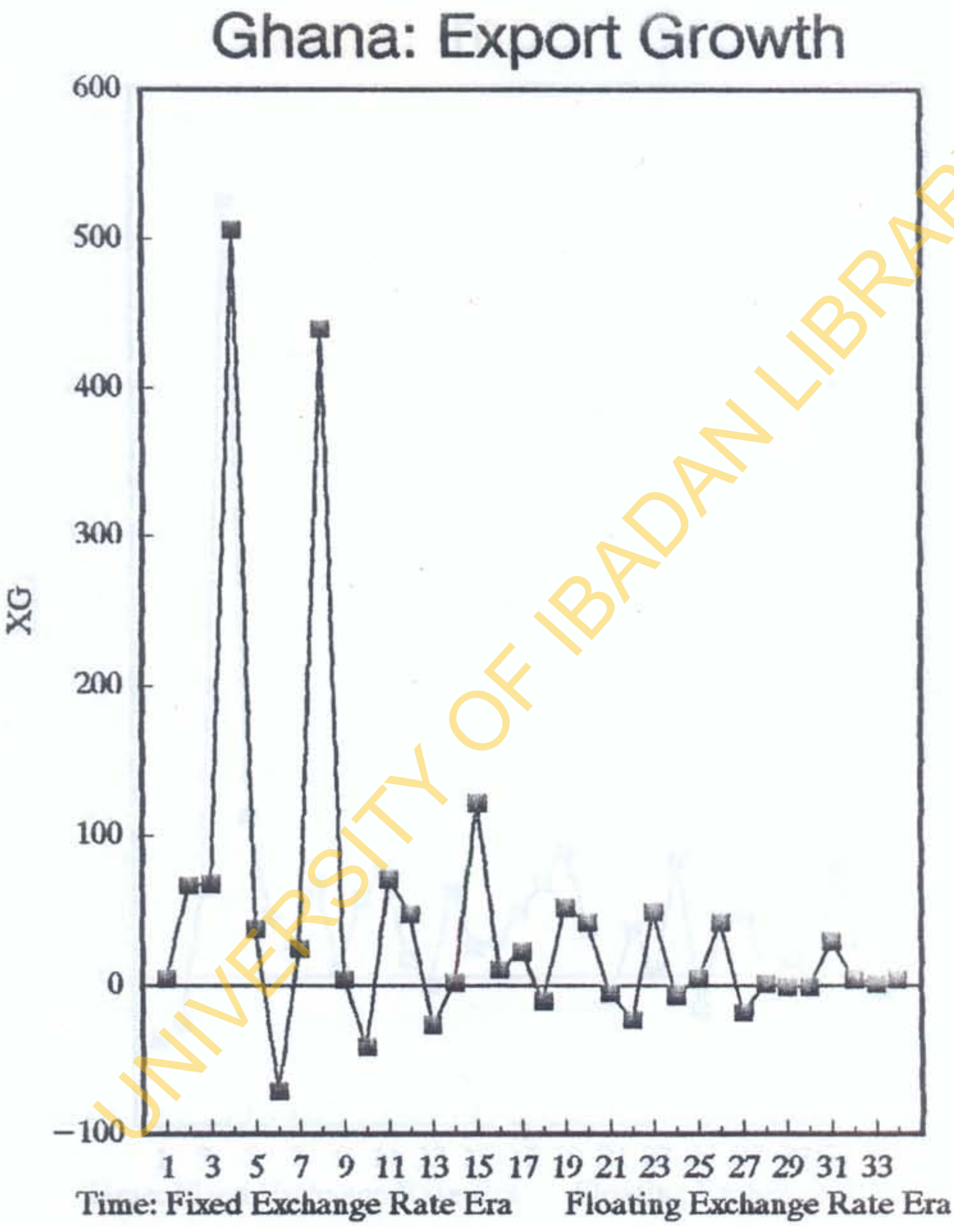

Ghana: Export Growth
600
500
400
300
200
100
0
−100
XG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

Chart 5.6

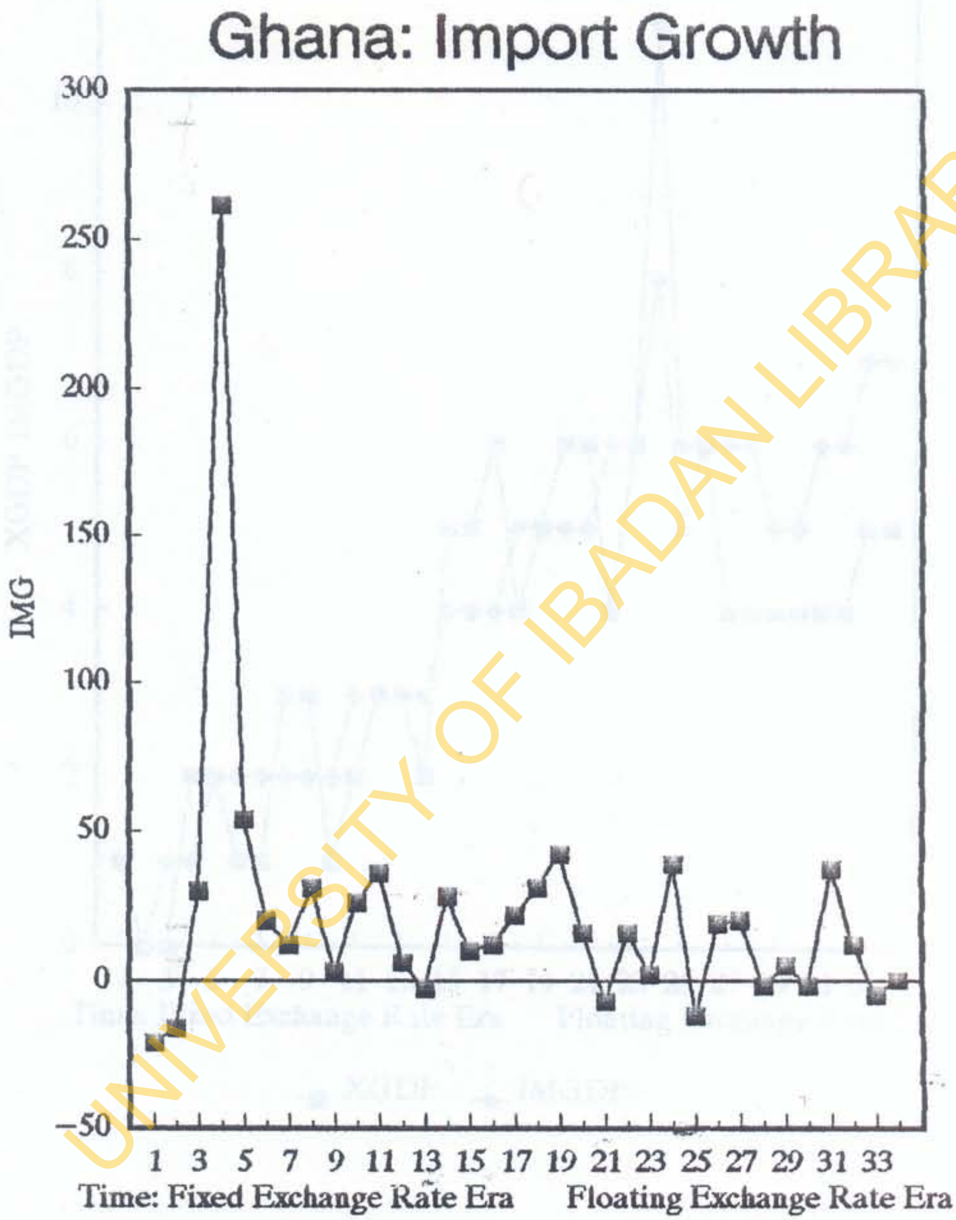

Ghana: Import Growth
IMG
300
250
200
150
100
50
0
-50
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

Chart 5.7

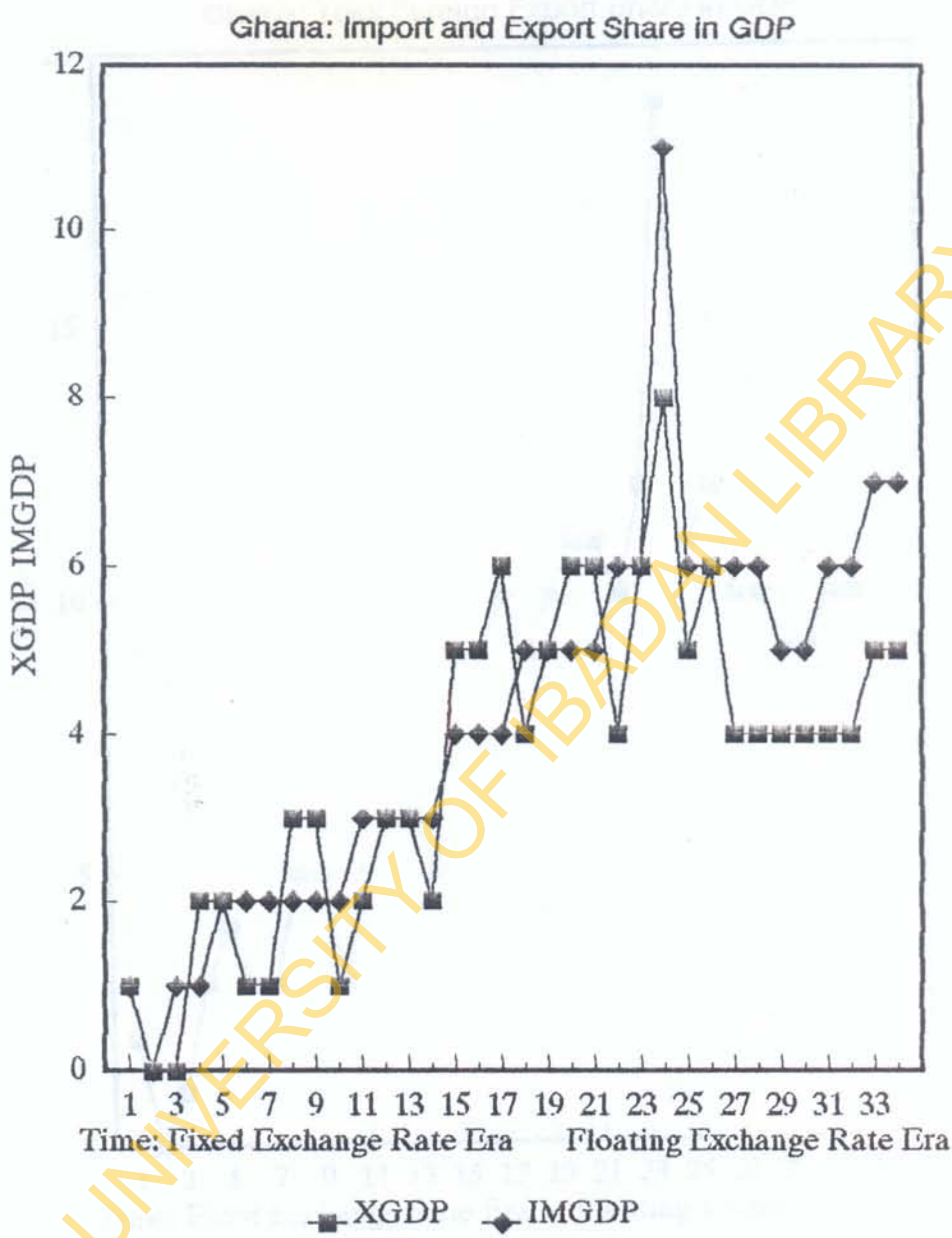

Ghana: Import and Export Share in GDP
12
10
8
6
4
2
0
XGDP IMGDP
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era
XGDP
IMGDP

Chart 5.8

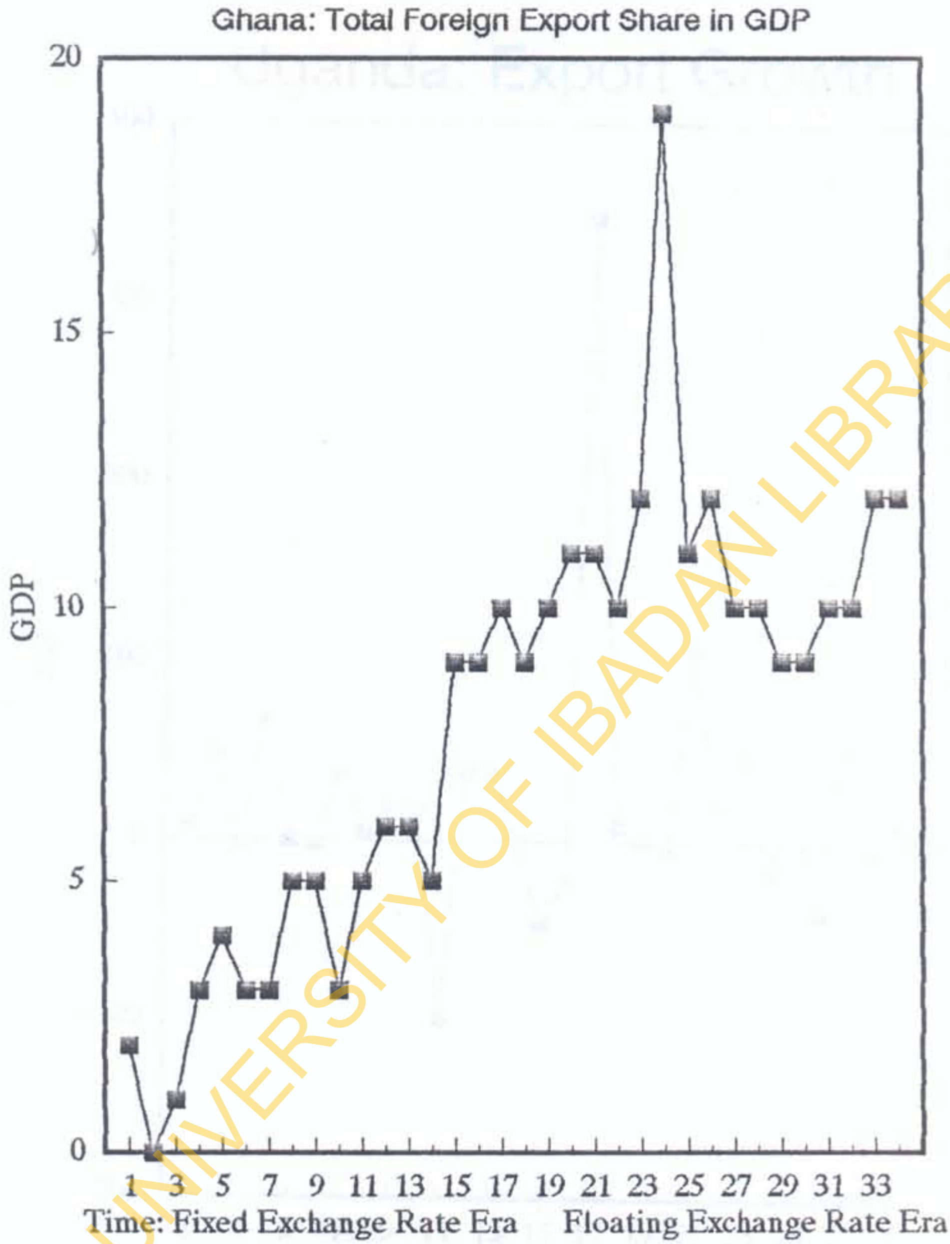

Ghana: Total Foreign Export Share in GDP
GDP
20
15
10
5
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

Chart 5.9

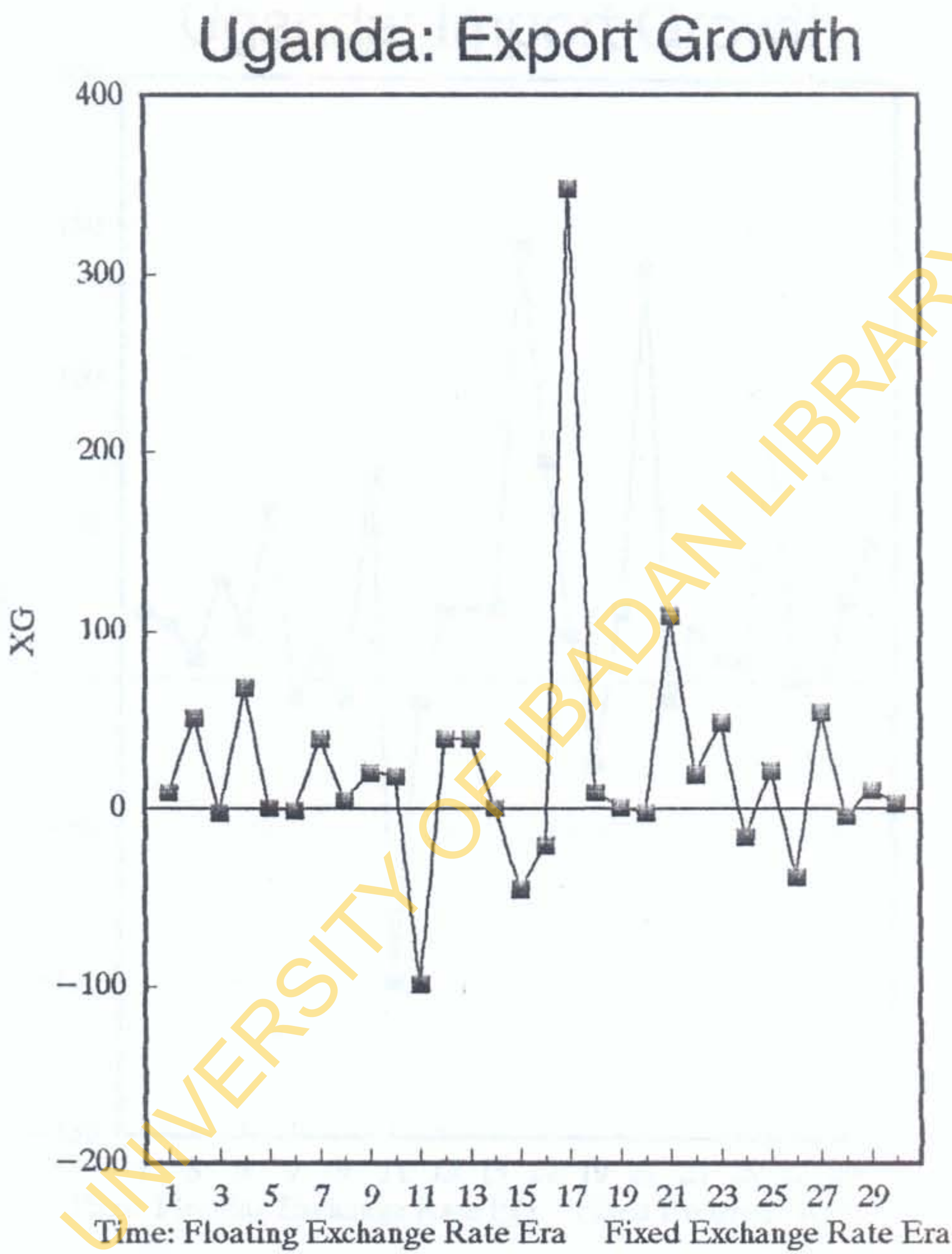

Uganda: Export Growth
400
300
200
100
0
-100
-200
XG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Time: Floating Exchange Rate Era Fixed Exchange Rate Era

Chart 5.10

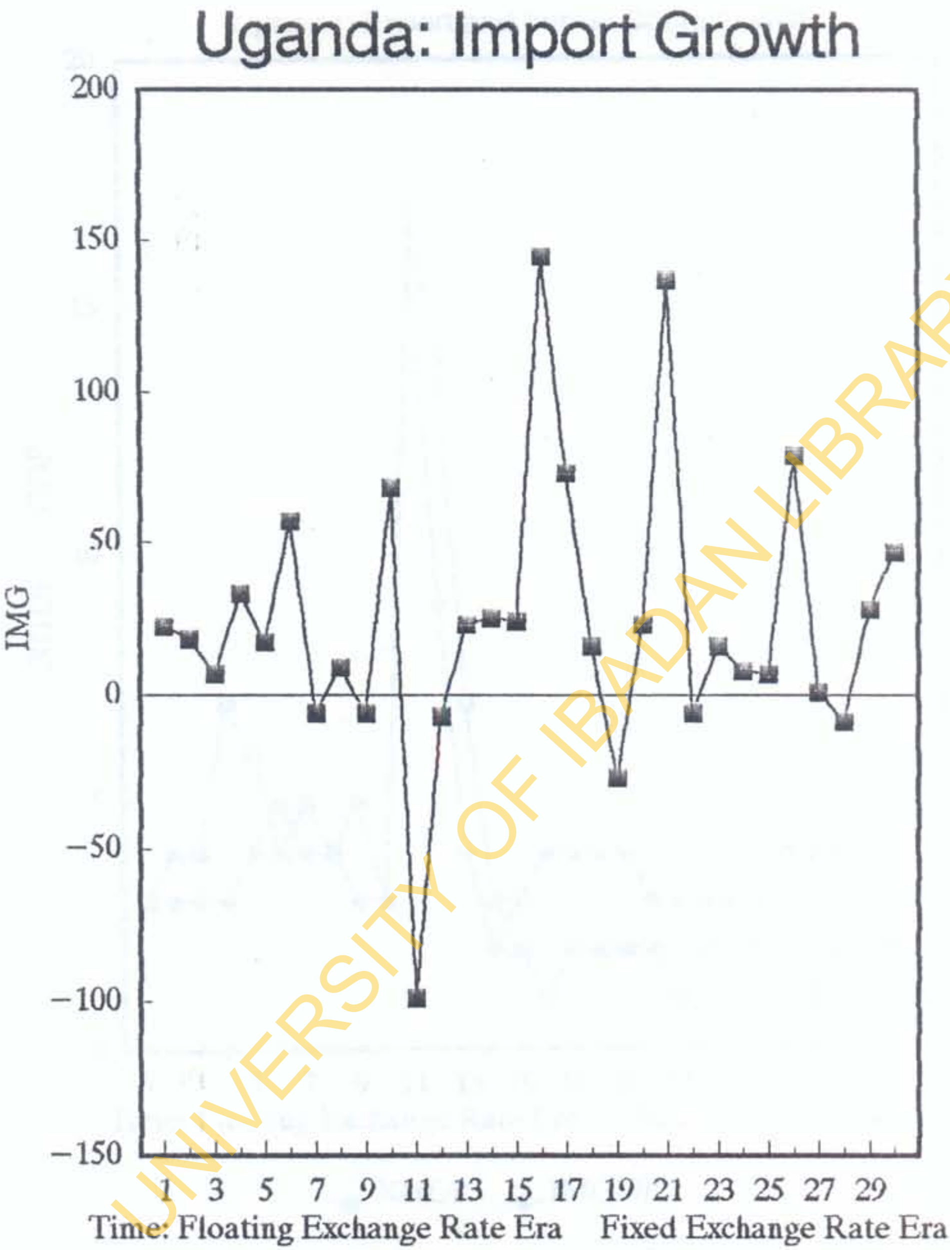

Uganda: Import Growth
200
150
100
50
0
−50
−100
−150
IMG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Time: Floating Exchange Rate Era Fixed Exchange Rate Era

Chart 5.11

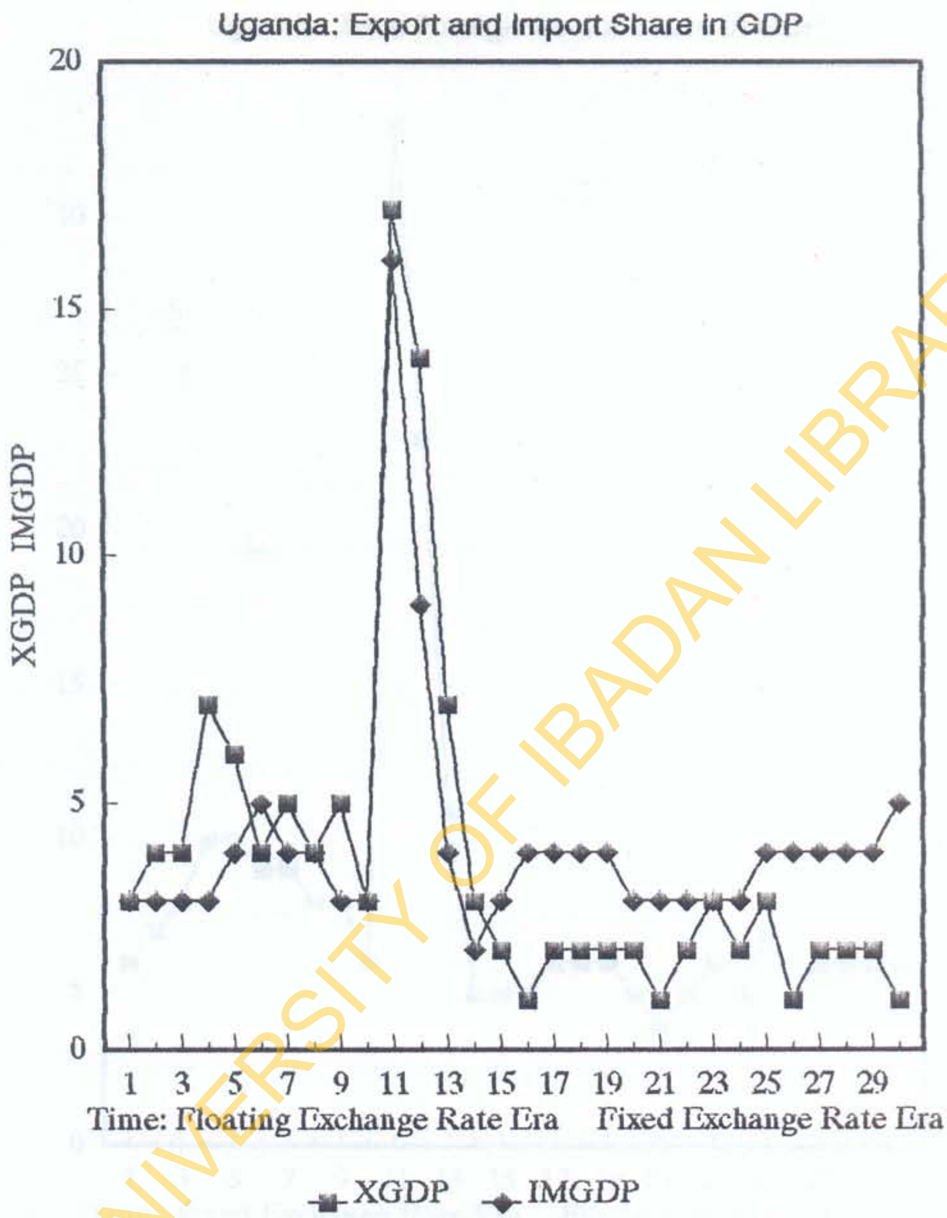
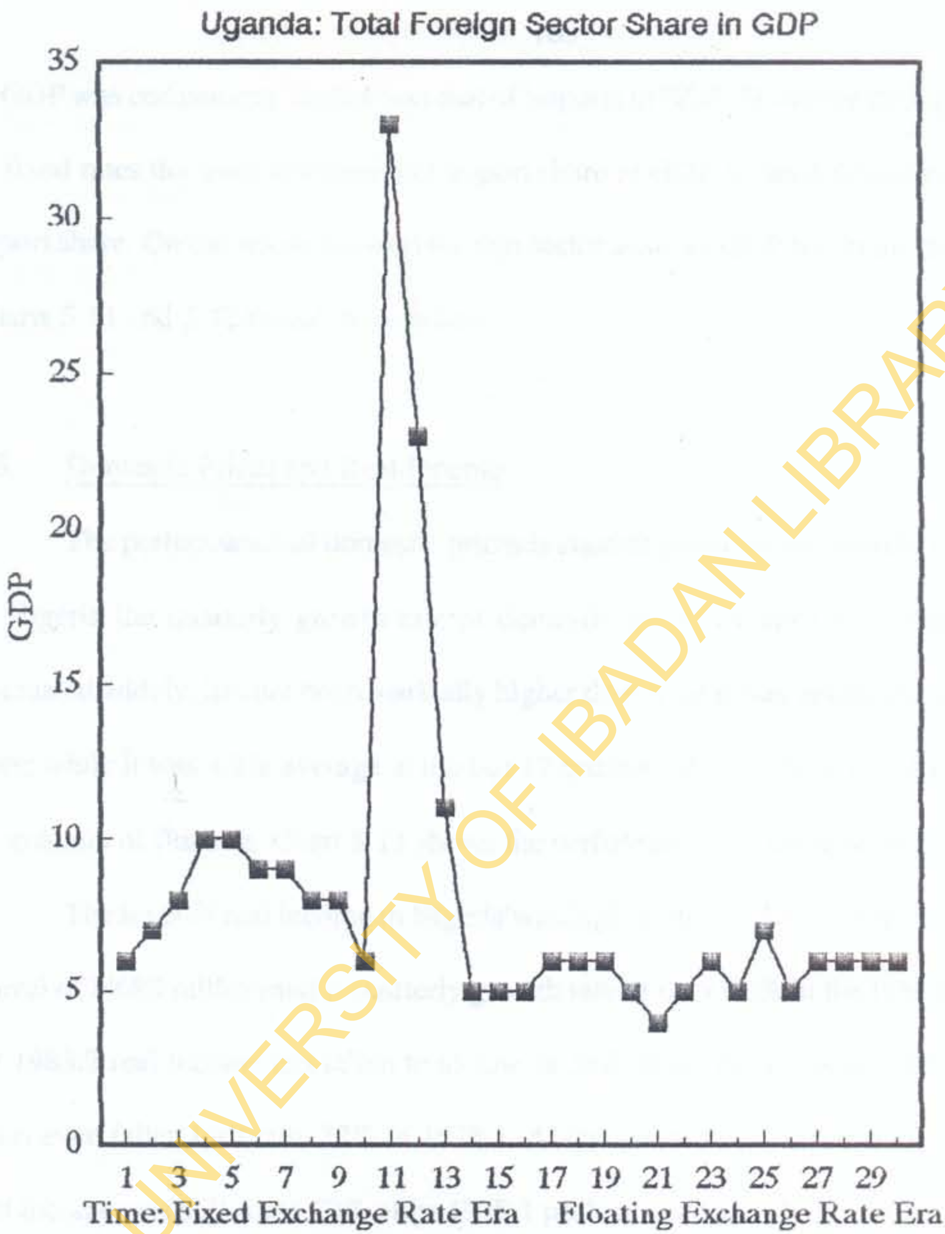

