MONEY, FINANCE AND PORTFOLIO BEHAVIOUR OF COMMERCIAL BANKS IN LDCs: AN ECONOMETRIC ANALYSIS OF THE NIGERIAN CASE

OLUWATAYO ONI FAKIYESI

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Department of Economics
School of Arts & Social Studies
University of Strathclyde

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ABSTRACT

The primary purpose of the dissertation is to establish a conceptual study that will assist in financial policy formulation, and further applied research on banking institutions in LDCs and in Nigeria in particular.

In order to achieve this, we examined existing models of banks' portfolio behaviour with a view to isolating major issues that should be the concern of policy; the pecularities of banking operations in LDCs were also examined and analysed. Having done these we then settled for two adaptable models capable of providing insights into the problem of commercial banks' portfolio behaviour in Nigeria. The choice of models was made in the light of the data constraint faced in the study.

The two complementary models, the first a static model and the other a dynamic model have their basis in utility maximization. They both gave rise to multivariate analysis in empirical implementation.

The summary of results with policy implications concern:

(i) the relative insignificance of the interest rate variables and their relative inelasticities, particularly with respect to bank loans and other medium term bank portfolios;

(ii) availability of funds were more significant on banks portfolio allocation of funds than other variables, particularly those measuring the cost of funds;

(iii) on other policy variables, reserve policies of the financial authority were important in bank portfolio, whereas public sector borrowing from the banks were less important;

(iv) the term transformation implied by the portfolio of the banks was shown to be less positive than the underlying structure of funds would imply;

(v) the introduction of money market instruments were shown to have affected the adjustment behaviour of the banks; and

(vi) the results also held implication for the control of money supply.

However, we believe the major contribution of this study to knowledge lies in indicating the responses and lags of banks' behaviour to changes in policy instruments in a developing country like Nigeria. This information would no doubt form the basis for further research.

CONTENTS

CHAPTER ONE

INTRODUCTION

1.1 Background

Money and finance play a vital role in the macro-economic affairs of nations - both developed (EACs) and less developed (LDCs). In long-term discussions of economic issues, the effect of money and finance in the saving - investment process of capital accumulation is by now a well documented thesis.[1] However, the same cannot be said of the role of money and finance in short-term macro-economic policy. This is in spite of the importance of money and finance in determining and affecting the levels of aggregate demand, especially the actual level of spending, which cannot be overlooked by policy.

The importance of money and finance brings the role and place of financial institutions, as the main connecting link with the economy at large, to the forefront of economic analysis. Since financial institutions and intermediaries have remained an important medium of economic change in history,[2] it is not surprising that the contention has been made that they are the factors necessary to propagate the process of economic growth and development of nations.[3]

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[1] See, for instance, Goldsmith [1955, 1958, and 1969], Patrick [1966] among others.

[2] See Cameron [1967], Cameron et al. [1967] and Schumpeter [1934].

[3] See Patrick [1966].

Some economists/economic historians have even contended that financial institutions played a very important (if not a dominant) role in industrial development of twentieth century Germany.[4] In the literature of money and finance in the development process, the main issue has centered on whether finance is 'supply leading' or 'demand following' [Patrick 1966] and whether the demand generated by the process of development would be capable of generating its own supply of financial services. It also concerns whether the financial sector itself constitutes a leading sector in the process of economic growth and development.

There is no doubt about the importance of these issues especially in terms of the stance of financial policy. Policy prescriptions determine to a large extent the institutional and organisational structure of the financial sector. The bulk of these issues relate to long or medium term problems of money and finance, and the majority of studies have concentrated on these issues, together with the related problem of the role of money and finance in the saving - investment process. These issues become more important when one considers the finance options in the development process. For instance, the dichotomization of saving from the investment decision process and the resolution of the different and often conflicting requirements of the surplus and deficit units within the economy are usually functions of finance and institutions of finance. The out-

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[4]See Cameron, R. and Patrick, H. (eds.) [1967].

come of this process adds to the productivity of the economy. It leads to mobilization of savings, encouraging investment, transforming maturities, and transforming risks, reducing information and transaction costs [Bain, 1980. p.9].

The deficiency of the process in the LDCs is largely due to the level of development of the institutional and organizational structure of the financial sector, and to some extent the lack of adequate bases on which formulation of monetary and financial policy can be based by the authorities. These factors are not mutually exclusive; in fact, they reinforce one another. While a well developed institutional and organisational structure can aid and induce bases for efficient policy, the prevalance of adequate bases for policy would guide policy makers on how best to improve the system.