Uganda: Export and Import Share in GDP
20
15
10
5
0
XGDP IMGDP
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Time: Floating Exchange Rate Era Fixed Exchange Rate Era
XGDP
IMGDP

Chart 5.12


Uganda: Total Foreign Sector Share in GDP
35
30
25
20
15
10
5
0
GDP
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

in GDP was consistently higher than that of imports in GDP. However throughout the period of fixed rates the trend reversed and import share in GDP became consistently higher than export share. On the whole the total foreign sector share in GDP fell in the era of fixed rates. Charts 5.11 and 5.12 reveal these points.

5.3 Domestic Prices and Real Income

The performance of domestic prices is another phenomenon worthy of investigation. In Nigeria the quarterly growth rate of domestic prices except for two quarters when it fluctuated widely, has not been markedly higher than what it was before the onset of floating rates; while it was 4.2% average in the last 17 quarters of fixed rates it was 6.1% in the first 17 quarters of floating. Chart 5.13 shows the performance of domestic prices in Nigeria.

The level of real income in Nigeria was highest in the first quarter of 1978, recording a level of N683 million and a quarterly growth rate of over 60% in the first quarter of 1978. By 1983:2 real income has fallen to as low as 38% of its 1978:1 peak level and by 1984:2 it has even fallen further to 22% of 1978:1. At the eve of the structural adjustment program real income was still some 22% of its 1978:1 peak, and stood at ₦151 million. By the fourth quarter of 1986 real income showed considerable improvement recording a quarterly growth rate of over 81% over the previous quarter. From 1987:1 to 1990:4 real income hovered in the neighbourhood of ₦350 million to ₦400 million. Although it has not reached the ₦600 million peak of the 1970s it at least has not fallen below ₦200 million as obtained in the last four years before floating. What is more - the average quarterly growth rate of real income in the first seventeen quarters of floating exchange experience is 8.2% as compared with 3% in the last 17 quarters of fixed exchange system. Chart 5.14 shows the behaviour of real income in the last 17 quarters of fixed exchange system and the first 17 quarters of floating experience.

Chart 5.13

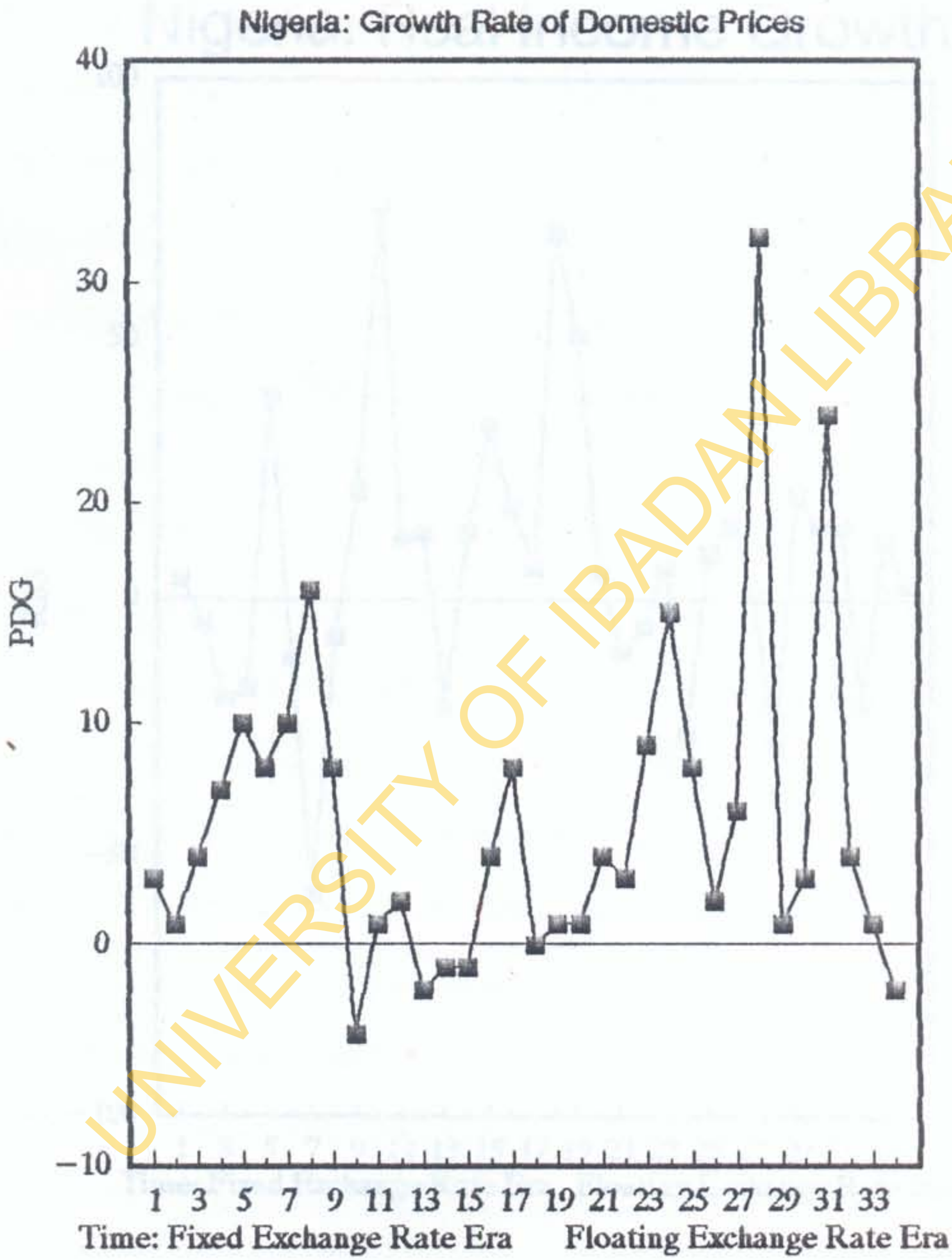
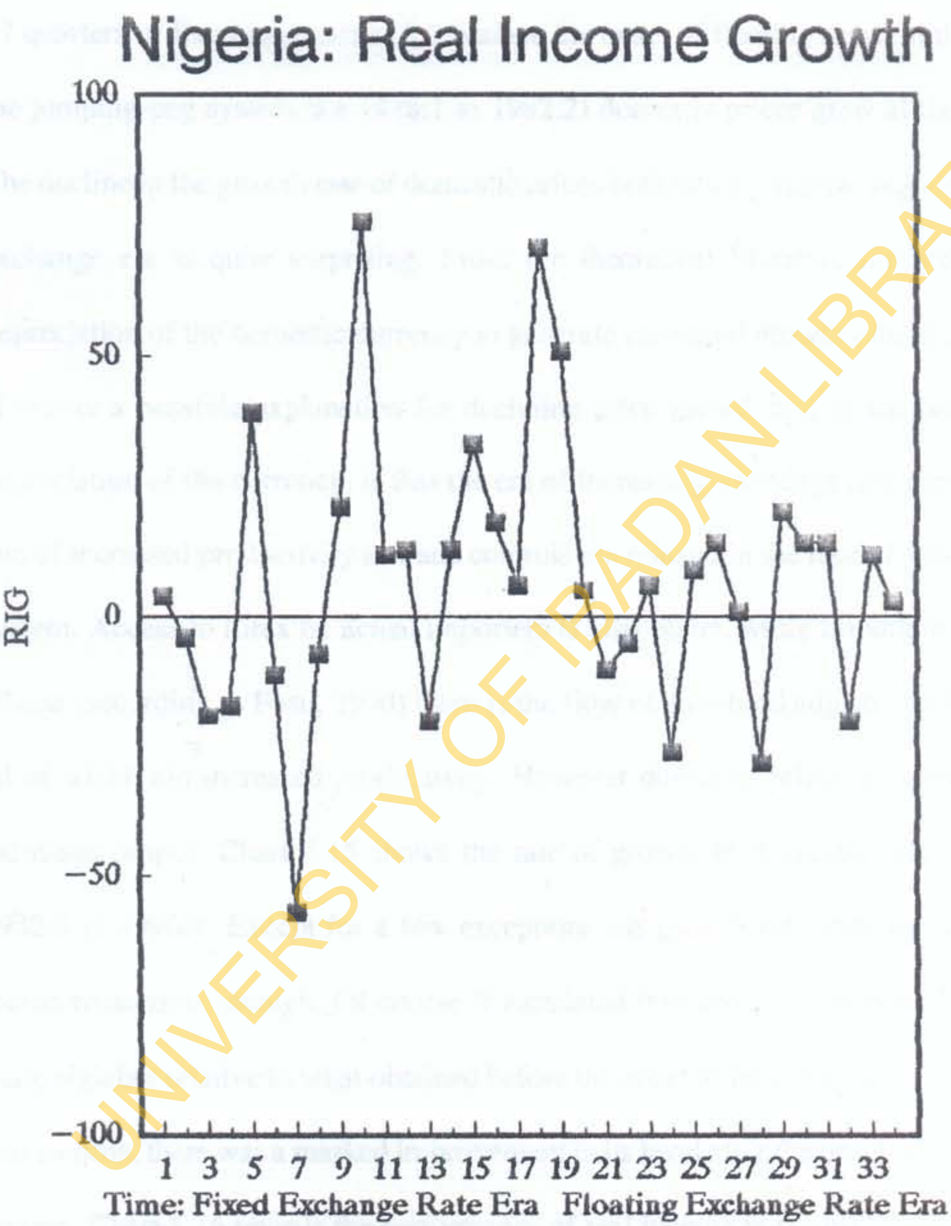

Nigeria: Growth Rate of Domestic Prices
40
30
20
10
0
−10
PDG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

Chart 5.14


Nigeria: Real Income Growth
100
50
0
-50
-100
RIG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

The domestic price level (Pd) in Ghana grew at a quarterly average rate of 10% in the last 17 quarters of fixed rates and at 8.5% since the onset of floating rates; in the period before the jumping-peg system (i.e 1978:1 to 1982:2) domestic prices grew at the rate of 15.9%. The decline in the growth rate of domestic prices both in the jumping-peg and in the floating exchange era is quite surprising. From the theoretical literature one expects increased depreciation of the domestic currency to generate increased growth rate of domestic prices. However a possible explanation for declining price growth rate in the face of increasing depreciation of the currency, is that the era of increasing exchange rate depreciation is also one of increased productivity as trade controls are relaxed in the face of a floating exchange system. Access to forex by actual importers is also easier. More importantly in the case of Ghana (according to Fosu, 1990) there is the flow of structural adjustment loans and grants all of which aid increased productivity. However domestic prices declined in the face of increased output. Chart 5.15 shows the rate of growth of domestic prices for the period 1982:3 to 1990:4. Except for a few exceptions the growth rate after the onset of floating seems reasonable enough. Of course if translated into annual growth rates these rates are quite high but relative to what obtained before the onset of ERP they are much lower. As for real income, there was a marked improvement in its level after the onset of floating exchange regime. Chart 5.16 reveals the performance of real income in Ghana.

Chart 5.15

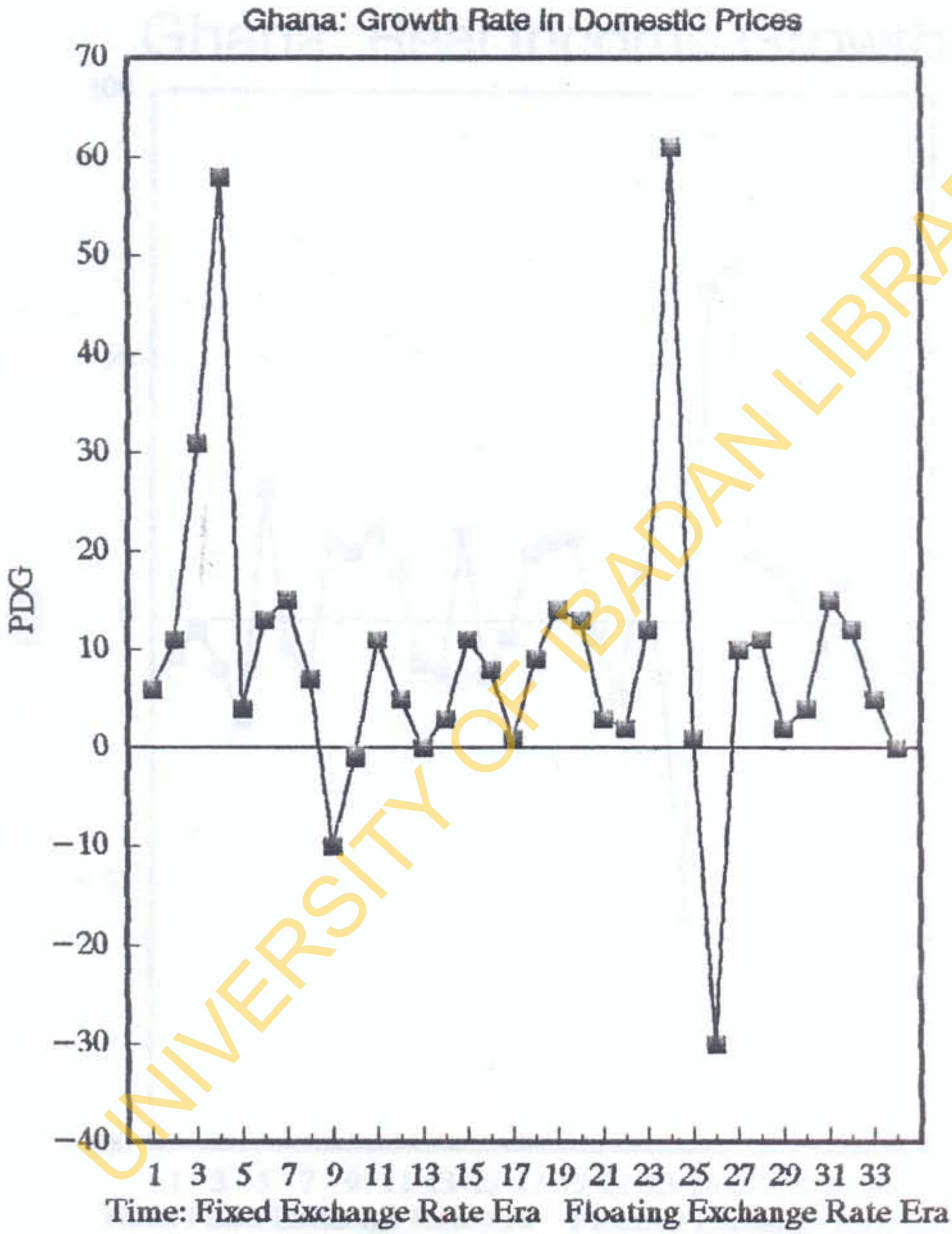
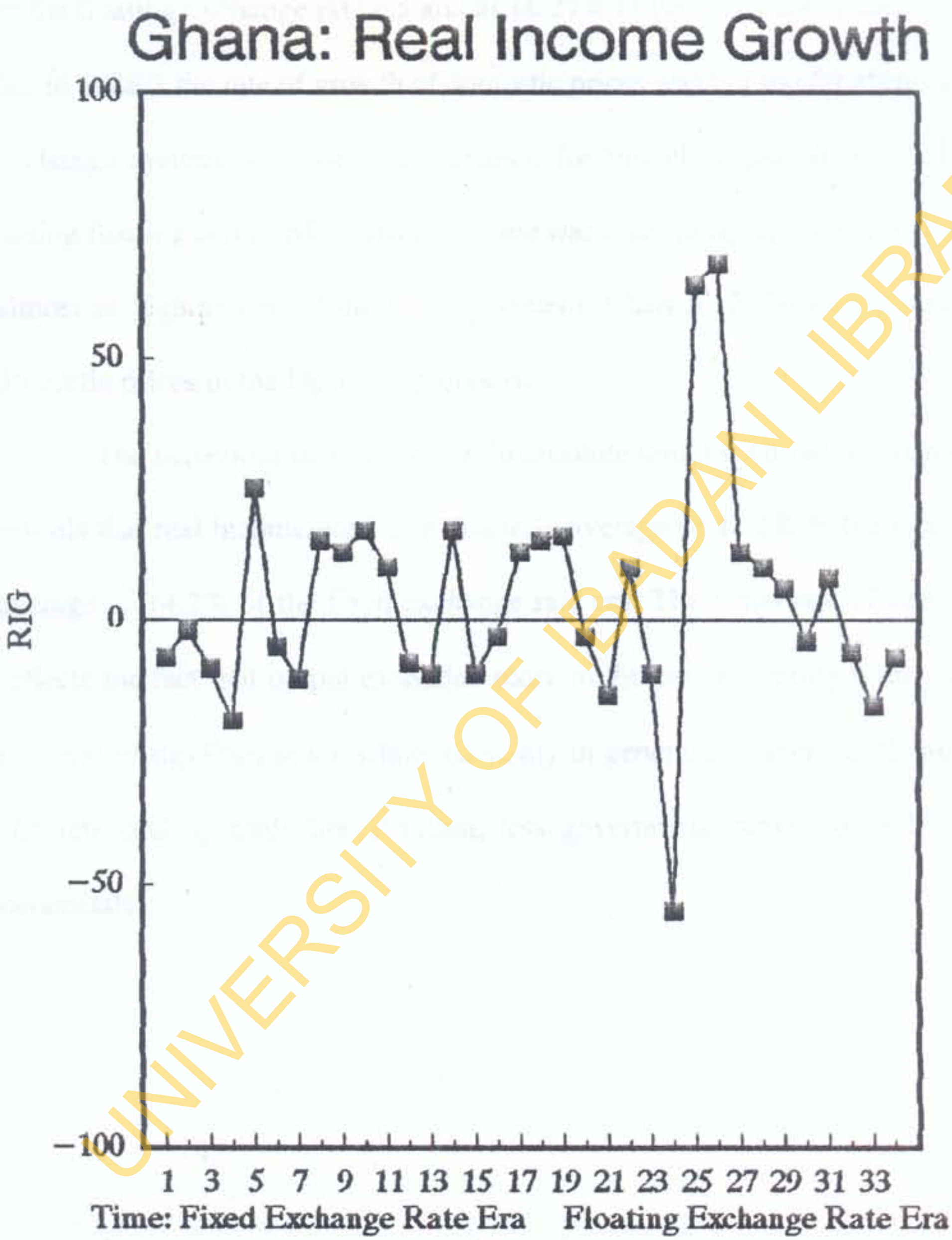

Ghana: Growth Rate in Domestic Prices
70
60
50
40
30
20
10
0
−10
−20
−30
−40
PDG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

Chart 5.16


Ghana: Real Income Growth
100
50
0
−50
−100
RIG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33
Time: Fixed Exchange Rate Era Floating Exchange Rate Era

The domestic price level in Uganda grew at a quarterly average rate of about 17.3% in the floating exchange rate era and at 16.27% in the fixed era. Except for an exceptional fall in 1988:1 the rate of growth of domestic prices was not too far ahead under the floating exchange system. A possible explanation for this close performance of domestic prices during floating and fixed exchange regime was a jumping peg system whose flexibility was almost as high as that of the floating system. Chart 5.17 shows the pattern of growth of domestic prices in the Ugandan economy.

The behaviour of real income in absolute terms is shown in chart 5.18. Chart 5.18 reveals that real income grew at a quarterly average of 42.2% in the floating era and at an average of 14.2% of the fixed exchange rate era. The behaviour of real income probably reflects the fact that output expanded more in the era of floating rates, may be due to the removal of rigidities in the whole economy in general as the era of floating rates was also characterized by trade liberalization, less government control of public enterprises and parastatals.

Chart 5.17

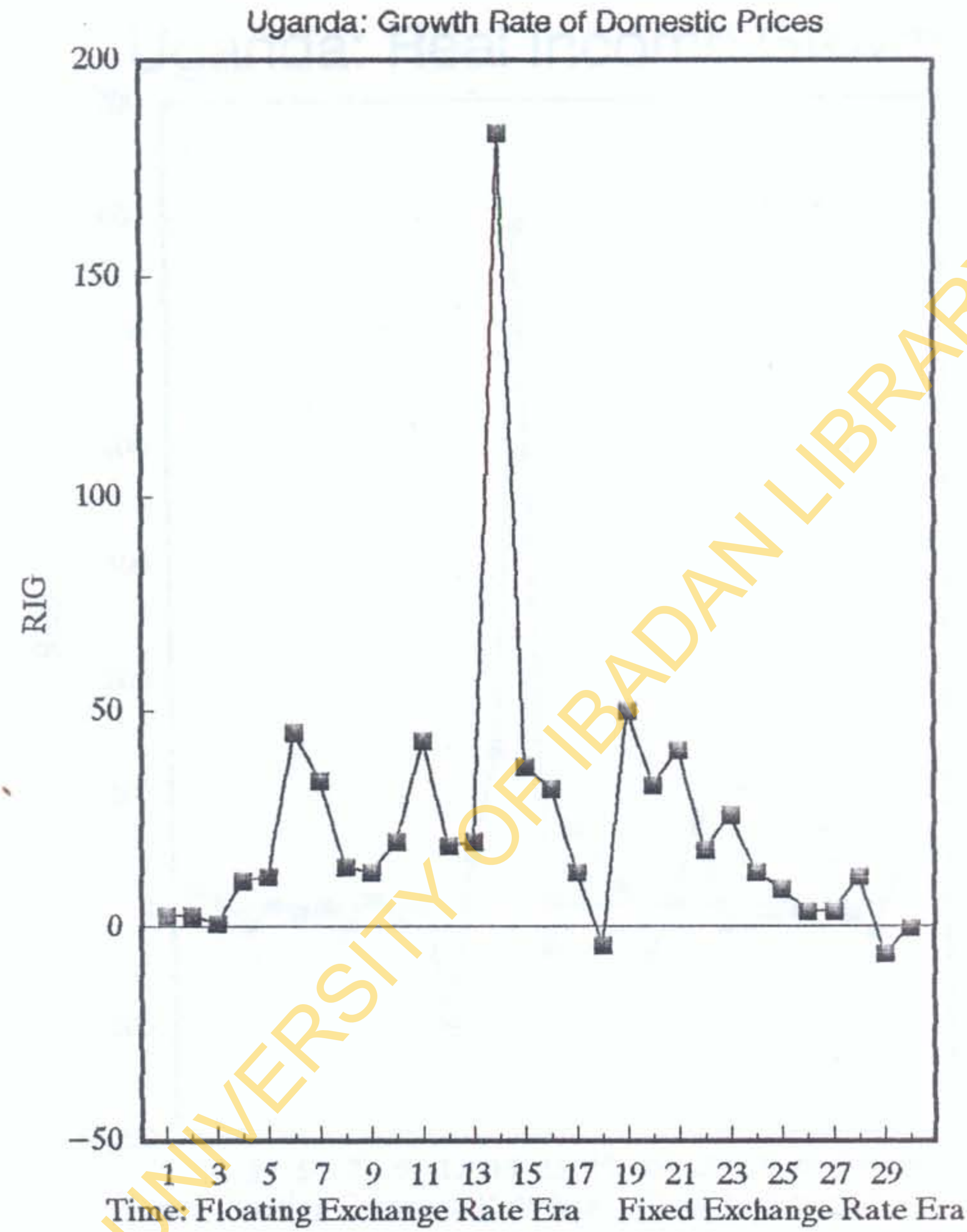
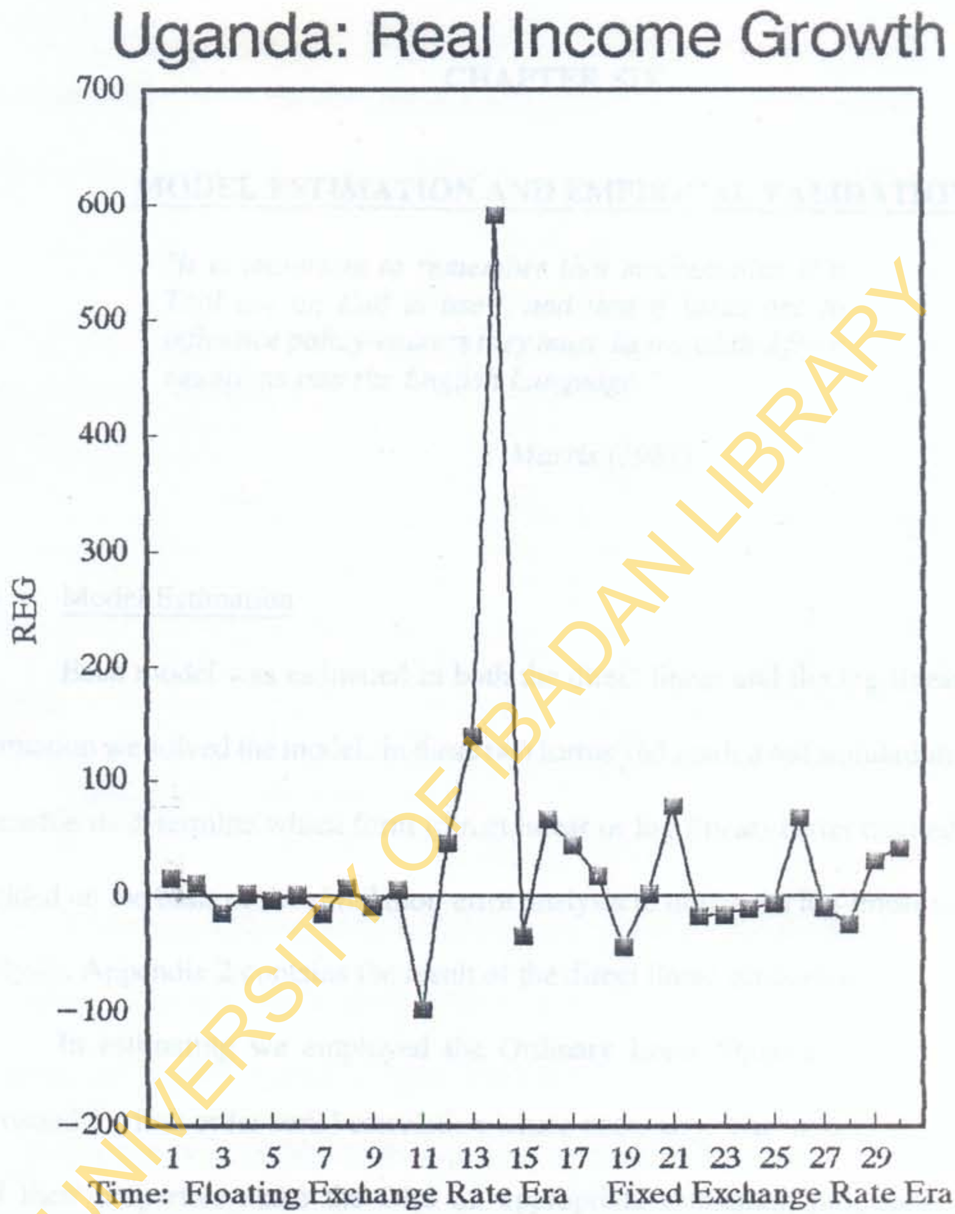

Uganda: Growth Rate of Domestic Prices
200
150
100
50
0
−50
RIG
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Time: Floating Exchange Rate Era Fixed Exchange Rate Era

Chart 5.18


Uganda: Real Income Growth
REG
700
600
500
400
300
200
100
0
−100
−200
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29
Time: Floating Exchange Rate Era Fixed Exchange Rate Era

CHAPTER SIX

MODEL ESTIMATION AND EMPIRICAL VALIDATION

> *"It is important to remember that mathematics is a Tool not an End in itself, and that if ideas are to influence policy-makers they must be translated from equations into the English Language."*
>
> *Marris (1984)*

6.1 Model Estimation

Each model was estimated in both the direct linear and the log-linear forms. After estimation we solved the models in these two forms and carried out simulation-error analysis to enable us determine which form (direct linear or log-linear) better tracked our data. We decided on the basis of the simulation-error analysis to utilize the log-linear form for further analysis. Appendix 2 contains the result of the direct linear estimation.

In estimating we employed the Ordinary Least Squares (OLS) technique and corrected for first order serial correlation where necessary. The models are block-recursive and their properties make the OLS an appropriate estimation procedure (Pindyck and Rubinfeld, 1981). Below we discuss the log linear results on the basis of issues highlighted in 4.1 above.

The first hypothesis we attempted to investigate is, that market determined exchange rates fuel inflation. This implies that there is a significant pass through from exchange rates to domestic prices which is heightened under market determined exchange rates. Table 6.1 gives an indication of whether this hypothesis holds or not. (Note that for all the tables the figures in brackets are the 't' statistics).

TABLE 6.1

Estimation Result For Dependent Variable - Domestic Prices (PD)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES							
			Log RI	Log MSS	Log EN	Log RD	Log π_t	Log PD_{t-1}	R^2	DW
Nigeria	Log PD	0.44	-0.22 (0.98)	0.22 (2.21)	0.05 (2.36)	0.06 (0.55)	0.13 (2.26)	0.74 (9.20)	.98	1.91
Ghana	Log PD	0.39	-0.35 (-2.96)	0.19 (2.56)	0.02 (0.56)	0.17 (2.25)	0.18 (4.70)	0.85 (14.70)	.98	1.88
Uganda	Log PD	2.16	-0.17 (-3.68)	0.16 (4.70)	0.11 (3.12)	0.49 (3.96)	0.10 (2.34)	0.82 (16.90)	.99	1.89

Note the figures in bracket are the 't' Statistics.

From table 6.1 we see that in Nigeria the exchange rate of domestic prices is 5%, and the relationship is statistically significant at the 5% level. However the money supply elasticity of domestic prices is more pronounced, standing at 22% while the elasticity of domestic prices with respect to inflationary expectations is 13%. All the relationships were statistically significant at the 5% level. These results show that in Nigeria there is indeed some pass through from nominal exchange rates onto prices, but the impact is not as pronounced as that of money supply or inflationary expectations or that of real income on prices. Though real income had the effect of lowering prices whenever it (real income) rises.

In Ghana there does not seem to be any pass through from nominal exchange rates onto domestic prices, given an exchange rate elasticity of domestic prices of only 2% which is also not statistically significant at the 5% level. Nominal money supply in Ghana, however, impacted significantly on domestic prices at the 5% level and so does real income. The money supply elasticity of domestic prices was 19% and real income elasticity - 35%. Similarly, as in Nigeria expectations with respect to inflation influenced current prices with an elasticity of 18% the relationship also proved to be statistically significant. Nominal domestic rate of interest also proved to be a powerful propeller of prices in Ghana. These Ghanaian results confirm the contention of Chibber and Shaffik (1989) that in Ghana it is not so much nominal exchange rate depreciation that fuels inflation as it is reckless increases in money supply often engendered by reckless fiscal deficits.

In Uganda there is a remarkable pass through from exchange rates unto domestic prices. The exchange rate elasticity of domestic prices in Uganda is 11% and this is statistically significant at the 5% level. This result seems to contradict Elbadawi (1990) wherein he maintained that in Uganda it is excessive fiscal deficits that fuel inflation rather than official exchange rate depreciation. It is however important to note that the impact of nominal money supply on domestic prices is much more remarkable. The money supply elasticity of domestic prices in Uganda is 49% and this is statistically significant at the 5% level. Another variable that seems to impact considerably on domestic prices is the domestic rate of interest. One is therefore tempted to conclude that Elbadawi (1990) may be right to the extent that both money supply and domestic rates of interest proved to be more powerful propellers of prices in Uganda, than the nominal exchange rate. Then one might say government monetary policy action which often is taken to finance its fiscal deficits is the major source of inflation and not nominal exchange rates.

It is important to note that real income had an inverse relationship with domestic prices for all three countries indicating that as output rises, prices fall; the relationship though significant for Ghana and Uganda was insignificant for Nigeria, (at the 5% level). The result for Ghana and Uganda uphold the position in the literature that the higher the level of output the lower the price level would be (Dombusch 1980, Edwards 1988).

The second issue we investigated is, that market determined exchange rates follow the money supply. If this hypothesis is valid then monetary policy is extremely important for efficient performance of a floating exchange rate regime. Table 6.2 reveals the result of this test.

TABLE 6.2

Estimation Result For Dependent

Variable - Nominal Exchange Rate (EN)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES					
			Log RDF_t	Log RE_{t-1}	Log Y_t	Log MSS_t	R^2	DW
Nigeria	Log EN	-2.02	0.37 (0.93)	-0.40 (-4.13)	-0.05 (-0.34)	0.85 (3.01)	.95	2.10
Ghana	Log EN	-1.48	0.53 (1.20)	-0.50 (-2.71)	-0.18 (-4.49)	0.54 (2.04)	.85	1.95
Uganda	Log EN	-1.64	0.32w (1.41)	-0.49 (-4.75)	-0.13 (-3.52)	0.37 (2.97)	.89	1.91

In Nigeria nominal exchange rate seems quite responsive to changes in the money supply. The nominal money supply elasticity of exchange rates is 85% and this relationship is statistically significant at the 5% level. Another variable that impacted significantly on nominal exchange rates is international reserves (with a one period lag). The reserve elasticity of exchange rate is 40% in Nigeria. The relationship is inverse indicating that the higher the level of reserves the lower (or more appreciated) the exchange rate becomes. Nominal income however is insignificant in Nigeria in the determination of nominal exchange rates. Both the Ghanaian and Ugandan results follow the Nigerian pattern in this respect. The Ghanaian and Ugandan results indicate that indeed the nominal exchange rate follows the money supply. The money supply elasticity of nominal exchange rates is 54% in Ghana and 37% in Uganda.

These results show that prudent and disciplined monetary policy is very crucial to the success of a floating exchange rate regime in these countries. One interesting point to note is the impact of interest rate differential on nominal exchange rates. The theoretical expectation is that the higher the interest rate differential (i.e domestic rate of interest minus foreign rate of interest) the more appreciated the domestic currency becomes, because a higher domestic rate of interest relative to (the foreign one) should encourage capital inflow, from the three countries this relationship turned out with the wrong sign (positive instead of being negative) and was also statistically insignificant at the 5% level . The probable reason for this situation is that in the literature it is often assumed that domestic securities are perfect substitutes for foreign securities, so that a higher domestic rate of interest should increase investment in domestic securities by foreign residents. However, in reality, the securities of our focus countries are not considered as perfect substitutes for foreign securities, so that no matter how high domestic rate of interest gets it is not likely to generate any appreciable capital inflow and hence no exchange rate appreciation will follow a rising domestic rate of interest as theory postulates.

A third hypothesis we looked at is that altering the structure of relative prices in the export sector by depreciating nominal exchange rates will generate increased export value given a two period lag (Khan 1981, Jebuni et al 1991) . Table 6.3 reveals the result of this test.

TABLE 6.3

Estimation Result For Dependent Variable - Export Value (X)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES					
			Log RIS_t	Log $ETOT_{t-2}$	Log IM_{t-1}	Log DPX_{t-2}	R^2	DW
Nigeria	Log X_t	-49.41	0.70 (3.79)	-1.01 (-2.57)	0.38 (3.85)	1.69 (3.80)	.92	2.10
Ghana	Log X_t	-10.10	0.77 (5.55)	0.43 (4.31)	0.78 (2.14)	0.28 (2.23)	.96	1.90
Uganda	Log X_t	-8.04	0.67 (5.32)	-0.78 (-4.92)	0.56 (5.80)	0.57 (5.72)	.93	2.10

From table 6.3 we found that the elasticity of exports with respect to changes in the relative export price ($ETOT_{t-2}$) in Ghana is 43% and this is statistically significant at the 5% level. This reveals the fact that altering the structure of relative prices in the export sector given a two period lag can be quite important in increasing export value. For Nigeria and Uganda however the result came out with the wrong sign (Negative instead of Positive). The suspicion here is that for these two Countries (Nigeria and Uganda) a two-period lag is not the appropriate lag structure, probably some other lag structure will elicit the appropriate response.

Another way by which we tried to see the impact of nominal exchange rate movement on exports is through the actual price of exports in domestic currency terms given a two period lag (DPX_{t-2}). As shown in table 6.3 the elasticity of exports with respect to its domestic price given a two period lag is 169% for Nigeria, 28% for Ghana and 57% for Uganda. The relationship was statistically significant at the 5% level in the three countries. This shows that nominal exchange rate depreciation which enhances income in the export sector, encourages increased export supply. It is important to note that real income had a positive and significant impact on exports in the three countries.

A fourth issue we investigated is, that, imports are crucial to export performance, so that compressing imports leads to reduced exports and expanding imports, leads to increased exports as well. Table 6.3 also contain the required information. For the three focus countries import impacted significantly on exports (at the 5% level). The import elasticity of exports is 38% in Nigeria, 78% in Ghana and 56% in Uganda.

The fifth hypothesis considered is, that, changing the structure of relative prices in the import sector in favour of the domestic goods, leads to declining imports. (Machlup, 1939, 1940; Alexander 1959,1961; Tsiang 1961, Sohmen 1965; Dornbusch 1980; Mussa 1976). Table 6.4 contain the relevant information on this score.

TABLE 6.4

Estimation Result For Dependent

Variable - Import Value (IM)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES					
			RDM_t	Log RI_t	RPIM	Log DRE_t	R^2	DW
Nigeria	Log IM_t	-1.15	0.37 (3.34)	0.33 (3.14)	0.12 (0.50)	0.28 (3.47)	.86	1.99
Ghana	Log IM_t	-0.16	0.25 (2.84)	0.30 (3.45)	0.03 (0.62)	0.41 (2.10)	.98	1.89
Uganda	Log IM_t	-16.07	0.28 (2.63)	0.84 (11.34)	-3.11 (-1.39)	0.58 (2.58)	.93	1.97

For Ghana and Nigeria the relationship between imports and relative prices (RPIM) turned out with the wrong sign. Even for Uganda wherein the relationship turned out with the right sign, the relationship proved to be statistically insignificant (at the 5% level). It was also statistically insignificant for Nigeria and Ghana too. However when we looked at the real income elasticity of imports (also from Table 6.4) we found the relationship to be statistically significant and with the right signs too. The real income elasticity of imports is 33% for Nigeria, 30% for Ghana and 84% for Uganda. This result goes to confirm the contention of Osagie (1985) and Ajakaiye (1985) that for developing countries like Nigeria, altering the relative price structure in the import sector is not likely to affect imports, because import in these countries depends more on real income than on prices. One possible reason for this observed insensitivity of imports to relative price change is the complete dependence of almost all sectors of developing economies on imported inputs and machineries, so that irrespective of rising relative import prices certain level of imports has to be maintained otherwise these dependent economies would completely collapse.

That imports in developing countries also largely depend on import-capacity rather than prices (Hemphill,1974 ; Moran 1984, Ndulu 1991) is the sixth hypothesis we attempted to validate from Table 6.4. Taking the change in the level of international reserves as a proxy for import-capacity we tried to find the nature and degree of relationship between imports and change in international reserves. We found that the elasticity of imports with respect to changes in the international reserve level is 28% for Nigeria, 41% for Ghana and 58% for Uganda and the relationship is significant at the 5% level for all the countries. This result has implications for export promotion as shown in the next hypothesis.

The seventh hypothesis we investigated is that, net exports is a major determinant of import-capacity. We investigated this hypothesis through the relationship of net exports (or trade balance) to the international reserve level as shown in Table 6.5. Table 6.5 shows that the trade balance elasticity of reserves is 28% for Nigeria, 36% for Ghana, and 44% for Uganda (given a one-period lag in the trade balance i.e. TB_{t-1}). The relationship is statistically significant at the 5% level in all the three countries. These results confirm that net exports is a crucial determinant of import - capacity to the extent that it impacts reserves significantly and the change in reserves is according to hypothesis six, a major determinant of imports. If we combine the results of hypothesis six and seven with that of hypothesis four, it becomes obvious that the relationship between imports and exports is a cyclical one and it could be a virtuous or vicious circle depending on the take-off point. So, it is important for policy makers to take cognisance of this interwoveness in designing policies that affect exports and imports.

TABLE 6.5

Estimation Result For Dependent

Variable - International Reserves (RE)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES				
			$EMSS_t$	Log GD_{t-1}	Log TB_{t-1}	R^2	DW
Nigeria	Log RE_t	1.21	-0.24 (-2.48)	0.33 (3.14)	-0.24 (-2.48)	.91	1.98
Ghana	Log RE_t	1.48	-0.58 (-4.62)	0.30 (3.45)	-1.10 (-2.56)	.86	1.88
Uganda	Log RE_t	0.12	-0.32 (-2.36)	0.84 (11.34)	-0.41 (-2.36)	.81	1.87

TABLE 6.7

Estimation Result For Dependent

Variable - Real Demand For Money (RDM)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES					
			Log Y_t	Log GE_t	Log RD_t	Log RDM_{t-1}	R^2	DW
Nigeria	Log RDM_t	3.75	0.02 (0.27)	0.17 (2.72)	-1.26 (-2.03)	0.25 (2.03)	.89	1.99
Ghana	Log RDM_t	2.59	0.54 (5.48)	0.21 (2.83)	-1.59 (-2.86)	0.54 (6.92)	.86	1.95
Uganda	Log RDM_t	3.75	0.59 (2.23)	0.18 2.77	-2.01 (-3.24)	0.57 (6.34)	.96	1.93

That government deficit is a major source of excessive money supply increases is indirectly revealed in table 6.6 where the money supply is significantly impacted by government deficit. The government deficit elasticity of money supply is 76% for Nigeria, 85% for Ghana, and 71% for Uganda all are statistically significant at 5% level.

The money supply on the other hand significantly impacts the international level as revealed on table 6.5 where there is and inverse relationship between excess money supply, and the reserve level. This shows that often reserves drawn down are monetized thus increasing the money supply, and often is for purpose of financing government deficits.

The drawing down reserve to finance government deficit is a major source of money supply increases, and, given the extent of passthrough between money supply and domestic prices as shown under the first issue discussed, it follows that fiscal irresponsibility is a major source of inflation in these three focus countries. That government spending is a prime determinant of economic activity in the focus countries is shown in table 6.7 where the government expenditure elasticity of the real demand for money is 17%, 21% and 18% in Nigeria, Ghana and Uganda respectively, all statistically significant at the 5% level.

Table 6.8 reveals that the main determinant of the domestic rate of interest in Nigeria and Ghana is the money supply. When there is excess money supply the domestic rate of interest falls. Thus the relationship between the domestic rate of interest and excess money supply is negative and significant at the 5% level for Nigeria and Ghana. Also significant for the domestic rate of interest in Nigeria is the inflationary expectations and the past level of the rate of interest. for Ghana the inflationary expectations impacts remarkably on the domestic rate of interest but the level of the rate seems to have no bearing on its present level. In Uganda the supply seems to have no significant impact on the domestic rate of interest but nominal income and inflationary expectations do.

In Table 6.9, real income is shown to respond insignificantly to demand pressures in Nigeria and Ghana. This probably reflects the fact that there are structural rigidities in these economies that make it difficult for output to increase promptly and in proportion to increased demand. Hence the relationship between real income and excess real demand for money came out positive but insignificant in the two countries. Imports however impacted significantly on real income in the three countries, while the differential between previous real income and the mean real income also proved significant. In Uganda, demand pressure impacts real income significantly given an excess real demand for money elasticity of real income of 68% which was significant ant 5% level.

In all we can conclude that for Nigeria and Uganda there is indeed some degree of pass through between nominal exchange rates and domestic prices. However even in these economies nominal exchange rates are not the most forceful in propelling domestic prices, rather the money supply and inflationary expectations are. In Ghana nominal exchange rates do not seem to impact domestic prices at all, the most important explanatory variable in this respect is the money supply. Also market determined exchange rates seem to follow the money supply. This implies that exchange rate depreciation occurs with undue increases in the money supply. Therefore there is need for prudent and disciplined monetary policy for the success of a flexible exchange rate regime. As for our ninth hypothesis ie. that macroeconomic indicators improve on the adoption of a floating exchange rate system we need the results of the simulation exercises to be able to test this hypothesis. Hence this issue shall be discussed in the next chapter.

Table 6.8
Estimation Result For Dependent
Variable - Domestic Rate of Interest (RD)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES					
			Log $EMMS_t$	Log Π_t	Log Y_t	Log RD_{t-1}	R^2	DW
Nigeria	Log RD_t	-1.98	-0.29 (-2.67)	0.06 (2.66)	0.02 (0.43)	0.52 (4.15)	.96	1.99
Ghana	Log RD_t	2.07	-0.16 (-2.02)	0.19 (1.22)	0.15 (2.18)	0.05 (0.04)	.80	1.93
Uganda	Log RD_t	-0.02	0.05 (1.61)	0.54 (3.48)	0.54 (3.48)	0.16 (2.75)	.86	1.97

Table 6.9

Estimation Result For Dependent

Variable - Real Income (RI)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES					
			Log $RDME_t$	Log $RISD_{t-1}$	Log PD_t	Log IM_t	R^2	DW
Nigeria	Log RI_t	0.02	0.11 (0.65)	0.59 (3.24)	-0.32 (-2.50)	0.31 (3.39)	.88	1.93
Ghana	Log RI_t	3.96	0.02 (0.39)	0.27 (4.11)	-0.15 (-2.42)	0.16 (2.67)	.85	1.97
Uganda	Log RI_t	12.27	0.68 (4.40)	0.85 (2.65)	-0.18 (-2.19)	0.55 (3.82)	.87	1.95

TABLE 6.6

Estimation Result For Dependent

Variable - Nominal Money Supply (MSS)

Country	Dependent Variable	Constant	INDEPENDENT VARIABLES				
			Log RI_t	Log TDC_{t-2}	Log DRE_t	R^2	DW
Nigeria	Log MSS_t	0.19	0.22 (3.14)	0.76 (16.90)	0.14 (3.15)	.89	1.98
Ghana	Log MSS_t	0.62	0.07 (0.21)	0.85 (16.28)	0.23 (2.75)	.95	2.01
Uganda	Log MSS_t	8.37	0.16 (5.99)	0.71 (13.43)	0.31 (3.12)	.95	1.97

6.2 Empirical Model Validation

We solved each of our models using the Time Series Processor (TSP) econometric software (Version 4.0) developed by Hall in 1983. When we solved each model using the Gauss-Seidel iterative technique (Ortega and Rheinboldt, 1951) each converged for each endogenous variable and for each year. This demonstrates that each model is internally consistent. Below is the result of the model validation exercise for each country.

The root mean square simulation errors for all the endogenous variables in the Nigerian model are as shown in table 6.10. The Theil's inequality coefficient as well as its decomposition for all the endogenous variables are shown in table 6.11.

Table 6.10

NIGERIA: ROOT MEAN SQUARE SIMULATION ERRORS

Dependent Variable	RMSE
Domestic Prices	0.0600
Real Demand for Money	0.1030
Money Supply	0.1600
Domestic Rate of Interest	1.5300
Exports	0.2400
Imports	0.2800
International Reserves	1.6480
Nominal Exchange Rates	0.5200
Real Income	0.2240

Table 6.11

NIGERIA: THEIL'S INEQUALITY COEFFICIENT AND ITS DECOMPOSITION

Dependent Variable	Theil's Inequality	Bias Proportion	Variance Proportion	Covariance Proportion
PD	0.00014	0.000057	0.00798	0.99145
RDM	0.00050	0.002070	0.06521	0.93272
MSS	0.00027	0.000100	0.04093	0.95897
RD	0.16399	0.142300	0.11426	0.74344
X	0.00084	0.000030	0.06558	0.93439
IM	0.00124	0.000080	0.02775	0.97224
RE	0.26309	0.171990	0.16397	0.66404
EN	0.04248	0.002220	0.00330	0.99448
RI	0.00149	0.000020	0.88370	0.91161

For six of the nine endogenous variables the RMSE is less than 0.3, while it is about 0.5 for one of the variables. For the two other variables the RMSE is greater than 1, i.e RD and RE respectively. And if we compare the value of the RMSE with the average size of the variables in question we get SRMSE of 0.1228 and 0.0003 respectively which indicate that the error is marginal. As for how well the model captures turning-points, charts 6.1 to 6.6 reveal that the Nigerian model has performed well in this respect. The Domestic Price Chart reveals that often the simulated values of this variable exactly equal the actual values and all turning-points are perfectly tracked. The same goes for all the other endogenous variables too.

The values of the Theil's Inequality coefficient are small with the largest being 0.26039. The smallness of these values indicate the absence of systematic bias. The decomposition of the Theil's inequality coefficient into its component parts indicate that only a small part of the error is due to bias for all endogenous variables except for domestic rate of interest and international reserves. But given that the value of the Theil's inequality coefficient for each of these variables is itself small (i.e. less than 0.3) then the fact that 0.17 of the error is due to bias as in the case of RE, should not be too much cause for worry. Generally the distribution of the errors is in favour of the covariance proportion for most of the variables computed, which indicates the degree of unsystematic error. Since the covariance proportion represents the remaining error after deviations from average values and average variabilities have been accounted for, its accounting for the highest proportion of the errors shows that the model on Nigeria performed beautifully as systematic error is minimal.

As for Ghana the root mean square simulation errors for all the endogenous variables in the Ghanaian model are as shown in table 6.12.

Table 6.12
GHANA: ROOT MEAN SQUARE SIMULATION ERRORS

Dependent Variable	RMSE
Domestic Prices	0.1278
Real Demand for Money	0.1850
Money Supply	0.1334
Domestic Rate of Interest	0.0649
Exports	0.2668
Imports	0.2195
International Reserves	0.3065
Nominal Exchange Rates	0.0845
Real Income	0.1850

The root mean square simulation error is quite small for all the endogenous variables. The largest value of the RMSE is 0.3065 for RE, when we compare this RMSE to the average size of the variable in question (i.e International Reserves) we get an SRMSE of only 0.00011, which shows that RMSE of 0.3065 is not too bad. The low values of the RMSE show that the simulated variables, did not depart significantly from the actual time path of these variables thus revealing that our model was able to track the underlying economic realities.

As for how well the turning points are captured charts 6.7 to 6.12 depict how well our model did this. The charts reveal that all movements in our endogenous variables are almost perfectly tracked by our model.

The Theil's inequality coefficient as well as its decomposition are shown in table 6.13 for all the endogenous variables.