The majority of studies of finance in LDCs have concentrated on long or medium term issues, but studies on short-term issues of money and finance have been sparse. Empirically-oriented studies in this area have been hampered by the lack of concrete information and data. It is therefore with this background in view that this study is under-taken.

1.2 Motivation

In addition to the arguments above, a penchant for treating short-term problems of money and financial policy as inconsequential seems to permeate thinking in LDCs. The danger in this frame of things is that it may have inhibited the development of meaningful analysis capable of providing a sound foundation for financial policy. Because the analysis of the role of the behaviour of the financial institutions in macro-economic policy has been relegated below its importance, it is not unlikely that policies have failed to reflect the true structures of the institutions. In fact, there is a possibility that policies are devised and implemented without reflecting at all on the true nature and behavioural structure of the underlying agents, particularly the banks.

It is also known that in less developed countries, there is a tendency to predicate monetary and financial policy on models which are in the spirit of the money multiplier analysis [Taylor, 1978, chapters 2-4; Coats and Khatkhate , 1978; Coats and Khatkhate, pp. 3-36, 1980; and Ajayi, pp. 26-52, 1978]. This is in spite of the fact that when policies are predicated on such models, they do not reflect the true structure and behaviour of financial institutions in these countries. These models therefore tend to misrepresent the true nature and response of the institutions and are thereby likely to mislead policymakers.

The desirability of a sound micro-economic foundation for macro-economic policy has assumed increasing importance in recent times. In order to provide a solid foundation and to allow financial policy to be conducted to the best advantage, it is necessary to develop a satisfactory theory of banking behaviour. Such a theory would be an indispensable tool for understanding the workings of the system. Such a theory may also act as a prerequisite for understanding better the workings of the financial sector, especially as it affects the role of the sector within the economy in general and the important money supply and other financial variables in particular.

This point is strengthened by the unique place held by commercial banks within the economy and especially by their dominant position within the financial sector itself. Commercial banks play a central role in the intermediation process. They are responsible for handling a substantial amount of funds that flow from lenders to borrowers and also provide most of the economy's payments through the current account chequing system. Their role as custodians of the money supply also makes them unique, even though they have to act within the regulatory construct of governments.

This relative importance of commercial banks has been discussed and emphasized for some time now. For instance, Goldsmith [1969] puts these institutions in perspective as probably the most important segment of the financial sectors in developing countries.

In his studies of 36 countries, he found that commercial banks were of greater significance than non-banking financial intermediaries. This was particularly true of the less developed countries.

Table 1.1: Distribution of Total Assets of Financial Institutions Among Main Types of Institutions

	All Countries (36) 1967	Developed Countries (17) 1967	LDC (19) 1967
Central Banks	17.6	8.5	23.6
Deposit Banks	38.5	33.5	43.3
Thrift Organizations	13.5	19.3	8.0
Insurance Organizations	15.6	23.3	11.1
Mortgage and Development Institutions	12.4	10.6	13.0
Others	2.5	5.0	1.0

Source: Goldsmith [1969].

In Table 1.1, a close analysis of the situation indicates that for the countries combined 38.5 per cent of the total assets of the financial sector belong to the commercial banks and in fact, for the less developed countries the figure was higher, 43.3 per cent. The same picture emerges when one looks at Table 1.2, which is an attempt to produce more recent comparative figures for the position of the commercial banks in some selected African countries. For instance, apart from Sudan where the relative position of the Post Office Savings Bank seems very important in the 60s, Goldsmith's conclusion on the relative importance of the commercial banks within

Table 1.2: Distribution of Assets of Financial Institutions for Some African Countries

Country	Year	Commercial Banks	Post Office and Savings Banks	Provident and Social Security Fund	Insurance	Other NBFIS	Total Percentage	Total Value in Millions of Local Currency
Ghana	1966	65.8	8.5	10.8	11.4	3.5	100	102.2
	1974	46.8	3.1	38.1	6.6	5.4	100	613.4
Kenya	1966	59.4	10.6	6.0	11.3	12.7	100	930.4
	1974	48.0	3.1	21.5	9.2	18.2	100	4504.9
Nigeria	1966	78.7	2.6	18.0	n.a.	0.7	100	206.5
	1974	86.9	0.3	8.9	n.a.	3.9	100	2595.9
Sudan	1966	44.7	46.3	n.a.	9.0	-	100	18.8
	1975	72.4	18.7	n.a.	7.0	1.9	100	66.2
Tanzania	1966	83.2	9.6	-	7.1	0.1	100	364.6
	1976	81.2	3.9	7.7	6.9	0.3	100	2381.9

Source: Calculated from various Central Bank Reports.

the financial sector is supported.