Table 6.13

GHANA: THEIL'S INEQUALITY COEFFICIENT AND ITS DECOMPOSITION

Dependent Variable	Theil's Inequality	Bias Proportion	Variance Proportion	Covariance Proportion
PD	0.0004	0.0010	0.0025	0.9965
RDM	0.0021	0.0023	0.0273	0.9724
MSS	0.0056	0.0000	0.0031	0.9969
RD	0.0004	0.0367	0.4282	0.5353
X	0.0017	0.0001	0.0095	0.9904
IM	0.0006	0.0008	0.0031	0.9961
RE	0.1154	0.0444	0.1284	0.8338
EN	0.0002	0.0011	0.0002	0.9987
RI	0.0010	0.0011	0.1001	0.8989

For all the endogenous variables the Theil's inequality coefficient is quite small the largest being 0.1154. Also the error proportions are in favour of the covariance proportion implying that whatever error is observed is not systematic, so that just as in the case of

Nigeria our model of the Ghanaian economy has performed well in capturing underlying realities of the Ghanaian economy.

For Uganda the root mean square simulation errors (RMSE) for all the endogenous variables in the Ugandan model are as shown in Table 6.14 below.

Table 6.14

Uganda: Root Mean Square Simulation Errors.

Dependent Variable	RMSE
Domestic Prices	0.1308
Real Demand for Money	0.4855
Money Supply	0.1324
Domestic Rate of Interest	0.1211
Export	0.0704
Import	0.0636
International Reserve	0.3973
Nominal Exchange Rate	0.4258
Real Income	0.0759

The RMSE is quite small for all the endogenous variables indicating the absence of systematic error in the model. We constructed charts of the actual versus simulated behaviour of the variables. Charts 6.13 to 6.18 reveal the extent to which our model tracks reality and show that our model of the Ugandan economy is an adequate reflection of reality.

Also we used the Theil's inequality coefficient and its decomposition to measure the predictability of our model. Table 6.15 below reveals the result of the exercise.

TABLE 6.15
Uganda: Theil's Inequality Coefficient And Its Decomposition

Dependent Variable	Theil's Inequality	Bias Proportion	Variance Proportion	Covariance Proportion
PD	0.00022	0.00039	0.0033	0.99620
RDM	0.01722	0.00009	0.00320	0.99671
MSS	0.00014	0.00033	0.0033	0.99630
RD	0.00122	0.00453	0.07438	0.92109
X	0.2151	0.04080	0.0176	0.94150
IM	0.23880	0.04670	0.0115	0.94170
RE	0.00225	0.00001	0.09180	0.90819
EN	0.00538	0.00005	0.04930	0.95065
RI	0.08260	0.03966	0.01945	0.94090

Table 6.15 reveals that our model is able to accurately predict reality. The highest value of the Theil's inequality coefficient permissible is 0.3 while the highest value in our model is 0.23880 for imports, and the bias proportion is also very small. The covariance proportion is highest indicating that any available errors at all are unsystematic. Results of the simulation exercises are discussed in chapter seven.

CHART 6.1

Nigeria: Actual/Simulated Chart.

Domestic Price(PD).

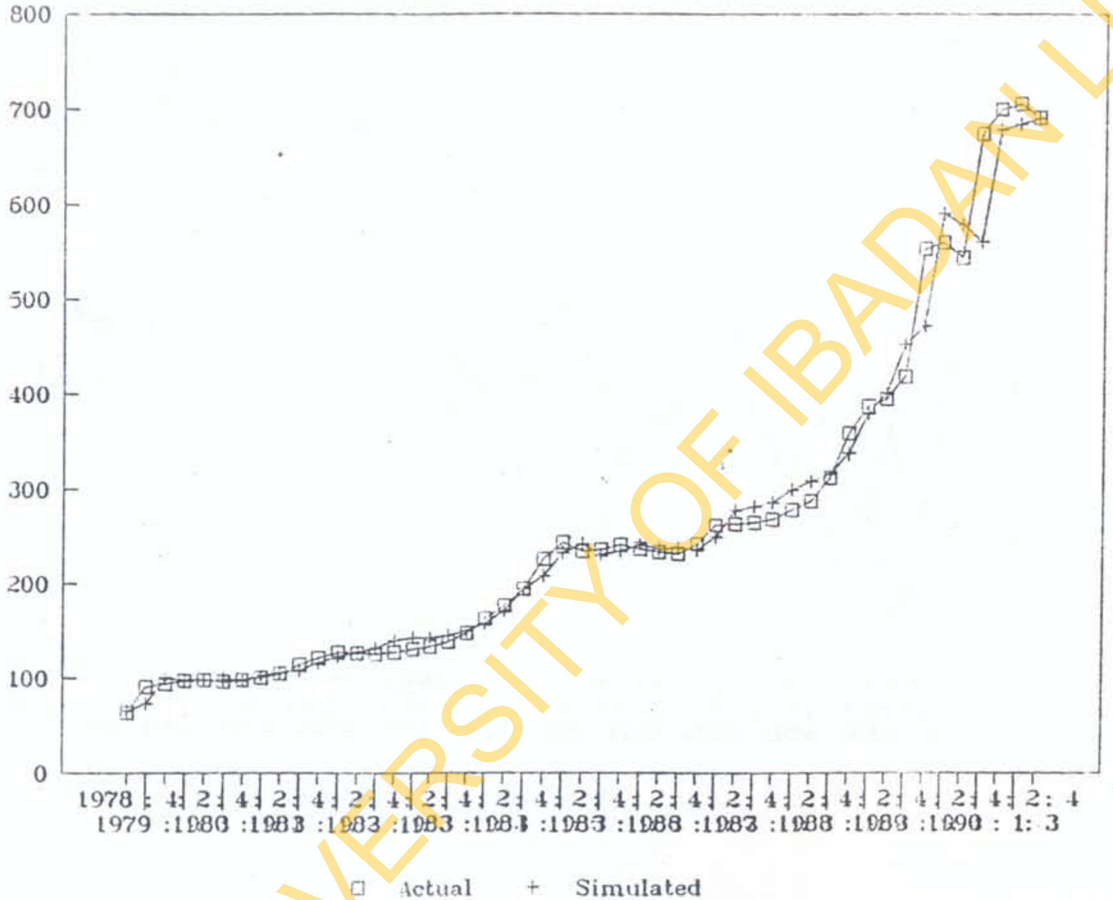


CHART 6.2

Nigeria: Real Demand Money (RDM)

ACTUAL/SIMULATED

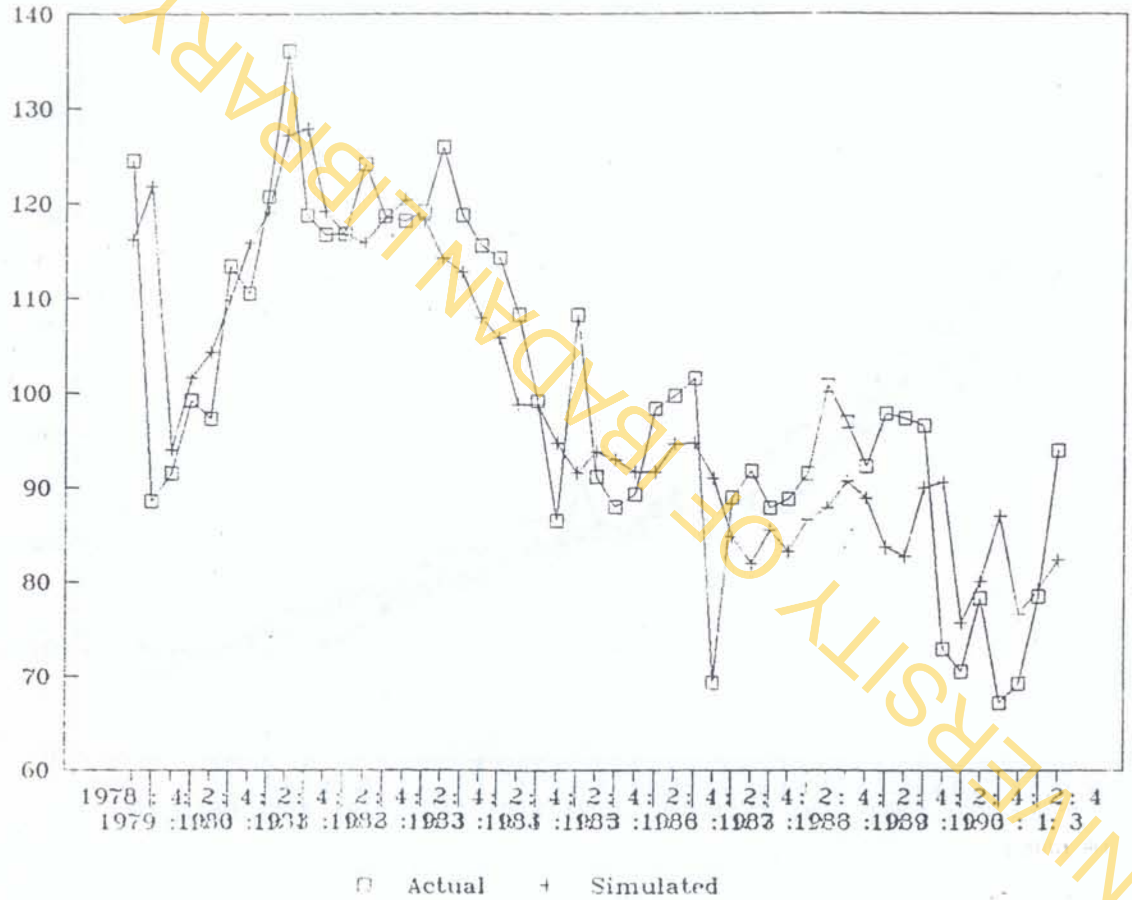


CHART 6.3

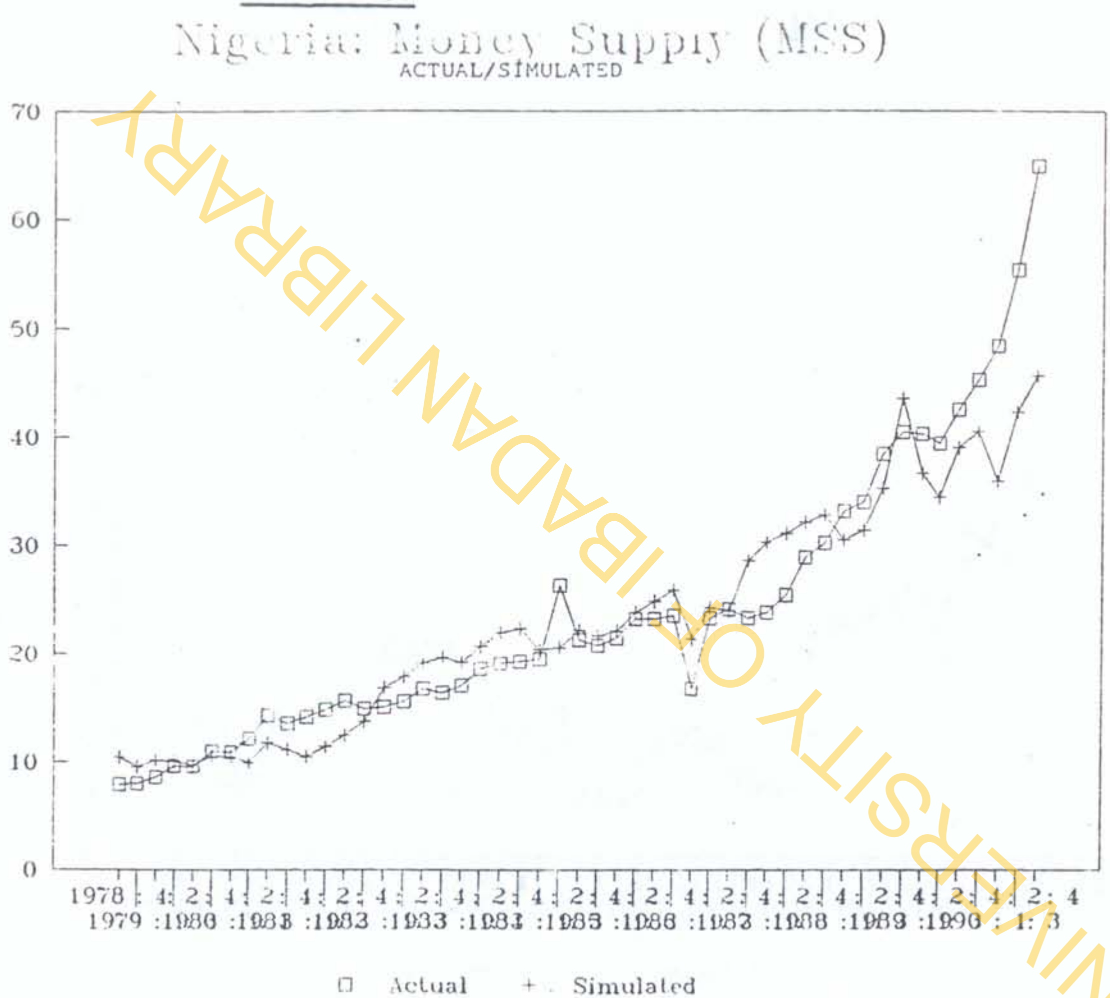

Nigeria: Money Supply (MSS)
ACTUAL/SIMULATED
70
60
50
40
30
20
10
0
1978 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4
1979 :1980 :1981 :1982 :1983 :1984 :1985 :1986 :1987 :1988 :1989 :1990 : 1: 3
Actual
Simulated

CHART6.4

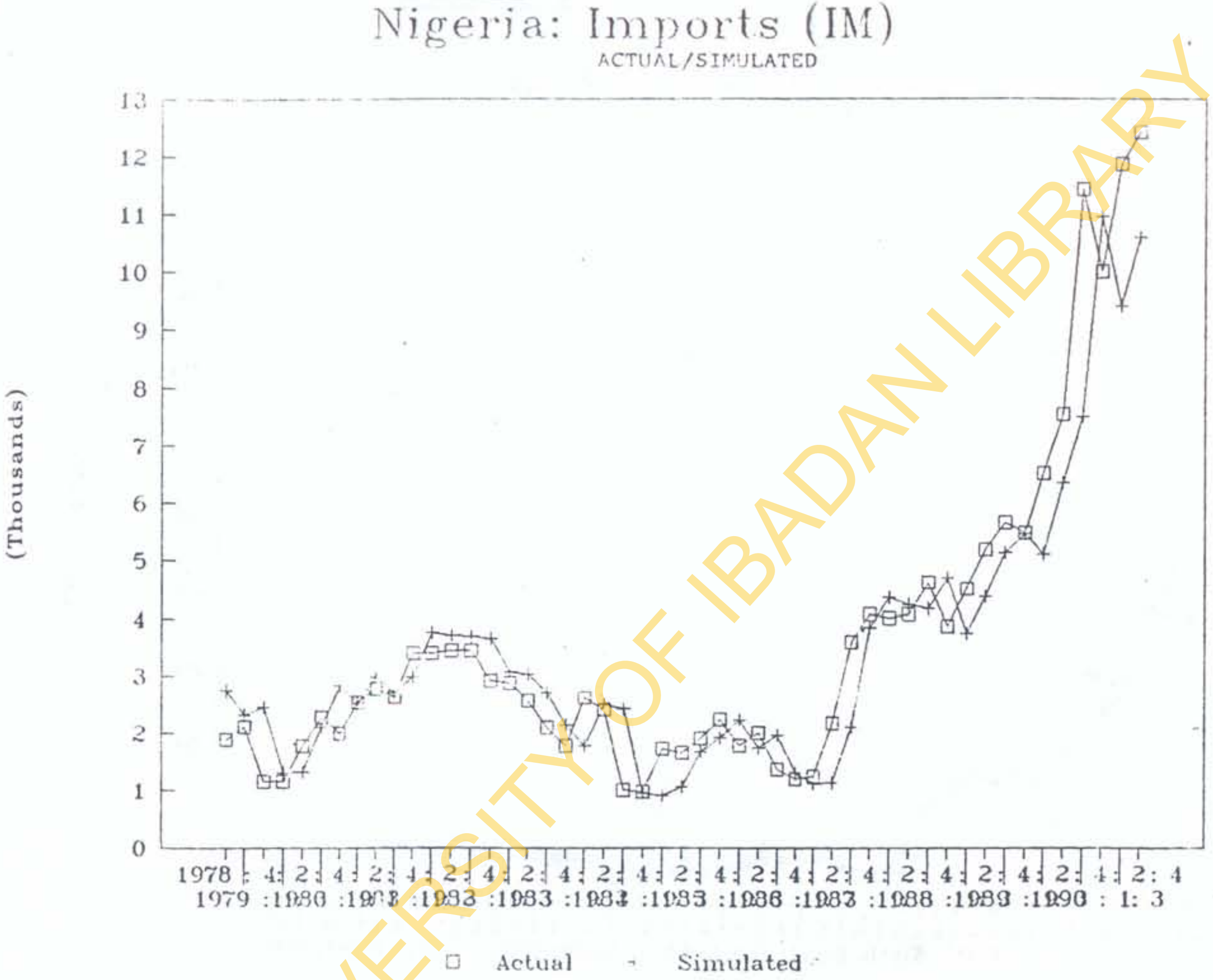

Nigeria: Imports (IM)
ACTUAL/SIMULATED
(Thousands)
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1978
1979
Actual
Simulated

CHART 6.5

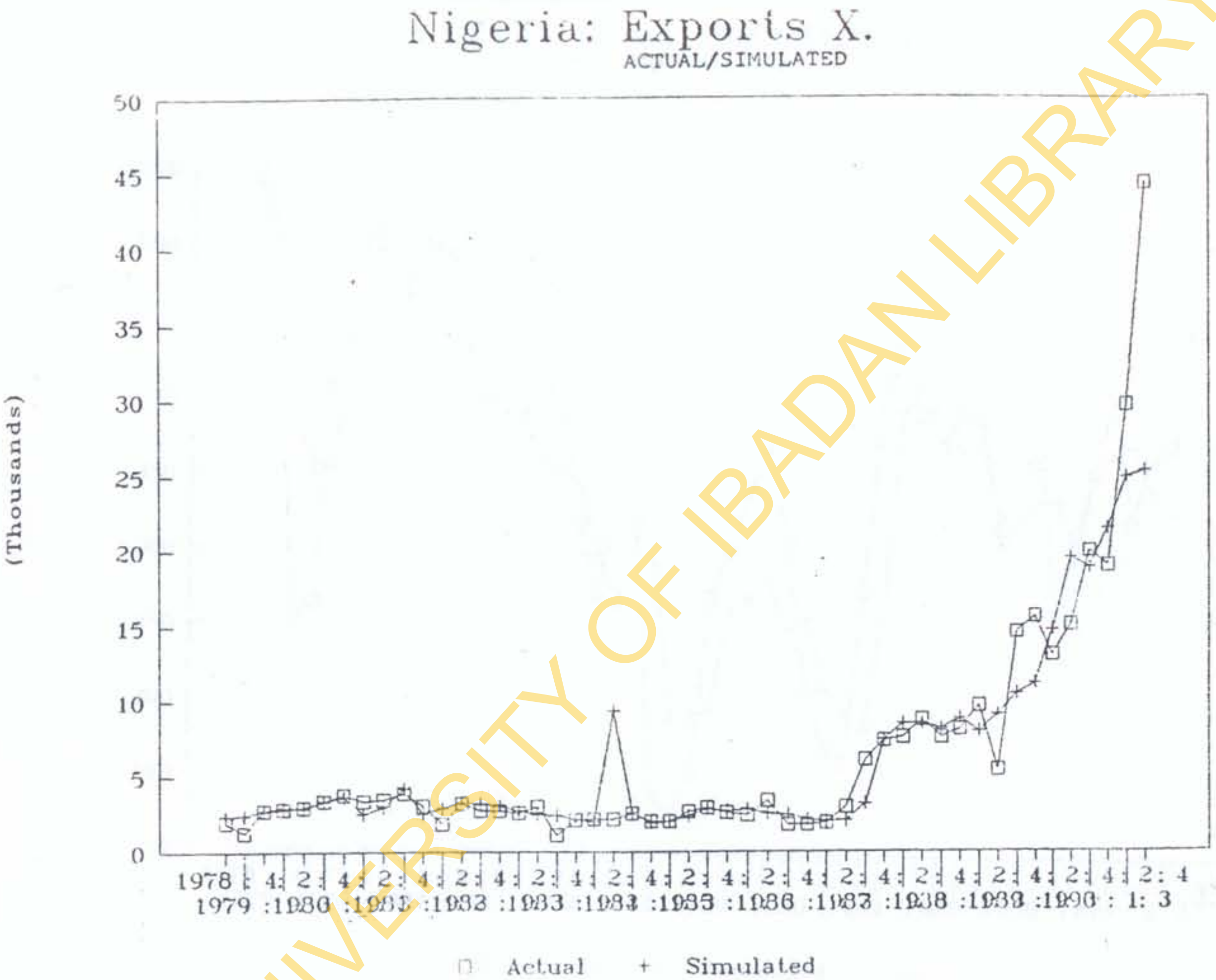

Nigeria: Exports X.
ACTUAL/SIMULATED
(Thousands)
50
45
40
35
30
25
20
15
10
5
0
Actual
Simulated

CHART 6.6

Nigeria: Real Income (RI)

ACTUAL/SIMULATED

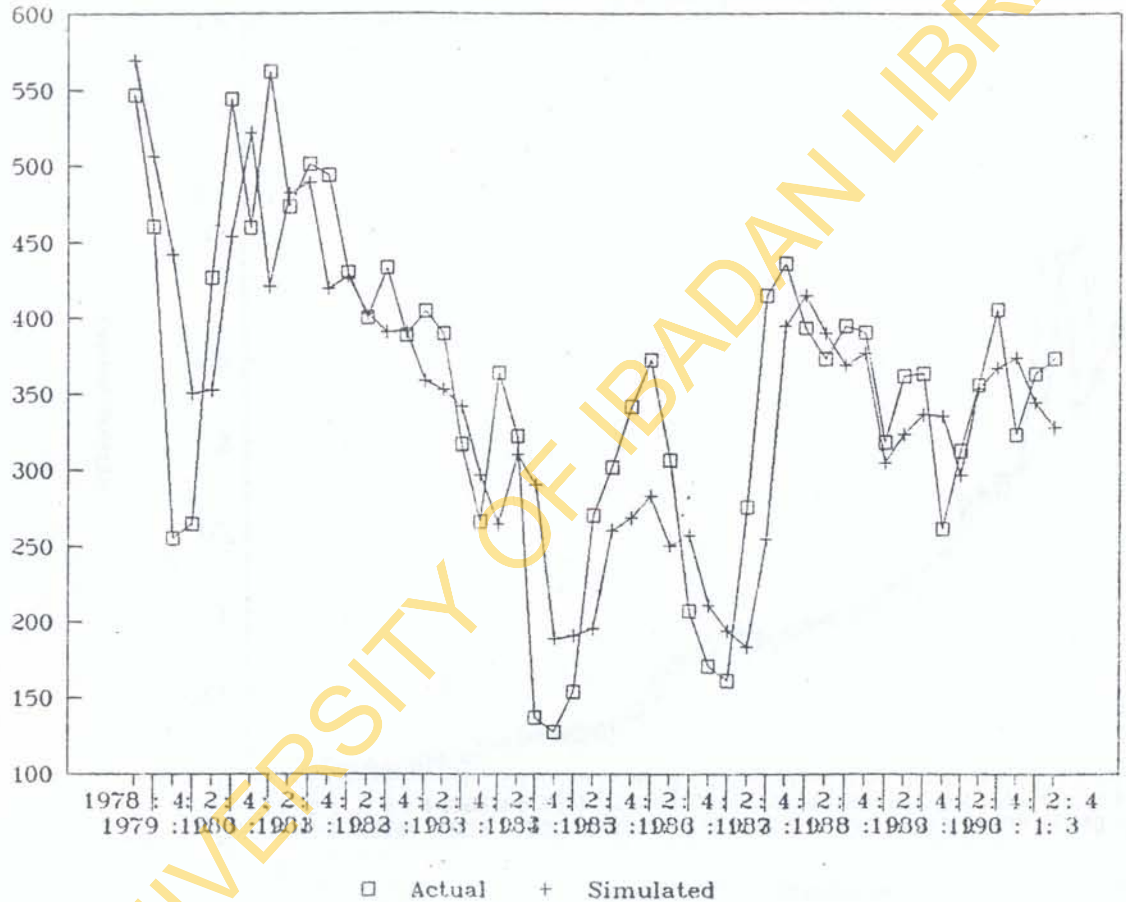


CHART 6.7

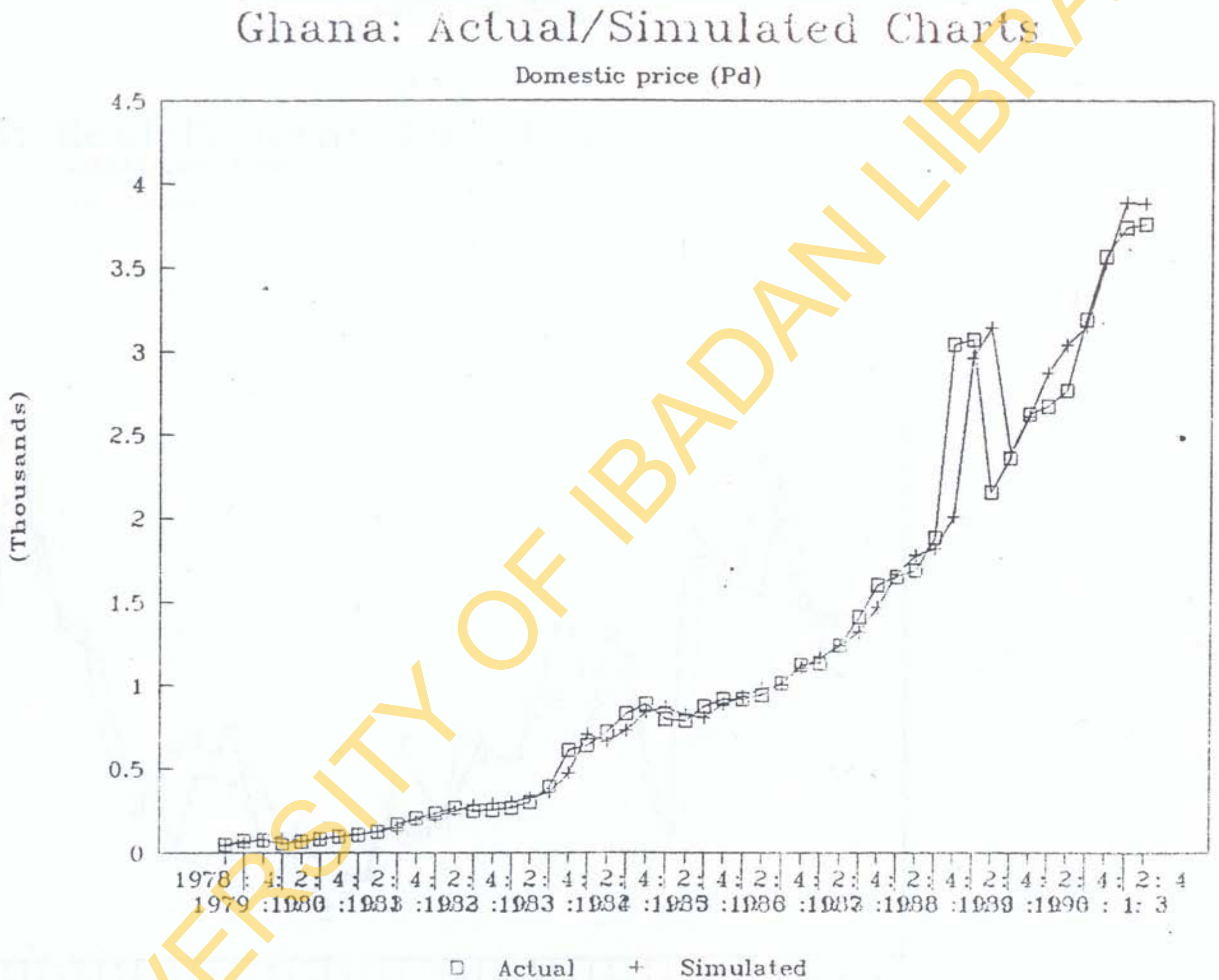

Ghana: Actual/Simulated Charts
Domestic price (Pd)
(Thousands)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1978
1979
Actual
Simulated

CHART 6.8

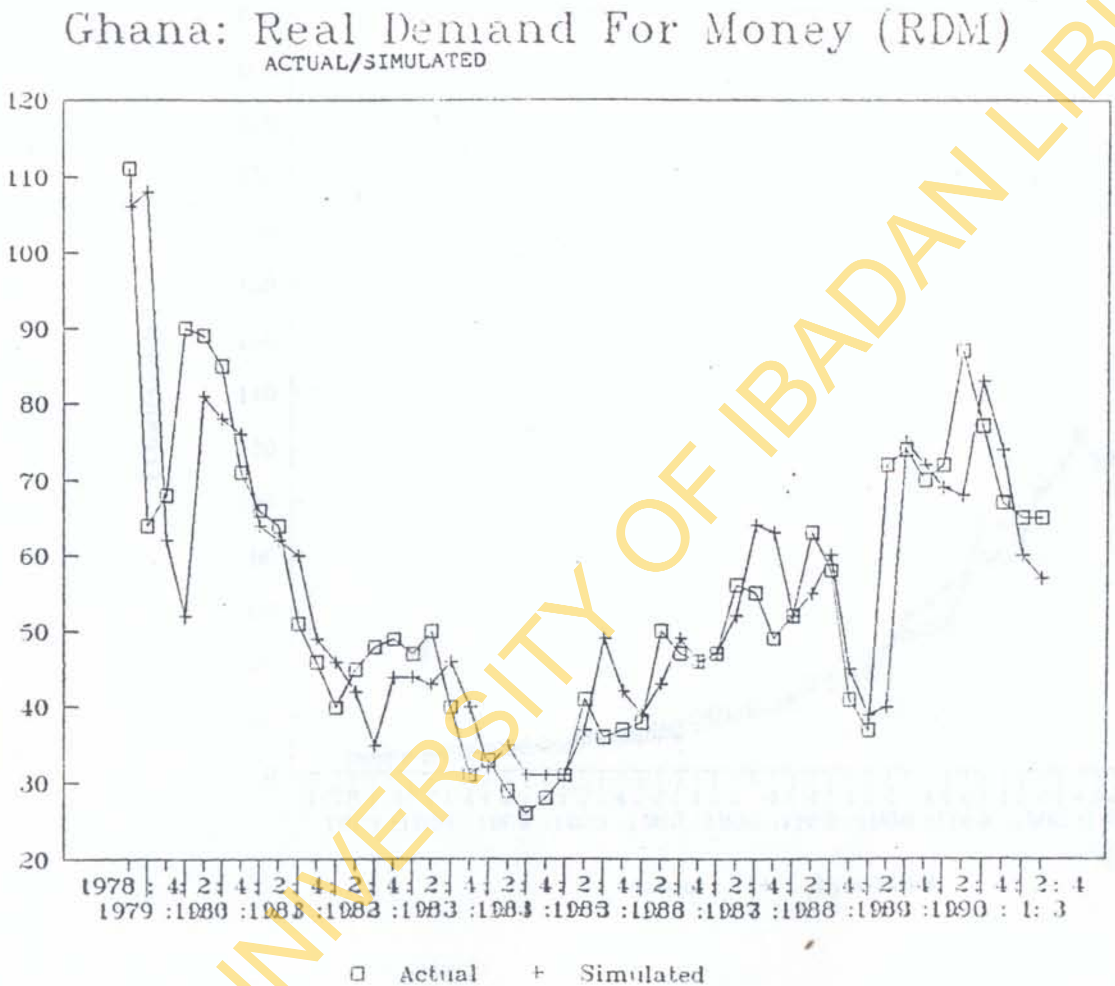

Ghana: Real Demand For Money (RDM)
ACTUAL/SIMULATED
120
110
100
90
80
70
60
50
40
30
20
1978 : 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4
1979 :1980 :1981 :1982 :1983 :1984 :1985 :1986 :1987 :1988 :1989 :1990 : 1: 3
Actual
Simulated

CHART 6.9

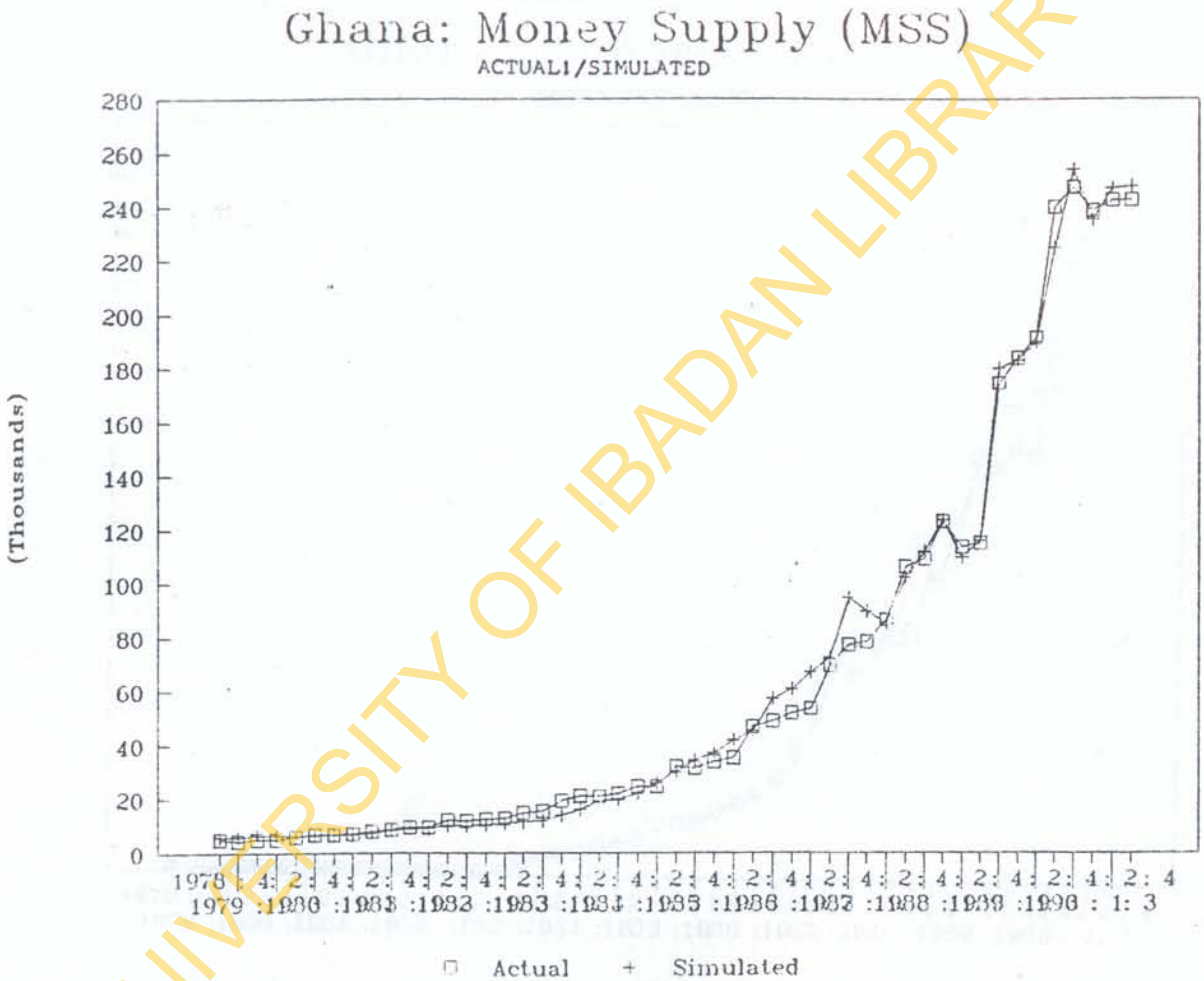

Ghana: Money Supply (MSS)
ACTUAL1/SIMULATED
(Thousands)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
□ Actual
+ Simulated

CHART 6.10

Ghana: Imports (IM)

ACTUAL/SIMULATED

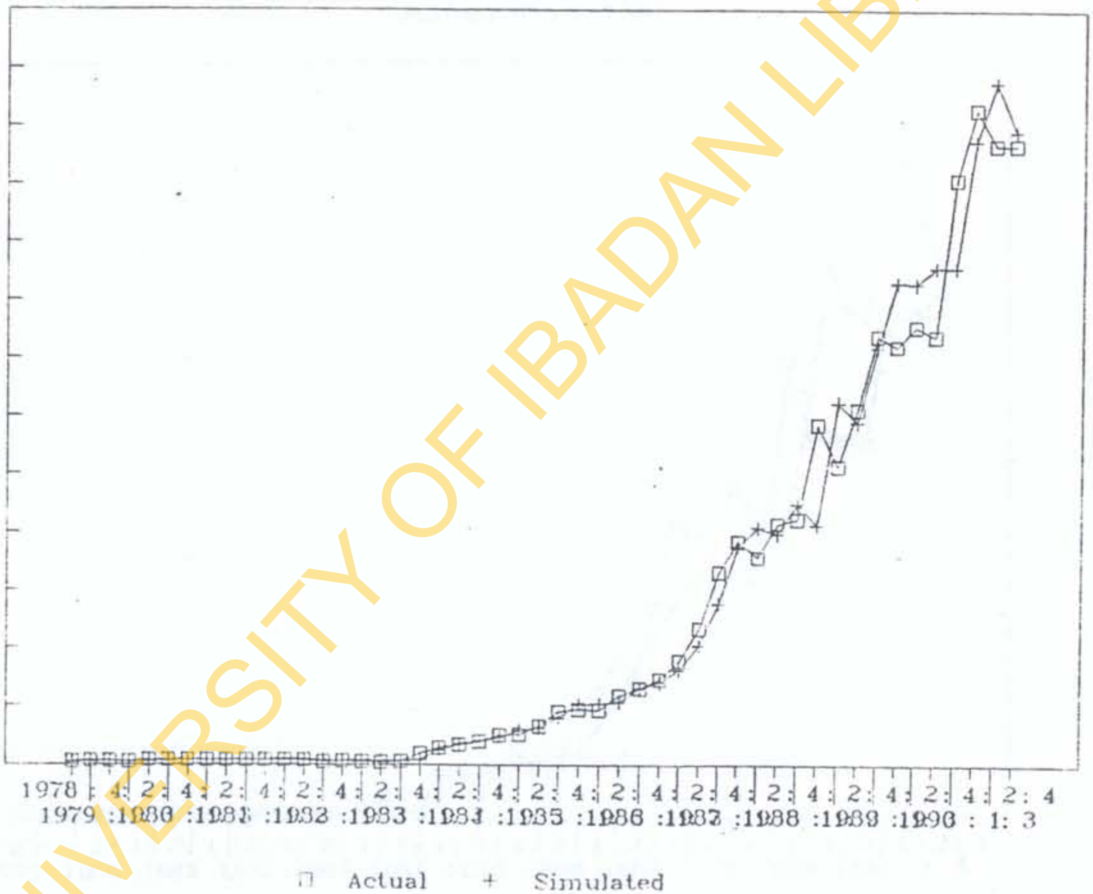


CHART 6.11

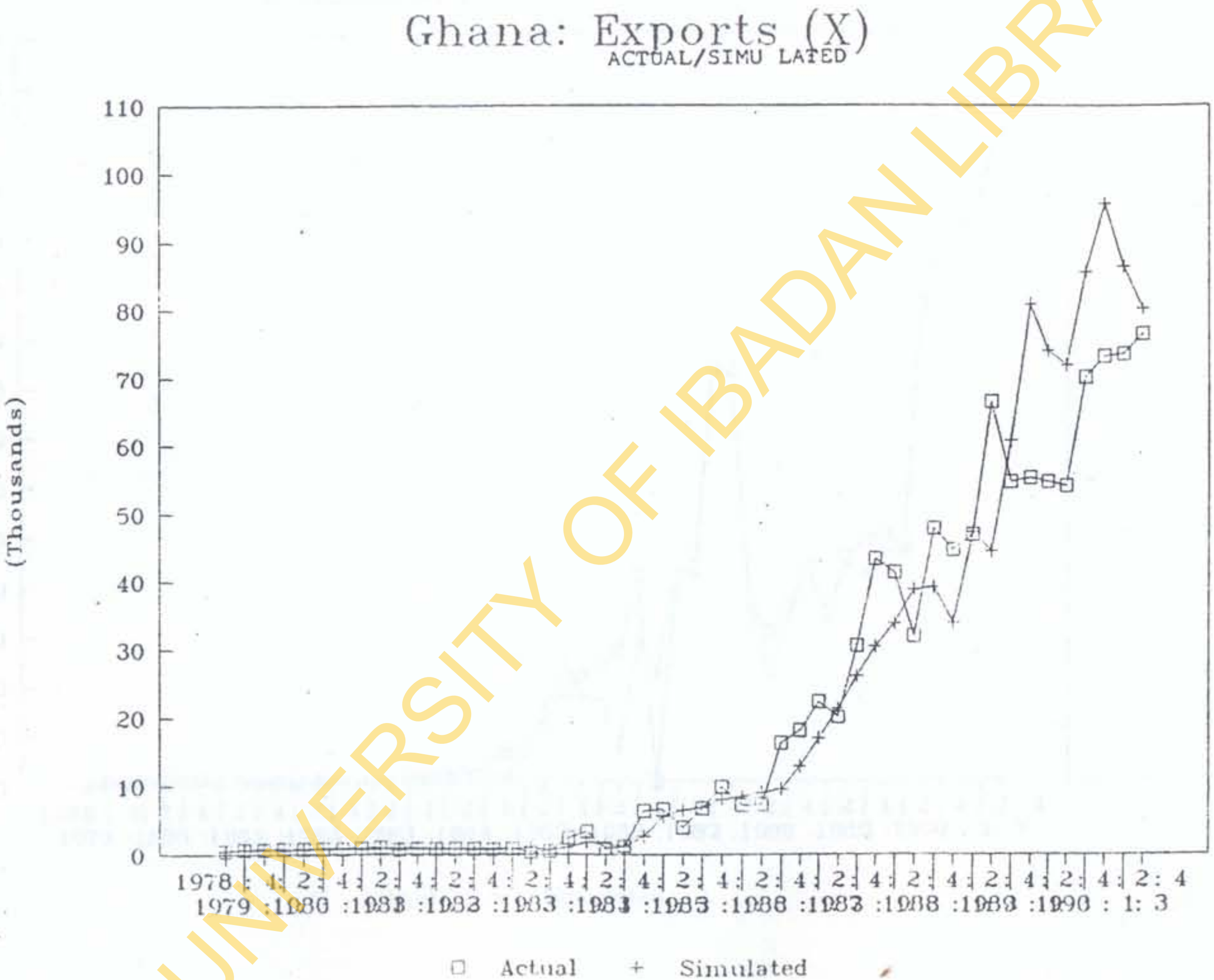

Ghana: Exports (X)
ACTUAL/SIMULATED
110
100
90
80
70
60
50
40
30
20
10
0
(Thousands)
1978 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4 : 2 : 4
1979 :1980 :1981 :1982 :1983 :1984 :1985 :1986 :1987 :1988 :1989 :1990 : 1: 3
Actual
Simulated

CHART 6.12

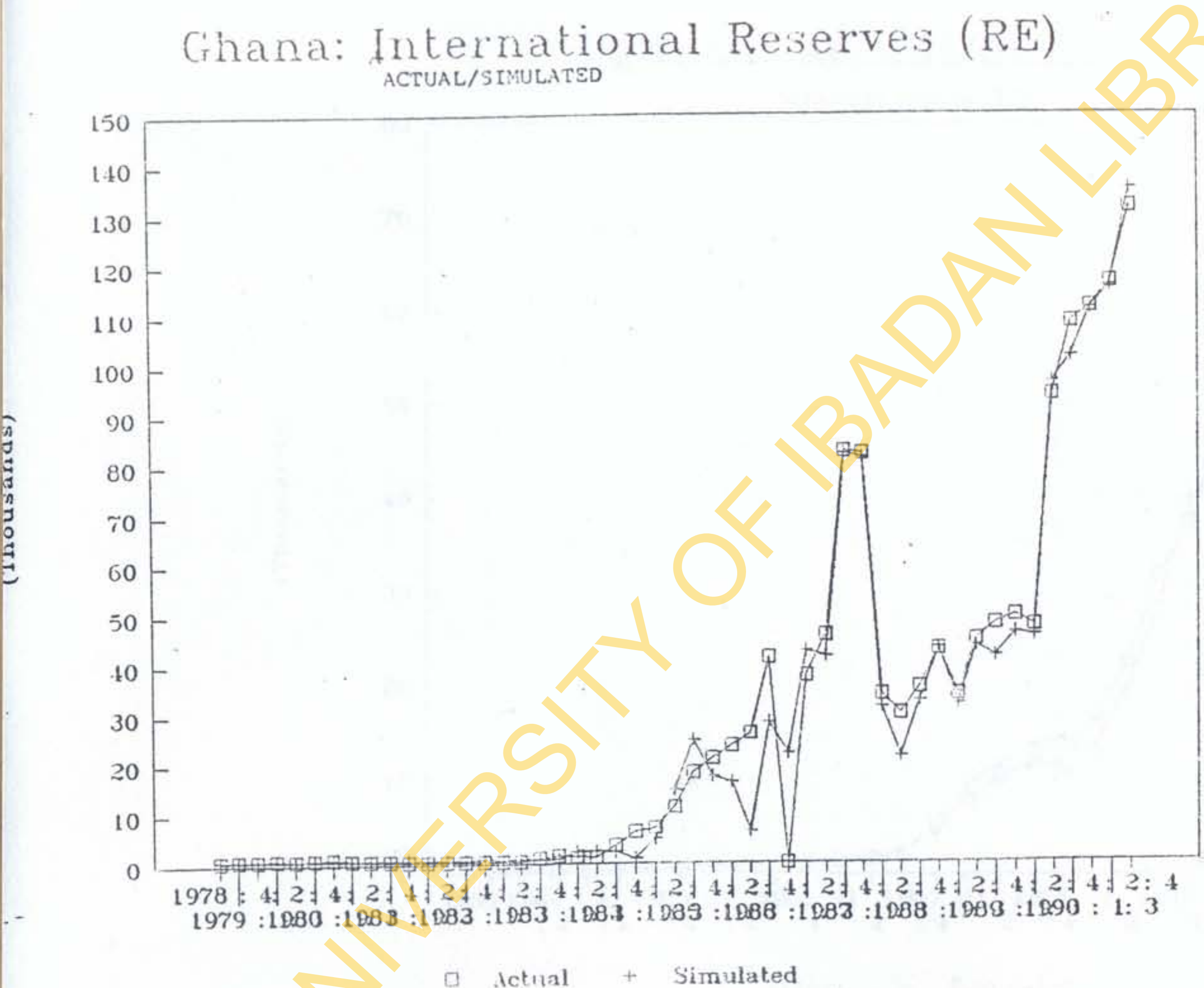

Ghana: International Reserves (RE)
ACTUAL/SIMULATED
(Thousands)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1978 : 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4: 2: 4
1979 :1980 :1981 :1982 :1983 :1984 :1985 :1986 :1987 :1988 :1989 :1990 : 1: 3
Actual
Simulated

CHART 6.13

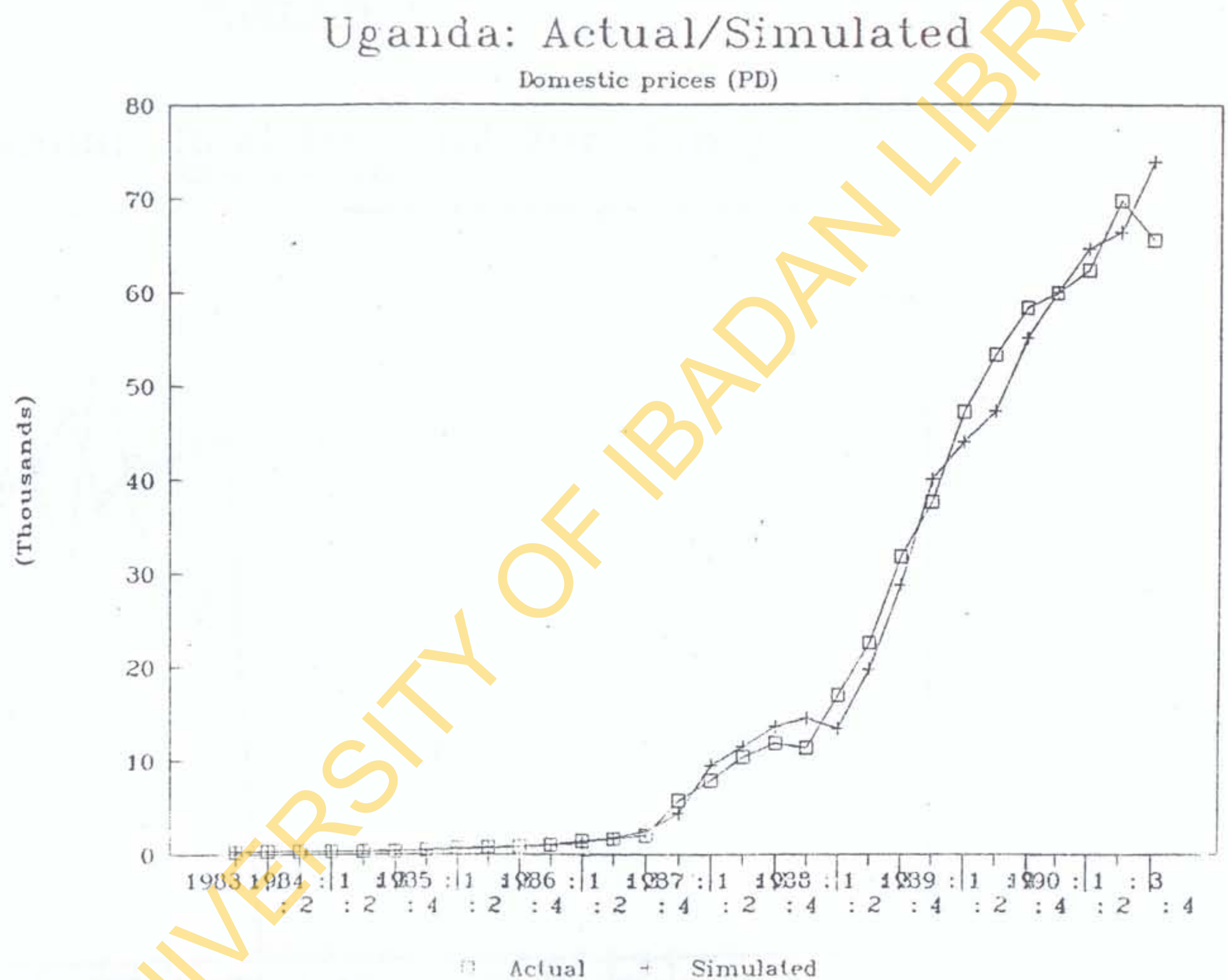

Uganda: Actual/Simulated
Domestic prices (PD)
(Thousands)
80
70
60
50
40
30
20
10
0
1983 1984 :1 1985 :1 1986 :1 1987 :1 1988 :1 1989 :1 1990 :1 :3
:2 :2 :4 :2 :4 :2 :4 :2 :4 :2 :4 :2 :4 :2 :4
Actual
Simulated

CHART 6.14

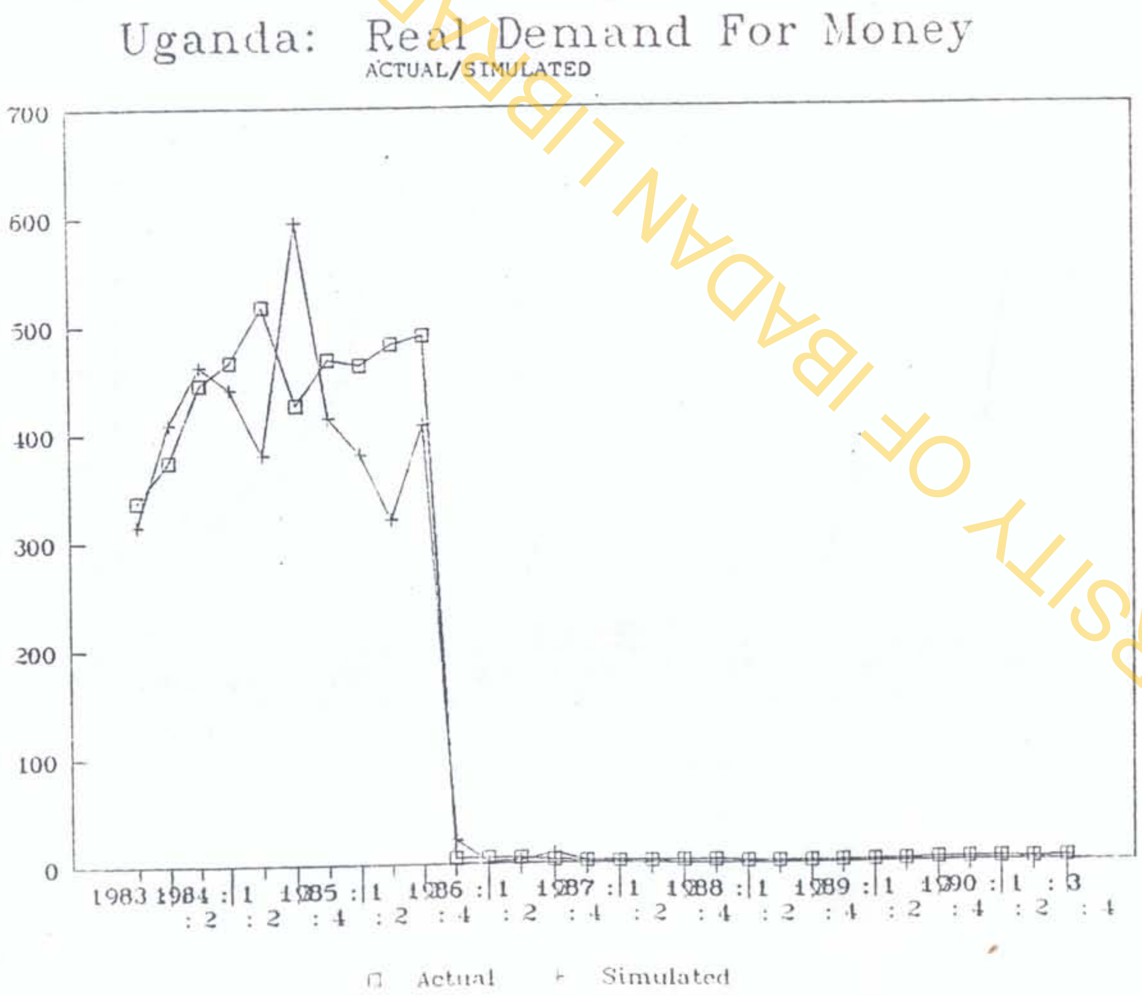

Uganda: Real Demand For Money
ACTUAL/SIMULATED
700
600
500
400
300
200
100
0
1983 1984 :1 1985 :1 1986 :1 1987 :1 1988 :1 1989 :1 1990 :1 :3
:2 :2 :4 :2 :4 :2 :4 :2 :4 :2 :4 :2 :4 :2 :4
Actual
Simulated