These factors therefore offer enough reasons for singling out the commercial banks for study within the financial sector of an LDC. Such a study would help in understanding the nature of the interactions that exist within the whole sector as well as between the sector and the financial authority.

While empirical studies of financial institutions', and in particular banks', portfolio behaviour have been carried out most have concentrated on the developed countries. Moreover, in most of the studies, even though the effects of the composition and variation of the banks' portfolios were very important in transmitting actions of the monetary and financial authority to the economy, the effects of monetary and financial policy on commercial banks have been concentrated through mediums such as open market operations, the bank rate or discount rate and the reserve requirements. This is despite the fact that an analysis that focusses attention on only these issues may be of little relevance to open economies like the less developed countries. The special features of LDCs thus provide an additional justification for a study of this type.

Commercial banks' role in the domestic money market is especially important. Apart from developing the domestic money market they provide a mechanism for monetary and financial policy through their role in channelling funds from the private sector to

finance government activity and budget deficits. Superimposed on the structure of the banks is the extent of government intervention in LDCs, especially the tinkering of the financial authority with normal market quantities and prices, particularly interest rates, and the credit rationing process of banks' operations.

1.3 Purpose of Study

The issues highlighted so far call for a better understanding of the role of banks in the process of money and financial policy; and point to the importance of assessing the effects of institutional development on the composition of the portfolio of commercial banks. They call for an empirical study of commercial banks' portfolio behaviour in LDCs, to help to provide a basis for formulating monetary and financial policy, especially policies designed to offset destabilizing effects through the banking system, to ensure an efficient means by which government financing needs can be met, and to foster desirable financial development.

Apart from contributing to the meagre stock of studies available in LDCs, our purpose is in addition to emphasize the need to predicate macro analysis of financial policy on the micro-foundations of behaviours of banking institutions. We seek to clarify issues of commercial banking portfolio behaviour and issues on which short-term financial policies are based in these countries, particularly in Nigeria. Although the study is conducted within a sample data based on a consolidated balance sheet for the whole banking system,

principal issues in the portfolio behaviour of banking firms were also examined, including amongst others, the principal adjustment instruments in the portfolios of the banks and profitability of the environment of banking operations.

The structure of liability and asset management of the banking firms will be examined; for instance the banks' ability to rely on non-deposit sources of funds can affect their choice of portfolio size. Banks may use endogenously determined liabilities to bear the burden of adjustment. Thus, further borrowing in the domestic market or inter-bank lending may be important means of adjustment to some banks, whereas for others it may not be important.

Furthermore, policy measures may have led to developments in the money markets - an example is the effects of structural, institutional or technological changes in the portfolio of commercial banks. The introduction of rediscounting facilities and new instruments, and new institutions may have had some influence on banks' portfolio of assets and liabilities.

1.4 Scope and Coverage

In terms of scope and coverage this study can be divided into four parts. The first concerns itself with laying the foundation for the study. A review of portfolio studies carried out on advanced countries is undertaken, with a view to providing guidance and highlighting the major issues in banking portfolio behaviour. Attempts

are made to emphasize the relevance of these studies for our case while bearing in mind that some of the studies may of necessity be a reflection of the institutional environment of banking industries in the economically advanced countries (EACs). Despite the short-comings of the studies, they still offer the much needed theoretical insight for the study of banking portfolio behaviour in LDCs. Within this part an attempt is also made to examine the extent of studies in this vein that have been based on the LDCs. The lack of in-depth work on banks' portfolio behaviour in LDCs led us to consider the major issues that should be examined in the portfolio selection of banks in LDCs. Even though the lack of data on banking firms in these countries is realized, the major issues examined in this part are discussed as they impinge on the operations of banking firms in this part of the world economy. This is done because of the importance of the individual banking firm in the overall picture of the banking system in LDCs. For instance, issues such as banks' ownerships, their objectives, competition and regulatory constraints and environment are important issues in LDCs' banking system and their full implications cannot be understood without knowing how they affect the individual banks.