CHART 6.15

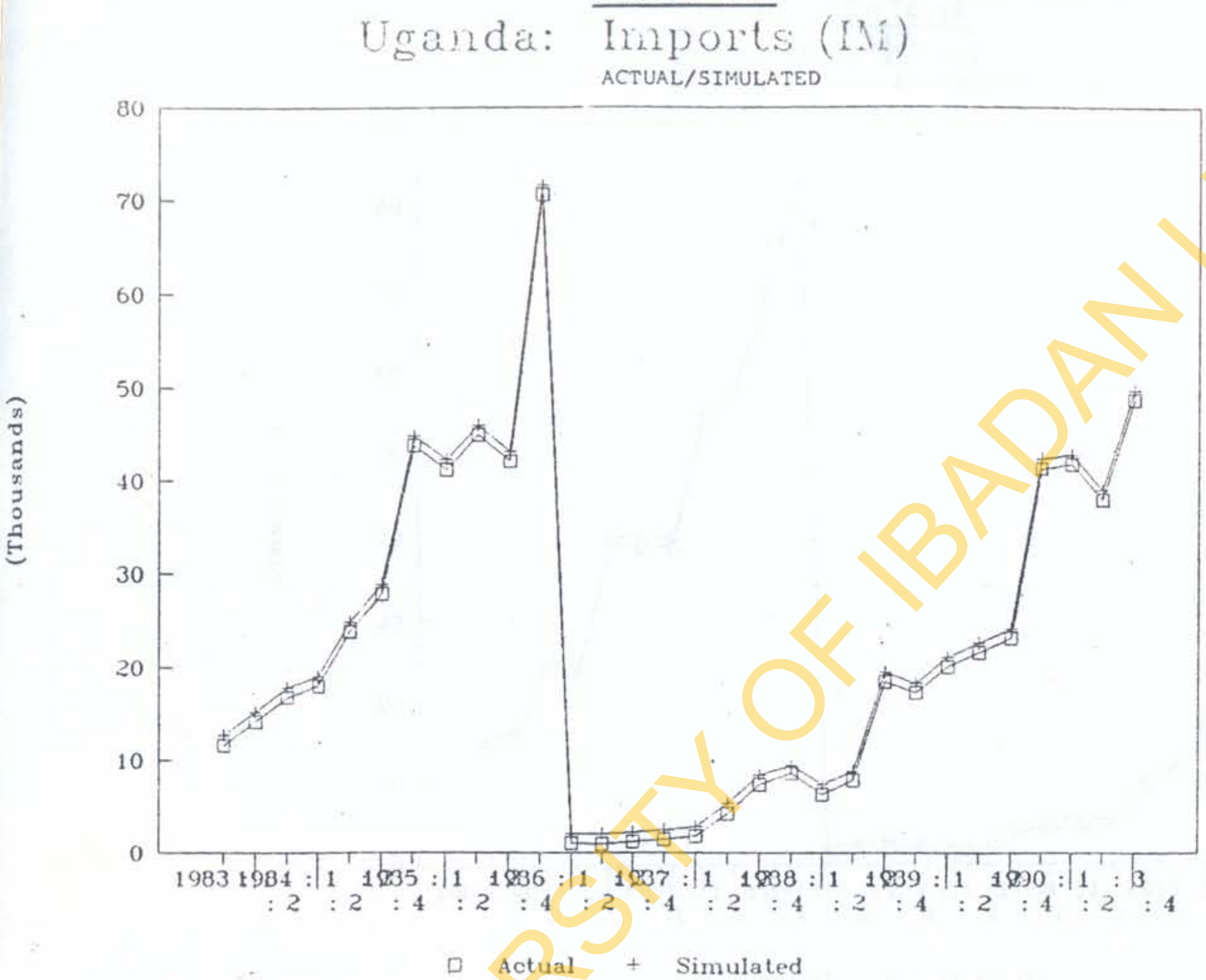

Uganda: Imports (IM)
ACTUAL/SIMULATED
(Thousands)
80
70
60
50
40
30
20
10
0
1983 1984 :1 1985 :1 1986 :1 1987 :1 1988 :1 1989 :1 1990 :1 :3
:2 :2 :4 :2 :4 :2 :4 :2 :4 :2 :4 :2 :4
Actual
Simulated

CHART6.16

Uganda: Exports X

ACTUAL/SIMULATED

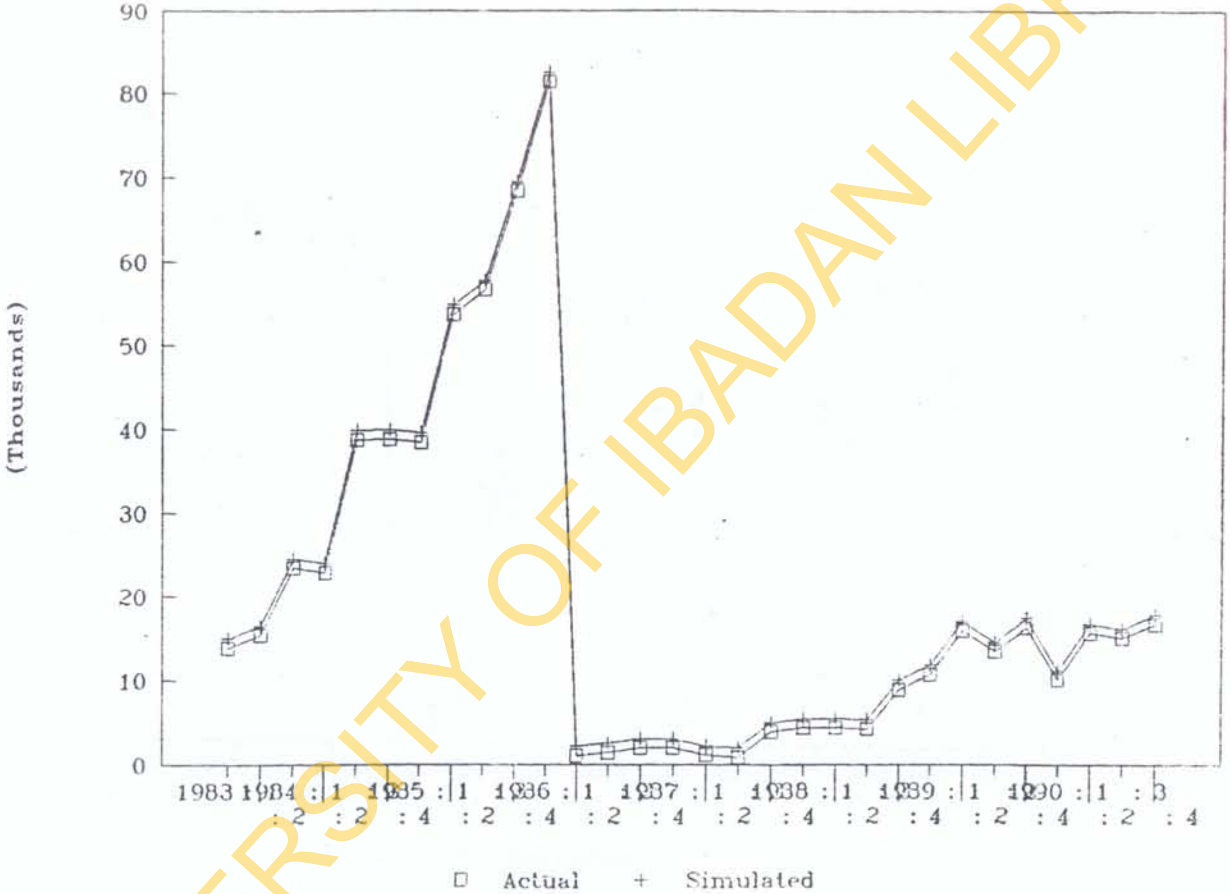
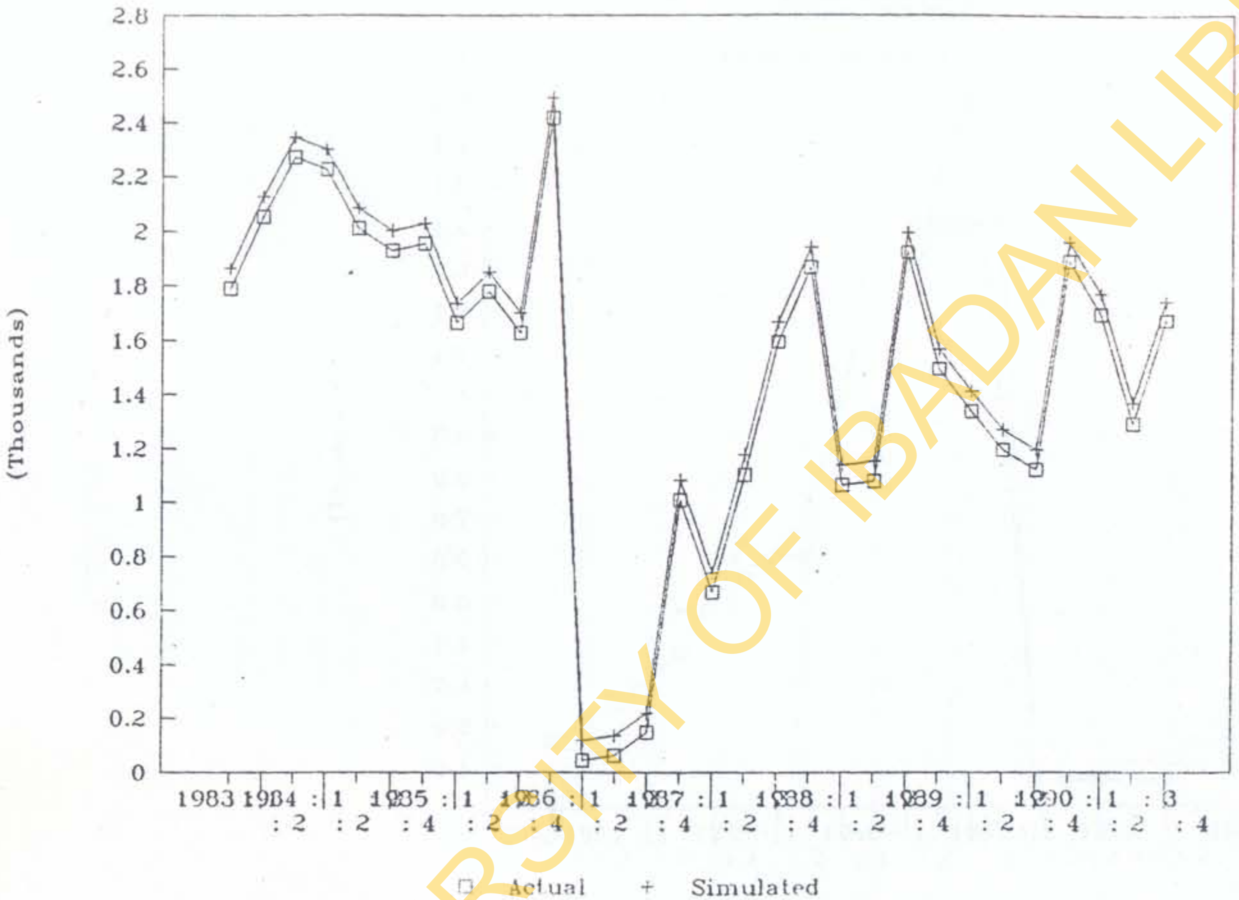
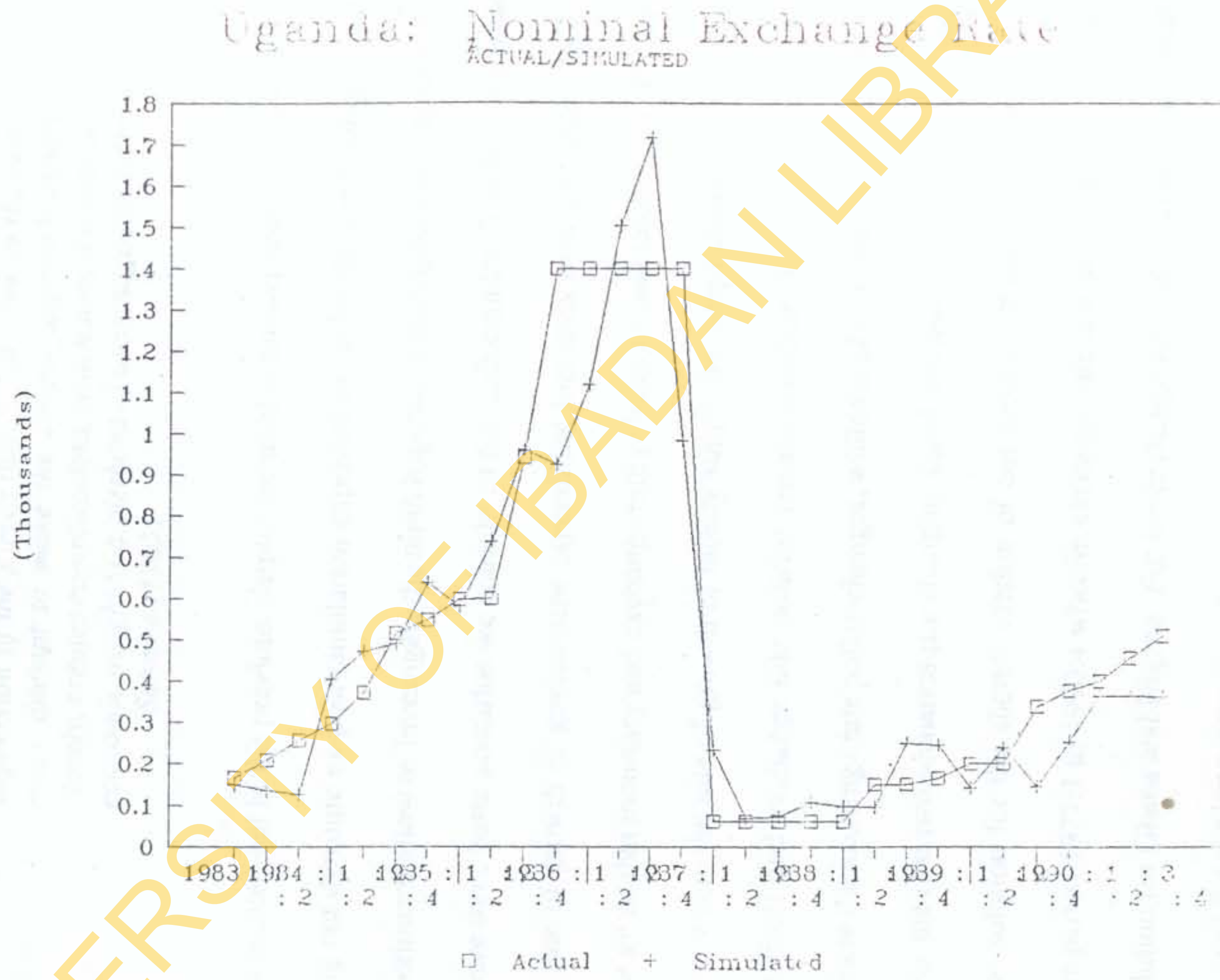


CHART 6.17

Uganda: Real Income (RI)

ACTUAL/SIMULATED




Uganda: Nominal Exchange Rate
ACTUAL/SIMULATED
(Thousands)
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Actual
Simulated

CHAPTER SEVEN

SIMULATION RESULTS

> *"The analysis of idealized polar cases cannot pretend to be more than a pedagogical exercise, to gain a firsthand impression of the forces that are at work in the real world, every attempt to make the system approach reality more closely, creates complications, which soon threaten to drown economic insight in a plethora of unmanageable formulas."*
> *Sohmen (1965)*

As pointed out in the previous chapter we tried to answer some 'what if' questions by carrying out dynamic ex-post simulation experiments under different policy scenarios. These experiments allow us investigate the ninth hypothesis highlighted in chapter 4 section I. There were three basic scenarios we considered for each country. The first is a situation where the rate of growth of government expenditure increases over and above its actual growth rate given that monetary and exchange rate policies remain unchanged. The second is a situation where the rate of growth of money supply increased above its actual growth rate, while fiscal and exchange rate policies remain constant. The third scenario is the situation where the exchange rate policy changes, while fiscal and monetary policies remain constant. For the first two scenarios (i.e changing fiscal and monetary policy environment) we used the solution for the shorter version of our model (i.e the version of the model covering the period 1977:1 to 1990:4 wherein exchange rate is assumed to be fixed) as the baseline solution for Ghana and Nigeria. For the exchange rate policy change, we used the simulation result for the longer version of our model as the baseline solution for Ghana and

Nigeria, (i.e the version of the model covering the period 1986:4 1990:4 wherein exchange rate and interest rates are assumed to be variable). This we did because for the exchange rate policy change what we did was to assume that rather than adopt a floating exchange rate system in the 4th quarter of 1986, suppose Ghana and Nigeria had simply depreciated their currencies by 80% and left the exchange rate fixed what would have happened to our endogenous variables relative to what happened to them as a result of floating.

In the case of Uganda we used the solution to the longer version of the model as the baseline solution (i.e the version of the model covering 1981:1 to 1990:4, wherein exchange rates and interest rates are assumed to be variables). This is because, of the ten years studied (1981 -1990). Uganda adopted a floating exchange rate system for six of those years. Thus deviations against the result of this time period was used to analyze the effects of monetary and fiscal policy changes. However since the change to a fixed exchange rate regime occurred in the 2nd quarter of 1987 we attempted to investigate what would happen to macroeconomic aggregates if instead of adopting a jumping-peg system in 1987:2, the country had merely adopted a crawling peg system appreciating its currency at the rate of 5% per quarter beginning from 1987:2

In all we were interested in six main endogenous variables, three for the internal sector and three for the external sector, these were domestic prices, real demand for money and real income for internal balance and export value, import value and the trade balance for the external sector. The results of these exercises for the three countries are discussed in the following sections.

7.1 Simulation Results for Nigeria

In the case of Nigeria we tried to find out how the macroeconomic aggregates in the Nigerian economy would perform if (i) rate of growth of government expenditure increases from its quarterly average of 3.73% to 5% (ii) if money supply growth changed from its actual quarterly average of 4.7% to 7%. These two policy changes were simulated separately for the period 1981:1 - 1990:4 to enable us have a long-run view of the situation on hand. (iii) what would have happened if instead of floating the exchange rate independently in 1986:4 it had simply been depreciated from its 1986:3 level by 80% and allowed to remain fixed till 1990:4. Below are the results of these experiments.

Table 7.1

Nigeria: Change in Fiscal Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size Under Fixed Exchange System	Average Size Under Floating Exchange System
PD	294.6300	294.4000	239.2800
PDM	95.8500	95.8700	103.2400
IM	3651.1500	3653.8200	3706.6300
X	6880.4000	6893.3300	7227.1700
TB	3229.2500	3239.5100	3520.5400
RI	319.2300	321.6000	336.7300

Deviations From Baseline Solution

(Simulated Solution-Baseline Solution)

Endogenous Variable	Deviations Under Fixed System	Deviations Under Floating System
PD	-0.2300	-55.3500
RDM	0.0200	7.3900
IM	2.6700	55.4800
X	12.9300	346.7700
TB	10.2600	291.2900
RI	2.3700	17.5000

Percentage Deviation

Endogenous Variable	Fixed Exchange System	Floating Exchange System
PD	-0.0700	-18.7800
RDM	0.0200	7.7100
IM	0.0700	1.5200
X	0.1800	5.0400
TB	0.3100	9.0200
RI	0.7400	5.4800

Table 7.2

Nigeria: Change in Monetary Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size Under Fixed Rates	Average Size Under Floating Rates
PD	294.6300	311.8300	267.3800
RDM	95.8500	93.5400	99.4900
IM	3651.1500	3730.5000	3779.1300
X	6880.4000	6772.3700	7051.0300
TB	3229.2500	3041.8700	3271.9000
RI	319.2300	313.3200	371.7400

Deviations From Baseline Solution

(Simulated Solution-Baseline Solution)

Endogenous Variable	Deviations Under Fixed System	Deviations Under Floating System
PD	17.2000	-27.2500
RDM	-2.3100	-3.6400
IM	79.3500	127.9800
X	-108.0300	170.6300
TB	187.3800	42.6500
RI	-5.9100	52.5200

Percentage Deviation

Endogenous Variable	Fixed Exchange System	Floating Exchange System
PD	5.8400	-9.2500
RDM	-2.4100	3.7900
IM	2.1700	3.5100
X	-1.5700	2.4800
TB	-5.8000	1.3200
RI	-1.8500	16.4500

Table 7.3

Nigeria: Change in Exchange Rate Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size of Simulated Solution	Deviation From Baseline Solution	Percentage Deviation
PD	812.1900	548.9000	-263.2900	-32.4200
RDM	52.3200	83.0000	30.6800	58.6400
IM	6644.1000	6857.8000	213.7000	3.2200
X	17852.3500	16265.0000	-1587.1100	-8.8900
TB	11208.2500	9407.2000	-1801.0500	-16.0700
RI	305.5900	336.1000	30.5100	9.9800

Table 7.1 reveals the effects of changing fiscal policy while monetary and exchange rate policy remain fixed. The table is in three parts the first reveals the average size of our endogenous variables over the 40 quarters both in the baseline solution and in the simulated solution both under fixed and under floating exchange system. The second part reveals the deviations between the baseline solution and the simulated solution while the third part indicates the percentage deviation. It is interesting to note that increasing the rate of growth of government expenditure from its actual quarterly rate of 3.73% to 5% would lead under a floating exchange rate system to a decline in domestic prices of over 18% and improve export performance by about 5% of its baseline performance while the external sector (as proxied by the trade balance) would improve by over 9%. On the whole real income would rise by over 5% from its baseline level. Of course under a fixed exchange system the performance of all the macroeconomic aggregates improve too but very marginally. For

instance while the trade balance improved by only 0.31% real income rises by only o.74% under fixed rates as against 9.02% for trade balance and 5.48% for real income under floating rates.

Table 7.2 shows the effects of introducing a monetary shock into the system. Here instead of the actual average quarterly growth rate of 4.7% the money supply was made to grow at 7%. As in the case of fiscal policy this monetary policy shock under a regime of floating rates would in ten years lead to a decline of over 9% in domestic prices. Imports would improve by over 3% while overall the trade balance performance would improve marginally by over 1% but real income improves substantially by over 16%. Under a regime of fixed rates however the sustained increase in money supply growth would by the end of ten years lead to a permanent increase in domestic prices of over 5% and real demand for money would fall by over 2%. The trade balance performance worsens by over 5% while real income performance worsens also.

In other words monetary impulses under a regime of fixed rates would in Nigeria translate to rising prices, worsening trade balance and worsening real income.

We also attempted to find out what would have happened to our economic aggregates if rather than float the currency independently in the 1986:4 the Nigeria had simply depreciated its currency by 80% from its 1986:3 level, and left the exchange rate fixed at this new rate till 1990:4. The result of this experiment proved quite interesting. Table 7.3 shows that if such a situation had taken place, there would have been a decline of over 30% in domestic prices from their baseline level, real demand for money would have risen by over 55% and real income too would have improved considerably by well over 9%.

However, the external sector's performance would have worsened as export performance declines by over 8% and the external balance (as proxied by the trade balance) declines by over 16%. This poorer performance of the external sector may be due to the fact that given a fixed nominal exchange rate the declining domestic price level may not be sufficient to compensate for any decline in domestic price of exports, as a result of decline in world price of exports so that the real exchange rate appreciates. Alternatively even the domestic price exports may fall if the nominal exchange rate is fixed and the world price of exports is falling and as shown in table 6.3, the domestic export price with two period lag (DPX_{t-2}) is a major determinant of exports in Nigeria.

In sum each of the three experiments for Nigeria indicate that in an ex-post situation, the floating exchange rate system improves the performance of the Nigerian economy better than a fixed one; either one is looking at the external or internal sector of the economy.

That prices are falling under a floating exchange system whereas they are rising under a fixed one under monetary policy change seems quite strange. However the fact that import value expands faster under the floating system is a pointer to the reason for declining domestic prices. In the Nigerian economy almost all sectors are import dependent (be it agricultural, manufacturing etc). Under a system of floating rates the market system ensures that actual importers have reasonable access to foreign exchange resources, This easy foreign exchange access, ensures increased imports and hence increased domestic production and from table 6.1 increased real income leads to falling prices. Under a regime of fixed rates and its implicit forex rationing system there is a lot of crisis in the allocative mechanism,such that actual importers never get direct access to forex resources, those who do, get forex by virtue of "power patronage" or "political patronage". Thus, the actual importer buys from these middlemen at exorbitant prices. This restricts imports (especially of intermediate inputs and raw materials) thereby restricting output in the whole economy, and hence rising domestic prices. Whereas, given the neoclassical position of the market being more efficient than any allocative system, a system of floating rates ensures expanded imports and expanded exports, as well as expanded domestic output hence the fall in domestic prices.