The second part's main task is the presentation of a flexible model capable of being adapted to the study of banking behaviour given our peculiar environment. Given the background stated above, we were concerned with models capable of adaptations to suit our particular environment in terms of both data availability and

institutional development, we opted for a two-stage analysis. The first stage, which is basically static in its nature, utilizes the Tobin [1958] - Markowitz [1959] framework and similar to that applied by Parkin [1969, 1970]. The second stage framework, an essentially dynamic analysis, called upon the Tobin - Brainard [1968] framework, modified by the sequential procedure suggested by White [1975] and Bain [1977].

The third part of the study was concerned with the application of the models developed in section two. However, before the empirical exercise, the Nigerian banking system, operations and characteristics were examined with a view to highlighting major issues which our model building seeks to elucidate. The sequential procedure was therefore applied to the consolidated balance sheet of the banking system. Having determined on institutional grounds that the net foreign asset of the banking system should be treated as exogenous, we therefore assumed that the main criterion for broad allocation of banks portfolio after all prior claims and the financial authority regulatory conditions have been met, should be on the basis of liquidity of choice portfolio items.

The fourth part applied the models developed to the data drawn on the Nigerian banking system as an example of a less developed country. The data set was drawn from the fourth quarter of 1959 to the fourth quarter of 1981. Apart from the quarterly series for econometric analysis, to elucidate the results of the empirical analysis of the aggregate data, balance sheet data on individual

banks were used throughout the study descriptively. After suitable data transformation, the mode of the econometric analysis was mainly by the use of multivariate regression and ordinary least square regression methods.

1.5 The Plan of Study

In Chapter Two we set out to review the studies on portfolio behaviour of commercial banks. Apart from providing a focus for the theoretical issues involved in the modelling of banks' behaviour, our objective in this chapter is to highlight those issues that should concern policy makers in formulating policies on banks. We also draw attention to the sparseness of works on LDCs and the contributory nature of studies of this type.

In Chapter Three, consequent on the review, we examined some issues that may be important in the determination of banks' portfolio behaviour in LDCs - the objectives of individual banks in relationship to their ownership structure and the competitive as well as regulatory environment within which the banks have to operate.

In Chapter Four, we presented the theoretical models upon which our empirical exercise would be based. The choice of models was based on the adaptibility of the chosen models to take account of the peculiarities of our condition without losing much information in the process. Two models are presented as discussed earlier, the first the static model, would treat banks' adjustment behaviour as

instantaneous, whereas the second model, the dynamic model would examine the pattern of adjustments of banks from disequilibrium.

Chapter Five gives a descriptive analysis of the structure of banking operations in Nigeria, within the context of the financial system, in order to elucidate those issues that are peculiar to the structure and institutional conditions upon which our empirical application is based. Issues that are topical within the system are raised without trying to provide answers. The roles and importance of the commerical banks in the capital market and money market are highlighted. The performance of individual units of the banking system (that is banking firms) are compared and discussed in terms of their profitability with other firms within the economy and globally.

Chapter Six introduces the operational framework for the treatment of the balance sheet of the banking system, given that a sequential decision process is adopted by the banks for allocating their funds within choice portfolio items. This is done mainly to highlight the adaptation of the frameowrk to the study of the Nigerian situation.

Chapter Seven sets up the empirical framework and discusses the econometric and data problems. Chapters Eight and Nine present the static and dynamic estimation results respectively, and Chapter Ten concludes and discusses the policy implications of the study.

CHAPTER TWO

PORTFOLIO BEHAVIOUR OF COMMERCIAL BANKS AND COMMERCIAL BANKING SYSTEMS: A REVIEW OF MODELLING AND PORTFOLIO SELECTION

2.1 Introduction

The study of portfolio behaviour of commercial banks and other financial institutions has progressed fairly rapidly in recent times. It might, therefore, be expected to have provided solutions to the problems associated with these institutions in macro-economic processes and policy. On the contrary, however, the more attempts are made to answer some of these questions, the more perplexing the questions left unanswered.

The first major study of portfolio behaviour of commercial banks originated from the work of Edgeworth [1888], but thereafter the study of banking behaviour was in abeyance. The next stage of development was for a long time provided by the quantity equation, $MV \equiv PT$, and quantity theory framework. Curiously enough, the quantity equation - quantity theory held only a passive role for banking firms and the banking system, the more so as long as quantity theorists held to the view of a constant and institutionally determined velocity of money. This allowed no role to banking firms or the banking system other than mechanical acquiescence in the volume of money determined.

Later developments in the tradition of the quantity theory and Keynesian economics, however, realised the importance of the behaviour of banking and other financial institutions.