7.2 Simulation Results for Ghana

As pointed out earlier our simulation exercises were carried out under three scenarios. The first is under a change in fiscal policy environment while monetary and exchange policy environment remained constant. As a proxy for fiscal policy change we used a change in the rate of growth of government expenditure. More specifically we assumed that government expenditure had grown at an average quarterly rate of 16% as against the actual rate of growth of 14%. Also for the second scenario we assumed that the rate of growth of money supply can proxy for monetary policy change. Thus we tried to find out what would have happened if money supply had grown at an average quarterly rate of 14% as against the actual growth rate of 12%. These experiments covered the period 1981:1 - 1990:4 in order to enable us glimpse the long-run effects of using a particular exchange rate system.

For the exchange rate policy change, we attempted to investigate what would happen to macroeconomic aggregates in the Ghanaian economy if instead of floating its exchange rate in the fourth quarter of 1986, Ghana simply depreciated its currency by 80%. Below are the results.

Table 7.4

Ghana: Change in Fiscal Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size Under Fixed Exchange System	Average Size Under Floating Exchange System
PD	1421.5400	1364.6700	1321.0000
RDM	49.7300	50.8700	51.7500
IM	30851.6700	31240.400	31542.7500
X	26214.0800	27079.1400	27742.3600
TB	4637.5900	4161.2600	3800.3900
RI	398.9500	415.9100	428.9500

Deviations From Baseline Solution

(Simulated Solution-Baseline Solution)

Endogenous Variable	Deviations Under Fixed System	Deviations Under Floating System
PD	-56.6700	-100.5400
RDM	1.1400	2.0200
IM	388.7300	691.0800
X	865.0600	1528.2800
TB	476.3300	837.2000
RI	16.9600	30.0000

Percentage Deviation

Endogenous Variable	Fixed Exchange System	Floating Exchange System
PD	-4.0000	-7.0700
RDM	2.3000	4.0700
IM	1.2600	2.2400
X	3.3000	5.8300
TB	10.2700	18.0500
RI	4.2500	7.5200

Table 7.5

Ghana: Change in Monetary Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size Under Fixed Exchange System	Average Size Under Floating Exchange System
PD	1421.5400	1662.0000	1579.0000
RDM	44.7300	44.8900	46.5600
IM	30851.6700	29201.1100	29768.7900
X	26214.0800	22559.7700	23815.4900
TB	-4637.5900	-6641.3400	-5953.3000
RI	398.9500	327.2200	351.9100

Deviations From Baseline Solution

(Simulated Solution-Baseline Solution)

Endogenous Variable	Deviations Under Fixed System	Deviations Under Floating System
PD	240.4600	157.4600
RDM	-4.8400	-3.1700
IM	-1650.5600	-1082.8800
X	-3654.3100	-2398.5900
TB	-2003.7500	-1315.7100
RI	-71.7300	-47.0500

Percentage Deviation

Endogenous Variable	Fixed Exchange System	Floating Exchange System
PD	16.9000	11.0800
RDM	-9.7300	-6.3800
IM	5.3500	-3.5100
X	-13.9400	-9.5100
TB	-43.2100	-28.3700
RI	-17.9800	-11.7900

Table 7.6

Ghana: Change in Exchange Rate Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size of Simulated Solution	Deviation From Baseline Solution	Percentage Deviation
PD	3138.7000	3005.6000	-83.1000	-2.62
RDM	64.0000	65.0000	1.0000	1.53
IM	86424.1000	87150.0600	725.9600	0.84
X	72562.5000	74151.6100	1589.1100	2.19
TB	-13861.6000	-2998.4500	873.1500	6.29 2.83
RI	443.0000	455.5400	12.5400	

Table 7.4 reveals that if in Ghana, the rate of growth of government expenditure had increased by 2% quarterly over and above its actual rate of growth then within ten years the level of real income would have risen by 4.22% under a fixed exchange rate system and by 7.52% under a floating exchange system. Level of domestic price would have fallen as a result of increased output. The fall in domestic prices would have been some 4% under a fixed exchange rate system and about 7.07% under a floating one.

The increased rate of government expenditure while generating increased imports and hence increased import value would also have led to higher exports as declining domestic prices lead to increase in the real exchange rate (i.e. depreciation of the real exchange rate (ETOT)) thus encouraging exports, and from table 6.3 the real exchange rate ETOT with a two period lag has significant impact on exports. Over a period of ten years the trade balance would have improved by some 10.25% under a fixed exchange rate system and some 18.05% under a floating exchange rate system. Overall the economy would have performed better under a floating exchange rate system.

From table 7.5 it is clear that increase of 2% in the average quarterly rate of growth of money supply over and above its actual level would have in ten years led to increases in the rate of growth of domestic prices of about 16.9% under a fixed exchange rate regime and about 11.08% under a floating one. The increased rate of price growth given a monetary shock reflects the fact that monetary impulses in Ghana translate faster into higher prices than into higher output. As prices rise the real exchange rate appreciates and with it export volume and value fall too. The higher prices also reduce the level of real income thereby reducing the level of imports as real income is crucial to imports (see table 6.4). In the end, import value falls by some 5.35% under a fixed exchange rate regime while it falls by about 3.51% under a floating system. Export value also falls by some 13.94% under a fixed exchange rate system and some 9.51% under a floating one.

The differential in the performance of export value and import value under the two exchange rate systems is a reflection of the fact that even though the real income is falling under the two systems it is falling less under the floating system, hence the level of decline in imports is less under a floating system. Given that the export sector itself depends on imported inputs the fall in export value is less under a floating system then under a fixed one. What is more- as in Nigeria the use of the market system in the allocation of foreign exchange resources proves more effective by allowing actual producers access to forex so that level of imports is higher under floating system than under fixed. Under a fixed exchange rate system the forex rationing system is so wrought with crisis that often the forex does not get into the hands of importers but into those of the middlemen who then sell to actual importers at exorbitant prices, hence reduced level of imports under a system of fixed rates.

On the whole, though increased rate of growth of money supply in Ghana generates increased growth rate of domestic prices the rate of price growth is less under a floating system because the rate of expansion of output under a floating system is higher than under a fixed one. The decline in the trade balance and similarly the decline in real income are also less under a floating system than under a fixed one.

Table 7.6. reveals a situation where exchange rate is depreciated by 80% from its 1986: 3 level rather than adopting an independently floating system. The table reveals that this exchange policy would have by 1990:4 reduced domestic prices by some 2.65%, increased real income by some 2.62% while the trade balance would have improved by some 6.29%. This situation however does not provide a long run picture as the period covers only four and a quarter years.

7.3 Simulation Results for Uganda

As in the case of Ghana and Nigeria we performed simulation experiments under three different scenarios. The first was under the assumption that government expenditure increased at an average quarterly rate of 18.5% as against its actual rate of 17.43%. The second was under the assumption that money supply grew at an average quarterly rate of 19% as against the actual growth rate of 17%. The third was that rather than adopt a fixed exchange rate system of the jumping-peg variety in the second quarter of 1987, Uganda merely adopted a crawling peg system whereby it appreciated its exchange rate by 5% quarterly beginning from its 1987:1 level.

The difference in the Ugandan experiments compared with Ghana and Nigeria is that the solution to the longer version of our model (i.e the version wherein exchange rates and interest rates are floating) was used as the baseline solution in the Ugandan case for fiscal and monetary policy changes. This is because, of the ten years studied for Uganda (1981:1-1990:4) it floated her currency for the greater part of the period. In analyzing the exchange policy change however we used solution to the shorter version of our model (i.e the version where exchange rate is fixed) as the baseline. This is because the period covered by the exchange rate change (i.e 1987:2 - 1990:4), is the period of fixed rates covered by the shorter version of our model. Table 7.7, 7.8 and 7.9 contain the results of these experiments.

Table 7.7

Uganda: Change in Fiscal Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size Under Fixed Exchange System	Average Size Under Floating Exchange System
PD	19212.8600	18355.5600	18719.57
RDM	139.7900	149.1000	145.19
IM	22157.4300	24028.1500	23664.58
X	21058.7000	21793.6500	21481.98
TB	-2098.7300	-2234.5000	-2182.60
RI	1538.0000	1607.6700	1578.29

Deviations From Baseline Solution

(Simulated Solution-Baseline Solution)

Endogenous Variable	Deviations Under Fixed System	Deviations Under Floating System
PD	-857.3000	-493.2800
RDM	9.4000	5.4000
IM	870.7200	507.1500
X	734.9500	423.2800
TB	-135.7700	-83.8700
RI	69.6700	40.2900

Percentage Deviation

Endogenous Variable	Fixed Exchange System	Floating Exchange System
PD	-4.4600	-2.5700
RDM	6.6600	3.8800
IM	3.7600	2.1900
X	3.4900	2.0100
TB	-6.4700	4.0000
RI	4.5300	2.6200

Table 7.8

Uganda: Change in Monetary Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size Under Fixed Rates	Average Size Under Floating Rates
PD	19212.8600	11667.2900	11513.1300
RDM	139.7900	212.5400	212.7700
IM	23157.4300	30023.6100	30049.0800
X	21058.7000	27536.3600	27666.9200
TB	-2098.7300	-2487.2500	-2382.1600
RI	1538.0000	2082.1400	2084.1400

Deviations From Baseline Solution

(Simulated Solution-Baseline Solution)

Endogenous Variable	Deviations Under Fixed System	Deviations Under Floating System
PD	-7545.5700	-7699.9800
RDM	72.7500	72.9800
IM	6866.1800	6891.6500
X	6477.6600	6608.2200
TB	-388.5200	-283.4300
RI	544.1400	546.1400

Percentage Deviation

Endogenous Variable	Fixed Exchange System	Floating Exchange System
PD	-39.2700	-40.0800
RDM	52.0400	52.2100
IM	29.6500	29.7600
X	30.7600	31.3800
TB	18.5100	13.3800
RI	35.3800	35.5100

Table 7.9

Uganda: Change in Exchange Rate Policy

Endogenous Variable	Average Size of Baseline Solution	Average Size of Simulated Solution	Deviation From Baseline Solution	Percentage Deviation
PD	37429.13	48401.57	10972.4400	29.3200
RDM	223.25	125.06	-98.1900	-43.9800
IM	20963.59	18733.07	-2230.5200	-10.6400
X	10356.77	7978.86	-2377.9100	-22.9600
TB	-10606.82	-10754.21	-147.3900	-1.4000
RI	1425.68	1244.62	-181.0600	-12.7000

Table 7.7 reveals that if the rate of government expenditure in Uganda were to increase by some 1% over and above its actual average quarterly growth rate, then within a space of ten years this would bring about a permanent decline in prices (domestic) of about 2% an improvement in real income also of about 2% and a worsening of the trade balance by about 4% under a floating exchange system while it would lead to a decline in domestic prices of over 4%, a rise in real income of over 4% and a worsening of the trade balance by over 6% under a fixed exchange system. This worsening of the trade balance under a fixed exchange rate system in spite of declining domestic prices is to be expected as the decline in domestic prices may not be sufficient to outweigh any decline in international price of export, so that the real exchange rate would be appreciating. Alternatively given that nominal exchange rates are fixed, domestic price of exports (DPX) may be declining; if the world price of exports (Px) is declining, and given that DPX with a two period lag is crucial to exports (see Table 6.3) export value may be declining or at least may not rise, as fast as

imports. Under a floating exchange regime however, nominal exchange rates rise to negate declining internationally given export price (Px) so that decline in export value is reduced, as domestic price of exports falls less than under a fixed rate system

Table 7.8 reveals the effect of introducing a quarterly shock of about 2% into the system in form of increased growth of money supply. This increased money supply growth expands output thereby leading to declining prices both under fixed and under floating exchange systems. The declining domestic price level leads to increased real income by about 35.51% under a floating system and about 35.38% under a fixed system. Both imports and exports increase relative to the baseline level but the growth in exports is not sufficient to ensure a positive trade balance hence the trade balance declines under the two exchange systems but the decline is greater under a fixed system than under a floating one.

Thus while the trade balance performance worsens by some 13% under a floating rate system it worsens by some 18% under a fixed one. The worsening of this trade balance is probably due to structural rigidities in the economy such that export supply may not be able to respond adequately to relative price incentives while import demand may also not be able to respond appropriately to relative price signals. Whatever be the case while domestic prices are falling under the two exchange systems they are falling a little faster under a floating system. And while real income is rising under the two systems it is, rising a little faster under a floating one, and while trade balance is getting worse under the two systems it is getting worse at a faster rate under the fixed exchange system.

The third scenario depicts the impact of adopting a crawling peg in 1987:1 whereby the exchange rate is allowed to appreciate at the rate of 5% quarterly from its level of Ush 1400 per dollar, instead of the sudden jump from Ush 1400 per dollar in 1987:1 to Ush 60 per dollar in 1987:2. The results of this experiment shows that such an appreciation would have led to rising prices as the domestic price level would have risen by over 29% by 1990:4. The appreciation of the real exchange rate would have led to increased demand for imports and reduced demand for home produced goods, as home produced goods would have become relatively dearer than foreign goods. Though resources would in the short - run flow to the domestic - goods production because of the relatively higher prices in the medium to long run the lack of adequate demand in this sector would have stiffled increased production of domestic goods thus generating rising domestic prices in the medium to - long term. In the external sector exchange rate appreciation would also have a stiffling effect on the growth of exports, thus export performance would have worsened. As resources flowing from exports are needed to pay for imports (see Table 6.4) worsening export performance would also have led to declining imports though imports would expectedly decline at a lower rate than exports. Hence exports would have declined by 22.96%, imports by 10.64% and real income by 12.7%. However, the fact that Uganda put in place a jumping-peg arrangement wherein the over-appreciated currency had by 1988:1 become grossly depreciated and the depreciation continued until 1990:4, giving a picture more of a floating system than of a fixed one, accounted for the actual rise in real income in the actual trend movement.

On the whole the results of our simulation experiments confirm or validate the hypothesis that macroeconomic aggregates perform better under a system of floating rates than under a fixed one.

CHAPTER EIGHT

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

> *"... Partial Conclusions Are Handicapped By The Impossibility of Completely Isolating The Forces Under Analysis, Conclusions of General Validity Are Limited, Because Of The Impossibility of Assigning Lasting Weights To The Various Forces"*
>
> *Kindleberger (1956)*

This study has attempted to answer the question - which exchange regime enhances economic performance - a floating or a fixed one?. In answering this question we have used two main criteria. The first is - does the exchange rate regime help or hinder macroeconomic policy in pursuit of fundamental domestic economic objectives of stable prices, and high growth rate of real income ? The second is - how effective is the system in ensuring external sector equilibrium?. In order to evaluate our exchange rate regimes using these two criteria we have carried out our analysis at two levels. First we modelled the sample economies and then estimated our model(s). Each country's model had two versions. The first version attempts to capture the economy under a fixed exchange rate system, hence in this version the exchange rate is treated as exogenous while the level of international reserves is treated as stochastic (as obtains under fixed exchange systems). The second version of the model attempts to capture the economy under a floating system, hence in this version the exchange rate is treated as endogenous (as obtains under a floating system). The first version of the model was estimated for all the years covered by the study 1977:1 - 1990:4, for the countries of Ghana and Nigeria. The second version of the model was estimated for only the years these countries floated - 1986:4 to 1990:4. In estimating the second version of the model all the parameters of the first version were assumed to remain constant, so that all that is changing in the system is the nominal exchange rate and its companion, the domestic rate of interest. Thus any differences in the behaviour of the system can only be attributable to the exchange rate system. Having estimated these two versions of the models, we solved the models; the solution to the first version (i.e fixed exchange rate versions) was used as baseline solution for the evaluation of the macroeconomic aggregates under changing policy environment.

At the second level we carried out dynamic simulation exercises under changing monetary, fiscal and exchange policy environment. For each policy change examined we assumed the other policies remained constant. It is important to note that for Uganda the situation was slightly different. Having floated for the greater part of the period covered by the study (1981:1 - 1990:4) the solution to the version of the model designed for floating system was employed as the baseline solution and it was estimated for the ten years 1981:1 - 1990:4. The fixed exchange system version of the model was only estimated for the years 1987:2 - 1990:4.

8.1 SUMMARY OF MODEL ESTIMATION RESULTS

The results of the estimation reveal that, indeed there is some degree of pass through from nominal exchange rates unto domestic prices in Nigeria and Uganda, the relationship being more pronounced in Uganda where the exchange rate elasticity of domestic prices is 11% and it is significant at the 5% level. In Nigeria the exchange rate elasticity of domestic prices is only 5% and it is also significant at the 5% level. In Ghana there doesn't seem to be any pass through from nominal exchange rates onto prices as the relationship between the two variables is statistically insignificant. The major propeller of prices in Ghana is the money supply. Increases in nominal money supply increase prices. Thus while it may be true that market exchange rates may contribute substantially to inflation in Uganda, it is not likely to have a tremendous impact on inflation in Nigeria; and in Ghana it is not likely to affect inflation at all. As pointed out earlier, the Ghanaian result confirms Chibber and Shaffik's (1989) position concerning exchange market and inflation in Ghana, while the Ugandan situation does not seem to support Elbadawi's (1990) hypothesis with respect to inflation and exchange rates in Ugandan.

In respect of the impact of monetary policy on exchange rates the estimation results confirm that indeed nominal exchange rates follow the money supply. The money supply elasticity of nominal exchange rates is 85% in Nigeria, 54% in Ghana and 37% in Uganda, all are significant at the 5% level. This result goes to show that the success of a floating exchange rate regime depends very, very, crucially on responsible, prudent, and judicious monetary policy stance. Reckless increases of the money supply which often takes place in these countries in response to reckless government spending aggravate nominal exchange over - depreciation.

That imports are very crucial to exports is shown under the third hypothesis tested, the result of which showed that the import elasticity of exports is 38% for Nigeria, 78% for Ghana and 56% for Uganda. This result confirms Jebuni, Sowa and Tutu's (1991) position for Ghana that the rise in exports is a result of inflow of structural adjustment loans which expanded imports considerably. It also confirms the position of Khan and Knight (1986), Moran (1989), that imports are crucial to export expansion in developing countries.

That changing the structure of relative prices in the export sector in favour of exports through nominal exchange depreciation increases exports is confirmed by the Ghanaian result where the relative price (with a two period lag) elasticity of exports is 43% and is significant at the 5% level. Though the results came out with the wrong signs for Nigeria and Uganda we suspect that, the problem here, lies with the lag - structure, rather than with the validity of the position per - se; because a look at the domestic price of exports reveals that the higher this price gets (as nominal exchange rate gets depreciated) the higher exports get too.

That imports depend on exports, to the extent that net exports (or trade balance) is a major determinant of reserves, and change in reserves is crucial to imports is shown in tables 6.4 and 6.5. Table 6.4 reveals that the change in reserve elasticity of imports is 28%

in Nigeria, 41% in Ghana, and 58% in Uganda and all are statistically significant at the 5% level. And table 6.5 reveals that reserve depends significantly on net export (or the trade balance, with a one period lag, TB_{t-1}). The trade balance elasticity of reserves is 28% for Nigeria, 36% for Ghana and 44% for Uganda all statistically significant at the 5% level.

Finally the estimation results reveal that fiscal deficit is the major culprit for fuelling inflation in all the three countries. Table 6.6 reveals that government deficit (GD) is a major determinant of the money supply. The elasticity of nominal money supply with respect to change in government deficit is 76% in Nigeria, 85% in Ghana and 71% in Uganda. What is more, the money supply is shown to impact significantly on domestic prices (see Table 6.1). Thus prudent fiscal management policy is also crucial to the success of any exchange rate regime, (be fixed or floating) as reckless fiscal spending engender undue increases in the money supply, and since it has been shown that nominal exchange rates follow the money supply, undue increases in the money supply, lead to undue exchange rate depreciation.

In all, the estimation results show that exchange market movements are not the sole factor responsible for inflation in the focus countries rather poor monetary and fiscal management is. Also, that, overall output can be enhanced by enhancing imports because the economies are heavily import - dependent. What is more - export performance is itself dependent on import performance and there is a symbiotic relationship between them so that any policy that tries to promote exports while reducing imports may not work. Rather, the policy target should be, promoting both exports and imports but ensuring a faster rate of growth for exports than imports to ensure a positive external balance.

As for the position in the literature concerning capital mobility based on exchange rate differential, the estimation results show that capital inflow in these countries do not respond to interest rate differential between these countries and their trading partners(which are often developed economies) as the focus countries securities are not considered perfect substitutes for those of their trading partners. Hence the exchange rate appreciation that is supposed to result from maintaining domestic interest rate structure that is higher than that of their trading partners never materialized.

8.2 Summary of Model Simulation Results

The dynamic simulation exercises reveal the following: (Note that the ex-post simulation carried out under floating regimes for Nigeria and Ghana for the years 1981:1-1990:4 is known as "backcast simulation").

(i) In the long run (say over a period of ten years) a floating exchange rate system is more effective in expanding output and curbing inflation in Nigeria when fiscal policy is employed. This is revealed by a 5.48% permanent increase in real income after ten years and an 18.78% reduction in domestic prices under a floating exchange rate regime as compared with a 0.74% increase in real income and a 0.07% reduction in domestic prices under a fixed exchange system when government expenditure growth rate is increased by a quarterly rate of 1.25% over and above its actual growth rate.

(ii) External performance is also better under a floating exchange regime than under a fixed one, this is revealed by expansion of the trade balance by 0.3% under fixed rates as against 9.02% under floating rates.

(iii) In the long run, a floating exchange rate system is more effective in expanding output and curbing inflation than a fixed one when monetary impulses are changed. This is revealed by a 16.45% increase in real income and a decrease of 9.25% in domestic prices over a ten year period under a floating exchange rate regime as against a reduction of 1.85% in real income and an increase of 5.84% in domestic prices after ten years under a fixed exchange rate system with the introduction of a 2.3% increase in the average quarterly growth rate of money supply.

(iv) Under a floating system, use of monetary policy also proved more effective in improving external sector's performance than under a fixed exchange system as evidenced by an expansion in the trade balance of +1.32% under floating rates as against a decrease of - 5.80% under a system of fixed rates.

Results III and IV for Nigeria confirm the Mundell - Fleming's (1961,1962) as well as Rhomberg's (1964) position that the floating exchange system performs better than a fixed one when monetary policy instruments are employed. However the Nigerian result with respect to use of fiscal instruments contradicts the Mundell -

Fleming one that a fixed exchange rate regime is more efficient than a floating one when fiscal instruments are employed. In the case of Nigeria the floating system proved superior both under fiscal and monetary impulses. This Nigerian result also contradicts Tullio's (1981) position that the Italian economy performed better under a fixed exchange regime both when fiscal and when monetary instruments are applied.

(v) If rather than float her currency independently in 1986:4 Nigeria had simply depreciated the currency by 80% from its 1986:3 level and left the exchange rate fixed at the new level then by 1990:4 the level of domestic prices would have been less than what they were by 32.4%. A considerable fall in domestic prices which would have led to increased real income by 9.98%. However the external sector's performance would have worsened as evidenced by a reduction in the trade balance of 16.07%. Such worsening of the trade balance would also have had effects on the current account balance, the balance of payments and the country's ability to liquidate her debts.

(vi) In Ghana a floating exchange rate system is more effective in expanding real income and reducing prices (which usually follows increased output) when fiscal expansion is introduced, as evidenced by an expansion of real income by 7.52% and a decline of domestic prices by 7.07% under floating rates as against an expansion in real income of 4.25% and a decline of 4% in domestic prices under fixed rates. When the rate of growth of money supply is increased by 2% over and above its actual growth rate.

(vii) The performance of the external sector is also enhanced under a floating system than under a fixed one when fiscal policy is used as shown by an expansion in the trade balance of 18.05% under a floating system as against an expansion of 10.27% under a fixed system when the rate of growth of government expenditure is increased over and above its actual growth rate by a quarterly average of 2%. Result (VI) and (VII) above confirms Chibber and Shaffik's (1989) position that the onset of floating exchange rates is likely to have proved beneficial to Ghana to the extent that it improved fiscal balance given the inflow of structural adjustment grants at a more enhanced domestic rate. If fiscal expansion has the long run impact that results (vi) and (vii) imply, then an improved fiscal balance can only be beneficial to the Ghanaian economy.

(viii) A floating system is less problematic in terms of worsening income and rising domestic prices when monetary impulses translate faster into increased prices than they do into increased output. This is borne out by the fact that given the shock of a 2% average quarterly increase in the rate of growth of money supply in Ghana, real income declined by 11.79% under floating rates within ten years as against 17.98% decline under fixed rates. Also domestic price level rose by 11.08% under floating system while it rose by 16.9% under fixed rates.

(ix) In terms of external performance a floating exchange rate system also proved less problematic in terms of worsening trade balance when monetary impulses generate lower real income and lower exports. This is shown by a decline in the trade balance of 28.37% under floating rates as compared with a decline of 43.21% under fixed rates.

What is more - results VI - IX for Ghana imply that a floating exchange system is superior to a fixed one irrespective of whether monetary or fiscal policy instruments are used, this reinforces the Nigerian result.

(x) If rather than float her exchange rate independently in 1986:4 the Ghanaian monetary authorities had simply depreciated the cedi by 80% from its 1986:3 level and left it at the new level till 1990:4 then, domestic prices would have fallen by 2.68% while real income would have risen by 6.29% and trade balance would have improved by 6.29%.

Result (x) however provides a medium-run view as against a long-run view provided by results (vi-ix);a long-run view is better in taking decisions that would have long-run implications.

(xi) In Uganda a fixed exchange rate system is more effective in raising real income and reducing domestic price level when fiscal policy is employed, than a floating system.

This conclusion is borne out by the fact that an increase in the average quarterly growth rate of government expenditure by 1.08% led to a decline in domestic prices of 4.46% under fixed system and an increase in real income of 4.53% as against a decline of 2.57% in domestic prices under a floating system and an increase of 2.62% in real income. This result ryhmes with Mundell - Fleming and Rhomberg's position, that the economy performs better under a fixed system provided fiscal instruments are employed.

(xii) A floating system seems less problematic in terms of external sector performance even when fiscal policy is employed. This is revealed by a decline of 4% in the trade balance under a floating system as compared with a decline of 6.47% under a fixed system. Thus for Uganda under fiscal impulses the external sector performance will be enhanced under floating than under fixed exchange rate regime.

(xiii) A floating exchange system is more effective in Uganda when monetary policy is used in terms of increased real income and reduced level of domestic prices as evidenced by a growth of 35.51% in real income under floating rates and a decline of 40.08% in domestic prices over a ten year period, as compared with increased real income of 35.38% under a system of fixed rates and 39.27% decline in domestic prices when a shock of 2% in quarterly growth rate of money supply is introduced into the system.

(xiv) A floating exchange rate regime also proves less problematic in terms of external sector performance when monetary policy is utilised as shown by the fact that while the trade balance worsened by some 13.5% under floating rates it worsened by some

18.38% under fixed rates.

It is important to point out one fact with regards to result (xiii). The differences in the performance of these internal balance variables are so small under the two systems because the fixed exchange rate system adopted in Uganda from 1987:2 is more of a jumping peg and hence had almost the same degree of flexibility as the floating one, hence the closeness of the performance of the macroeconomic aggregates under the two systems. In spite of the above however, the floating system still proved slightly superior.

(xv) If Uganda had appreciated her currency by 5% quarterly beginning from 1987:1 instead of the sharp appreciation of 95.7% as between 1987:1 and 1987:2, then the level of domestic prices would have fallen by 12.7% while the trade balance would have worsened by 1.4% by 1990:4.

In all it can be concluded that the result of our ninth hypothesis is, that, floating exchange rate system enhances macroeconomic performance (in terms of higher growth rate of income, higher exports, more positive trade balance) better than a fixed exchange system. However this result can only obtain in the long - run when we are considering a period of about 10 years.

8.3 Limitations of the Study

It is important to point out some shortcomings implicit in this study. First, is the fact that it has been shown that in primary producing economies like Nigeria, Ghana and Uganda, import demand is affected by non-price factors or restrictions other than those associated with export earnings, thus, a term is usually required to represent such non-price-factors (Khan and Knight 1986). Such a term is missing from our model(s). Second, imports were lumped together as a homogenous whole, whereas we know that imports have three major components, capital imports, consumer imports, and intermediate imports. A distinction between these three categories of imports can prove very useful in deciding how to handle the problem of increasing imports in the face of dwindling foreign exchange earnings.

Thirdly, the study has failed to incorporate comprehensively the parallel market for foreign exchange, given that several studies (Elbadawi, 1990, Olopoenia, 1991, Chibber and Shafik, 1989) have shown the parallel market to be a significant force in the economies of our sample countries. However we do know that the bulk of the forex available in the focus countries is in the hands of government, as government, through its agent is usually the sole exporter of the major export commodity. For instance in Nigeria the Nigerian National Petroleum Corporation is the sole exporter of petroleum, the major source of forex, in spite of SAP. Thus the official forex market accounts for a significant proportion of the forex market share in these countries. Besides, data on parallel market transactions is usually considered suspect, because those who deal in the parallel market (because of its illegitimacy) do not always come out with transparent responses during the data-collection exercises. So that even published data on parallel market exchange rates in these economies are not considered completely dependable.

Further, the use of "experts" in the aggregated form is a serious shortcoming, to the extent that it limits the insights that can be had into the specific impact of exchange-regime change on specific forms of exports (traditional and non-traditional, oil and non-oil e.t.c). The use of 'exports' in its aggregated form was informed by the ready availability of data in this form, completely disaggregated exports for all the years covered by the study and for all the countries was not available.

Another serious limitation of this study worthy of emphazing is the use of nominal variables as against real ones. While we recognize the greater relevance of real variables we were however constrained to utilize nominal ones because of the numerous problems of trying to get real variables. First was the problem of getting an "appropriate" base year for all the countries, then there was the problem of getting an appropriate deflator for all the countries. The issue of deflator also brought in the problem of deciding on identical basket of goods and services for all the countries to go into the deflator. And finally was the problem of aggregation, to be sure that we had identical variables that we were deflating. Because of all these problems inherent in the use of real variable we decided to use nominal ones. Also, it has proved fairly difficult to isolate completely exchange rate effects from general trade liberalization effects and financial liberalization effects on the macroaggregates of interest, because almost all the policy instruments were changing simultaneously.

Finally, the study suffers from a major defect and that is, that to all intents and purposes it is a partial equilibrium analysis and hence Kindleberger's assertion cited at the beginning of this chapter aptly applies here.

8.4 Conclusions

We can conclude this study in the words of Goldstein (1984) that "the capacity of the exchange rate system per se to do good or harm should not be overestimated ... the importance of discipline and coordinated macroeconomic policies for the successful operation of floating rates should not be underestimated". In evaluating our exchange rate regimes we noted in particular to what extent a given ERR promotes the achievement of domestic stabilization objectives of stable prices and increased growth rate of income. Using the growth rate of real income as a measure of employment growth we can conclude from the results of our simulation exercises that a floating rate system appears better than a fixed one in the long-run in promoting macroeconomic performance. In the six experiments of the effects of monetary and fiscal policy changes on real income, and domestic prices and real demand for money, for the three countries, the floating exchange system proved superior in five of the six cases, the only time the fixed system proved superior was in Uganda's case under a fiscal policy change. It is important to note that even in situations where the economy was performing poorer as a result of the policy change the rate of decline of the relevant variables were lower under floating than under fixed system.

Secondly we evaluated the exchange rate regimes in terms of their ability to enhance the external sectors' performance. Employing this criterion we discovered that for the six experiments involving the use of fiscal and monetary policy instruments in the three countries, the floating exchange system proved superior in all the six instances: even when the external sector's performance was worsening, as evidenced by a declining trade balance, the rate of decline was less under floating system than under fixed, this was the situation in Uganda both when monetary policy was varied and when fiscal policy was varied.

Of course, we are aware that the floating exchange rate system has been noted for its extreme exchange rate variability which producers say is not good for planning. It is important to note however that as some economists have contended, a stable exchange rate system depends more on stable macroeconomic policies at the national level rather than on the form of the exchange rate regime itself. A system of stable exchange rates can itself be jeopardized as much by insufficient as by excessive exchange rate flexibility. Exchange rate variability is important to the extent that it impinges upon or facilities the achievement of the ultimate targets of economic policy. And if the floating exchange rate system proves potentially more efficient (in the long-run) in facilitating the achievement of these economic objectives then the floating exchange rate system can only be skillfully nurtured in developing countries to ensure that these countries get the best from the system.

8.5 Recommendations

An exchange rate system must not be thought of as possessing all the solutions to all the economic problems that a country might face. In particular developing African countries like Nigeria, Ghana and Uganda are known to face serious structural problems of which exchange rate regimes cannot offer any viable solution - (Oyejide, 1990).

That casual empiricism seems to suggest that there has been high inflation rates, high unemployment rates, slow growth in productivity in the latter half of the 1980s in Ghana, Nigeria and Uganda may not after all be due to the adoption of floating rates, for in the words of Goldstein "no exchange rate regime would have emerged unscathed from the combination of shocks, ... structural and institutional changes ..." of those years. What is more - the period 1986:4-1990:4 provides only a medium-run view when compared for instance with a period of ten years.

As mentioned earlier there are structural rigidities that these economies have had to grapple with which may themselves impinge on the performance of any exchange rate system. The greatest of such structural problems is supply rigidities especially of goods and of forex resources. Such supply shortages can however be remedied through increased imports and increased domestic output. Increased imports become important as Khan and Knight have shown that, even exports (the major forex earner) depend critically on imports in developing countries. Our results have borne this out as shown by an import elasticity of exports of 38% in Nigeria. Thus if import of intermediate inputs is so crucial to output expansion (both domestic output and exports) then imports of the right type must be encouraged. In Nigeria to increase supply a more aggressive promotion of non-oil production must be encouraged. The execution of the Liquified Natural Gas project and the Petrochemical and Oso Condensate must be pursued with seriousness in Nigeria.

For all the three countries studied a major problem has been the inadequacy of forex supply to the forex market both from official and non-official sources. The official source has been constrained by huge external debt service payments. This huge external debt repayment burden leaves little left for supporting investment in these countries. This is a situation that must be improved upon if indeed these countries must break free from the chain of indebtedness and poverty. The IMF and WB can help use their positions to help the countries obtain reduced rates of external loan repayment. Nigeria for instance spends as high as 45% of its export earnings on loan repayment; this is suicidal for any country, the debt service rate has to be considerably reduced. On the issue of capital inflow and the expected exchange rate appreciation that is supposed to follow such inflow in order to temper the excessive exchange rate depreciation, this has not materialized more for socio, polical, psychological as well as economic reasons. In the first place for any foreign investor to be attracted to an economy (be it for investing in financial or real assest) he must have the confidence that the investment plus the returns are realizable. In a situation of polical strife, turmoil and instability no rational investor would be willing to take the risk of losing all by investing in such an uncertain environment. Also the lack of transparency in governance as well as the lack of accountability which often inform policy-reversal, (in order to forster some private ends) disrupts planning, generates uncertainties and risks that can not easily be hedged, and so it discourages the inflow of capital. Thus in spite of continuously rising domestic rates of interest in the three focus economies, no appreciable capital inflow has followed (as economic theory stipulates). In the end the rising domestic rates of interest proved counter productive as it discouraged domestic investment even by domestic investors.

One would therefore wish to suggest that those in positions of authority must be made to appreciate the interwoveness of policies and economics and cannot denigrate one while trying to promote the other.

Finally, given that the governmental authorities in these countries believe in the efficacy of the floating exchange rate system, hence the return of Uganda that had in 1987 abandoned the system, back to it in 1992, the system however requires skillful and dogged maneuvering to make it work well. So far, the objective of diversification of exports is still miles away from being achieved in all countries. thus each of these economies is still prone to external shock in its present state. Foreign exchange leakages through non-repatriation of export proceeds persists and smuggling still goes on unabated. Therefore, new strategies must be designed that take explicit cognisance of the fact that managing the exchange rate is a complex question involving issues in economics, politics and psychology.

8.6 Areas For Further Research

Some economists have maintained that a model's result is as good as its assumptions. Certainly the assumptions on which our model(s) were based influenced our conclusions. For instance we assumed that under a floating exchange system the level of international reserves is no longer stochastic and hence we treated it as an identity. certainly this kind of assumption influenced our result; so it will be worthwhile to relax some of our assumptions and see to what extent and in what directions our macroaggregates change.

Secondly the issue of capacity utilization under different exchange rate regimes has generated some debate. While some argue that capacity utilization expand under floating rates some claim it does not. It would therefore be worthwhile to inbuild capacity utilization rate explicitly into our model and see how this affects our results. Lastly it would be interesting to carry out a comprehensive research on good-governance and economic performance, to enable us see to what extent some of our macroaggregates have been determined not by economic variables per-se but by socio-political and psychological factors.

ENDNOTES

C.P. Kindleberger (1956) cited in Machlup F. (1956) "The Terms of Trade Effects of Devaluation Upon Real Income And The Balance of Trade. KYKLOS Vol. 19, 1956.

Oyejide T.A. (1990) Supply Response In The Context of Structural Adjustment In Sub-Saharan Africa. (African Economic Consortium - Special Paper I).

ACRONYMS

1. IMF = International Monetary Fund
2. WB = The World Bank
3. FOREX = Foreign Exchange
4. SSA = Sub-Saharan Africa
5. LDC = Less Developed Countries
6. BOU = Bank of Uganda
7. BOG = Bank of Ghana
8. CBN = Central Bank of Nigeria
9. IMF/WB = International Monetary Fund Cum World Bank
10. SAP = Structural Adjustment Programme
11. ERP = Economic Restructuring Package
12. ERR = Exchange Rate regime
13. BOP = Balance of Payments

APPENDIX I

Definition of Terms

1.	MSS	=	Nominal Money Supply
2.	DCG	=	Domestic Credit to Government
3.	DCP	=	Domestic Credit to the Private Sector
4.	RE	=	International Reserves in Domestic Currency Terms
5.	DRE	=	Change in International Reserve
6.	CUB	=	Current Account Balance
7.	CAB	=	Capital Account Balance
8.	TB	=	Trade Balance
9.	X	=	Value of Exports in Domestic Currency Terms
10.	IM	=	Value of Imports in Domestic Currency Terms
11.	GD	=	Government Deficit
12.	GR	=	Government Revenue
13.	GE	=	Government Expenditure
14.	RDF	=	Interest rate differential between domestic and foreign rates of interest.
15.	RD	=	Domestic Rate of Interest
16.	RF	=	Foreign Rate of Interest
17.	RIST	=	Real Income differential between trend in real income in the previous

period and actual income in the last period $(RIS_{(t-1)} - RI_{(t-1)})$

18. RIS = Real Income Trend

19. RI = Real Income

20. RDME = Excess Real Demand For Money $(RDM_t - MSS_{(t-1)})$

21. RDM = Real Demand For Money which is Nominal Money Supply deflated by the domestic price level (MSS/PDL).

22. PD = Domestic Price Index

23. π_t = Expected rate of inflation at time t, $\frac{Pd_{t-1} - Pd_{t-2}}{Pd_{t-2}}$

24. PF = Foreign Price Index

25. EMSS = Excess Money Supply i.e. $(MSS_{(t-1)} - RDM_{(t)})$

26. RISD = Real Income Differential as Between Actual Real Income in the Previous Period and Mean Real Income $(RI_{(t-1)} - \overline{RI})$

27. $\overline{RI}$ = Mean Real Income Over The Study Period

28. E = Nominal Exchange Rate Index

29. EN = Nominal Exchange Rate

30. EPF = Foreign Price Index in Domestic Currency Terms

31. RER = Real Exchange Rate (i.e. EPf/Pd)

32. REŔ = Trend in Real Exchange Rate (EPf/Pd)'

33 $\overline{RER}$ = The mean Real Exchange Rate over the Sample period

34. RD = Domestic Rate of Interest

35. DPx = Export Price In Domestic Currency Terms (i.e. EPx).

36. ETOT = Real Exchange Rate In The Export Sector or Relative Price of Exports to that of domestic price level in domesticcurrency terms (EPX/PD)

37. RPIM = Relative Price of Imports to That of Home Goods i.e., EPim/Ph)

38. RID = Real Income Differential as Between Trend in Real Income and Actual weal Income in the Current Period (RIS-RI$_t$)

39. Y = Nominal Income or Gross Domestic Product.

40. RI = Gross Domestic Product deflated by the comsumer price Index

41. TOT = Terms of Trade (Pim/Px).

APPENDIX 2

Linear Estimation results.

And Error - Analysis

NIGERIA

A1, $PD_t = -0.47 - 0.65RI_{(t)} + .18MSS_{(t)}$
$\quad\quad(-2.83)\quad\quad(1.25)$
$+9.66EN_{(t)} + .12RD_{(t)} + .09\pi_{(t)}$
$(2.82)\quad(0.57)\quad(2.01)$
$+0.78\ PD_{(t-1)}$
(5.56)

$R^{-2} = .94$
DW = 1.90

A2, $RDM_{(t)} = 54.6 + .16\ Y_{(t)} + .05GE_{(t)}$
$\quad\quad(0.41)\quad\quad(2.06)$
$-2.15\ RD_{(t)} + 0.57RDM((_{t-1})$
$(-3.48)\quad\quad(6.11)$

$R^{-2} = .82$
DW = 2.10

A3, $MSS_{(t)} = 1976.12 + 3.25\ RI_{(t)} + .67TDC_{(t)}$
$\quad\quad(2.59)\quad(16.48)$
$+2.22\ DRE_t$
(5.31)

$R^{-2} = .82$
DW = 1.72

A4, $RD_{(t)} = 4.99 + 0.12\ EMSS_{(t)} + .17\pi_{(t)}$
$\quad\quad(2.05)\quad\quad(0.73)$
$-.40\ Y_t + 0.59RD_{t-1}$
$(-0.41)\quad(2.82)$

R^{-2} = .84
DW = 1.92

A5, $X_{(t)} = -2625.35 + 4.06\ RIS_{(t)}$
(0.45)
$-9.64\ ETOT_{(t-2)} + 0.921M_{(t-1)}$
(-1.67) (2.87)
$+ 0.46DPX_{(t-2)}$
(2.32)

R^{-2} = .89
DW = 2.20

A6, $IM_{(t)}$ $-221.33 + 0.46RIS_t + 2.64RPIM(_t)$
(2.19) (2.09)
$0.29DRE_t + .68RDM_{(t)}$
(0.48) (1.84)

R^{-2} = .84
DW = 2.04

A7, $RE_{(t)} = 822.59 - 0.05\ GD_{t-1}$
(-0.96)
$0.62TB_{(t-1)} - 0.21EMSS_{(t)}$
(2.24) (-2.48)

R^{-2} = .62
DW = 1.93

A8, $EN_t = -2.02 + 0.38\ RDF_t - 0.4RE_{(t-1)}$
(2.93) (-4.13)
$+ .05Y_t + 0.85\ MSS_t$
(0.34) + (3.01)

$R^{-2} = .75$
DW $= 2.10$

A9 $RI_t = 197.90 + .09RDME_t$
$\quad\quad\quad\quad (0.19)$
$\quad + 0.80RISD - .30PD + .09IM_{(t-1)}$
$\quad\quad (5.19) \quad (-2.41) \quad (0.76)$

$R^{-2} = .62$
DW $= 1.90$

(Please note that the figures in parenthesis are the t statistics while DW stands for the Durbin Watson and R^{-2} adjusted regression coefficient).

As pointed out in chapters four and six we solved our model in its linear and logarithmic forms, and then carried out the error-analysis in order to decide which form tracks the data better, as indicated by the form that has the least error. Table A1 reveals the result of this exercise for Nigeria.

TABLE A1

ERROR ANALYSIS OF NIGERIA'S LINEAR AND LOGARITHMIC ESTIMATIONS

Error Type	Root Mean Square Error (RMSE)		RMSE Relative to Average size of variable SRMSE		BIAS	
Dependent Variable	Linear Form	Log Form	Linear Form	Log Form	Linear Form	Log Form
PD	22.35	0.0006	8.7759	0.0235	0.1479	0.0005
RDM	9.40	0.1030	9.2610	0.1010	-1.2860	0.0046
MSS	3778.60	0.1600	16.0680	0.0006	222.5600	0.0016
RD	1.41	1.1530	7.3280	0.0050	0.4800	1.1480
X	2221.50	0.2400	34.8800	0.0037	-1.2143	0.0010
IM	693.70	0.2800	18.3730	0.0070	-11.2460	0.0007
RE	1802.90	1.6464	32.1610	0.0290	390.000	-1.3961
EN	0.57	0.5200	7.1670	0.0840	0.2000	-0.5160
RI	460.40	0.224	125.5890	0.0610	-132.7000	0.0009

No matter what type of error one looks at it is clear that for Nigeria the linear specification contains much more error than the logarithmic form. Therefore given that the log form has less error, we decided to carry out further analysis on our model based on its logarithmic form. For instance whereas the root mean square error for domestic prices is only 0.06 under the logarithmic form it is 22.35 under the linear form. Also whereas the degree of bias in the import equation is only 0.0007 under the log estimation it is -11.246 under the linear estimation.

GHANA

A10, $PD_t = 69.87 - 0.35RI_{(t)} + .05MSS_{(t)}$
$(-0.96) \quad (2.21)$
$+ .03EN_{(t)} + 0.32RD_{(t)} + 0.19\pi_t$
$(0.74) \quad (0.96) \quad (2.04)$
$+ .81PD_{(t-1)}$
(8.43)

$R^{-2} = .96$
DW = 1.80

A11, $RDM_t = 80.65 + .05Y_{(t)} + .12GE_{(t)}$
$(0.40) \quad (2.82)$
$-1.59RD_t + 0.80\,RDM_{t-1}$
$(-2.86) \quad (5.42).$

$R^{-2} = .84$
DW = 1.87

A12, $MSS_t = 6181.88 + 0.23RI_{(t)}$
(0.72)
$+.87TDC_{(t)} + .26DRE_{(t-1)}$
$(8.64) \quad (2.61)$

$R^{-2} = .98$
DW = 1.90

A13, $RD_{(t)} = 2.23 - .08EMSS_{(t)}$
(-0.94)
$-0.57\pi_t + .12Y_t + .97RD_{(t-1)}$
$(-1.47) \quad (2.34) \quad (2.56)$

$R^{-2} = .70$
DW = 1.90

$$A14,\ X_{(t)} = -1556.85 + .20RIS_{(t)} + 2.28ETOT_{(t-2)}$$
$$(0.39) \quad (6.72)$$
$$+0.59IM_{t-1} + .25DPX_{t-2}$$
$$(12.88) \quad (1.71)$$

R^{-2} = .89
DW = 1.97

$$A15,\ IM_{(t)} = -2258.37 + 0.46RI_{(t)}$$
$$(2.34)$$
$$+ 0.25RPIM_{(t)} + 0.34DRE_{(t)} + .18RDM_{(t)}$$
$$(0.84) \quad (3.78) \quad (1.96)$$

$$A16,\ RE_{(t)} = -276.04 - 2.21GD_{(t-1)}$$
$$(-2.00)$$
$$24.66TB_{(t-1)} - 0.45EMSS_{(t)}$$
$$(3.93) \quad (-1.85)$$

R^{-2} = .85
DW = 2.10

$$A17,\ EN_t = -38.24 + 7.4RDF_t$$
$$(13.88)$$
$$0.05RE_{(t-1)} + 0.11Y_t + .18MSS_t$$
$$(0.71) \quad (3.55) \quad (2.74)$$

R^{-2} = .85
DW = 1.95

$$A18,\ RI_t = 396.00 + 0.09RDME_{(t)}$$
$$(2.49)$$
$$+ .82RISD_{(t-1)} - 0.12PD_t + 0.23IM_t$$
$$(10.00) \quad (2.10) \quad (2.43)$$

R^{-2} = .70
DW = 1.87

As in the case of Nigeria we carried out the error analysis of these two forms of our model specification (direct linear and log-linear) by solving the model in two forms and investigating the simulation errors. Table A2 reveals the result of this exercise.

TABLE A2

GHANA: ERROR ANALYSIS OF NIGERIA'S LINEAR AND LOGARITHMIC ESTIMATIONS

Error Type	Root Mean Square Error (RMSE)		RMSE Relative to Average size of variable SRMSE		BIAS	
Dependent Variable	Direct Linear Form	Log Form	Direct Linear Form	Log Form	Direct Linear Form	Log Form
PD	188.217	0.1278	0.6193	0.0004	3.0478	0.0004
RDM	11.3044	0.1850	0.1652	0.0027	-4.0957	0.0002
MSS	7930.2870	0.1334	0.1334	0.00001	72.8623	0.4100
RD	1.3535	0.0649	0.0785	0.0037	-0.1623	-0.0124
X	4692.7627	0.2668	2.5978	0.00002	30.1661	0.0003
IM	3593.7600	0.2195	0.1349	0.00001	-35.2349	0.0006
RE	57742.1125	0.3065	2.13172	0.00001	-27112.67	0.6545
EN	26.4398	0.0845	0.3172	0.0010	7.2940	0.0027
RI	56.8089	0.1850	0.1425	0.00046	-3.6954	-0.0060

It is clear from table A2 that the log specification is better than the direct linear specification as the inherent errors are smaller. The root mean square simulation error is almost always less than unity under the log specification and the same holds for the bias but the root mean square errors were considerably large while the bias too was also large under the linear specification. Thus we conducted further analysis on the log form estimation result.

UGANDA

$$A19\ Pd_{(t)} = -10250.79 - 35.08\ RI_{(t)} + .31MSS_{(t)}$$
$$(-2.53) \qquad (11.09)$$
$$+5.79EN_{(t)} + 829.49RD_{(t)} + 0.10\ \pi_{(t)}$$
$$(2.01) \qquad (0.97) \qquad (2.35)$$
$$0.67PD_{(t-1)}$$
$$(5.55)$$

R^{-2} = .95
DW = 2.10

$$A20,\ RDM_{(t)} = -30.47 + .53Y_{(t)} + .42RDM_{(t-1)}$$
$$(2.66) \qquad (6.13)$$
$$+ 0.19\ GE_{(t)} - 10.80RD_{(t)}$$
$$(2.35) \qquad (-1.82)$$

$\bar{R}^2$ = .89
DW = 1.63

$$A21,\ MSS_{(t)} = -7425.93 + 658.41RI_{(t)} + 0.73TDC_{(t)}$$
$$(0.06) \qquad (13.44)$$
$$+2.04DRE_{(t-1)}$$
$$(0.10)$$

$\bar{R}^2$ = .90

DW = 1.93

$$A22,\ RD_{(t)} = 11.41 + 1.50EMSS_{(t)} + .21\pi_{(t)}$$
$$(0.57) \qquad (2.34)$$
$$-.02Y_{(t)} + .84RD_{(t-1)}$$
$$(0.96) \qquad (9.73)$$

$\bar{R}^2$ = .84
DW = 1.83

A23, $X_t = -91313.28 + 5309.58RIS + 27.64ETOT_{(t-2)}$
$\quad\quad\quad\quad (4.76) \quad\quad (2.98)$
$+0.561M_{t-1} + 0.21DPX_{(t-2)}$
$(2.22) \quad\quad (3.81)$

$\bar{R}^2 = .86$

DW = 1.97

A24, $IM_t = 127496.5 + 1424.39\ RF$
(3.83)
$-1394.2RPIM + .60DRE + .41RDM_{(t)}$
$(-1.79) \quad (6.54) \quad (2.14)$

$\bar{R}^2 = .84$

DW = 1.76

A25, $RE_t = -3486.92 - 265.36GD_{t-1}$
(4.60)
$+ 0.57TB_{t-1} - 054EMSS_{(t)}$
$(3.59) \quad (-1.64)$

$R^{-2} = .87$

DW = 2.20

A26, $EN_t = 69.67 + 21.67RDF_{(t)}$
(3.90)
$- .01\ RE_{((t-1)} - 15.46Y_{(t)} + .46MMSS_{(t)}$
$(-0.97) \quad (-0.67) \quad (2.66)$

$\bar{R}^2 = .89$

DW = 1.84

+A27, $RI_t = 15.70 + .03RDME_{(t)}$
(2.12)
$+ .40RISD_{(t-1)} - 0.32PD_{(t)} + .45M_t$
$(2.81) \quad (-3.34) \quad (2.33)$

$\bar{R}^2 = .70$

DW = 2.10

As in the cases of Nigeria and Ghana we also solved the Ugandan model in both the direct linear and log-linear forms. Table A3 contains the result of our error - analysis.

TABLE A3

UGANDA: ERROR ANALYSIS OF NIGERIA'S LINEAR AND LOGARITHMIC ESTIMATIONS

Error Type	Root Mean Square Error (RMSE)		RMSE Relative to Average size of variablSRMSE		B I A S	
Dependent Variable	Direct Linear Form	Log Form	Direct Linear Form	Log Form	Direct Linear Form	Log Form
PD	22621.55	0.1308	1.3937	0.000008	15293.3	-0.0025
RDM	71.46	0.4855	0.4328	0.0029	26.73	0.0047
MSS	9609.11	0.1324	0.0899	0.000001	3.12	0.0023
RD	21.45	0.1211	0.7460	0.0042	14.58	-0.0081
X	1371.23	0.0704	0.78859	0.0008	-8527.34	+0.2975
IM	13065.85	0.6365	0.6593	0.0003	30.60	+0.1774
RE	1607.75	0.3973	0.0795	0.0002	-0.12	-0.0005
EN	845.10	0.4258	2.1827	0.0010	-551.10	0.0009
RI	4.38	0.0759	0.3014	0.0224	0.006	+0.3638

Table A3 reveals that whatever type of error one considers the direct linear form contains more error than the log-linear form e.g. while the root mean square error is .4855 for the real demand for money (RDM) under the log-form, it is 71.46 under the direct linear form. The Table justifies our carrying out further analysis in the study on the basis of the log form results.

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