The behaviour of banking institutions was lumped into the so-called multiplier approach to the determination of the money supply. The approach was dependent on the existence of the fractional reserve system. The analyses were more applicable to closed rather than open economies. Dissatisfaction with the explanatory as well as the predictive power of this approach led to further thinking on the issue.

In this connection, Gurley and Shaw [1956] argued that banks should be viewed from an optimization process point of view; that banks may choose to live with excess reserves rather than pay higher prices for primary securities or higher yields on their own debt issues. It was further contended by Towey [1974] that a meaningful analysis of monetary and financial economic issues cannot be accomplished without a proper understanding of the micro-economics of commercial banking portfolio decisions. He further argued that the current treatment of individual banks appeared methodical and mechanical, and had proved ineffective in explaining the actual responses of the banking sector to changes in monetary and financial policy. To these authors, banking firms must be viewed as active participants in the financial process.
They stressed the importance of understanding the micro-economic characteristics of the banks in formulating monetary and financial policy. They argued that, if banks are treated as profit-seeking firms, it no longer follows that an increase in discretionary reserves will necessarily generate a proportionate increase in the aggregate volume of bank credit. Their arguments

essentially imply that inside money in the economy is not entirely determined by supply considerations but depends upon the interactions between demand and supply of money balances. The banks' desired output of inside money is dependent upon the profit potential of demand deposits in relation to other sources of bank funds. Moreover, the public's desired holdings of demand deposit balances depend upon the relative advantages of other financial claims, and if demand deposits are viewed as both a medium of exchange and as a financial asset, the money stock is indeterminate until the degree of substitutability between inside money and non-financial claims is determined [Gurley & Shaw, 1956].

These issues led economists to devote attention to the study of portfolio behaviour of commercial banks. Apart from highlighting them in this review, it is our basic objective to summarise these important factors in various modelling approaches in order to provide the background for our study.

In selecting items for review, we shall be guided by their relevance to the portfolio behaviour of commercial banks and financial policy. Consequently, we shall examine models of portfolio behaviour that possess implications for monetary and financial policy, namely models that reflect competitive factors, industrial structure and the effect of the regulatory environment on portfolio behaviour. We shall also examine the relevance of the models to open economies, especially the less developed variety.

2.2 Theory of Banking Firms

2.2.1 Review Framework: A substantial proportion of models of bank portfolio behaviour deal with so-called partial models which mainly adopt a firm theoretic approach, usually emanating from the bank's reserve and liquidity management problems. These problems are believed to play a vital role in the money supply process. These models start from the assumption that the volume and structure of liabilities are exogenous but stochastic over the planning periods. Banks are required to liquidate assets in order to meet deposit overflows and withdrawals. They usually begin with the assumption that initial deposit levels are exogenous and the portfolio decision problem is the allocation of given funds among various assets, with attention paid to the implications of choice on earning assets and reserve assets. The models emphasise the least cost method of meeting liquidity problems viewed mainly as an inventory problem, emphasising the trade-off between expected yield and adjustment cost.

Others substantially deviate and improve on the above approach. Among these categories are those that emphasise the market structure and the banking environment in the determination of the outcome of banks' portfolio behaviour. In these models the choice of environment is either that of an imperfect or a perfect market. The others, however, emphasise imperfection of the market. The banks are faced with downward sloping demand curves for loans. Furthermore, the banks are also assumed to have monopsony power in the deposit market such that the supply

of funds is a function of the rate set by the banks.

There are also models based on perfectly competitive markets which essentially ignore the liquidity problems faced by banking firms. They deal mainly with the optimal mixture of assets and liabilities given the implied market structure.

Finally, the last group of models are the so-called resource models, based on what is believed to be a complete theory of the banking firm. They assign a prominent role to the 'real resource' or 'real production' aspects of the banking firm.

We shall, therefore, consider in the remaining part of this section, a general framework for the theoretical part of our review which utilizes a balance sheet framework to derive the objective function of the banking firm. It is also designed to highlight basic issues in the review that follows. The remaining sections deal with discussions, first of the theory and then of relevant empirical applications. Thus, section 2.3 reviews the so-called partial models and 2.4 the complete models. Section 2.5 examines empirical applications of some of the models, discusses their application to LDCs and examines their relevance to these countries and to our study. Section 2.6 summarises and draws some conclusions from the models examined.

2.2.2 Treatment of Assets and Liabilities:

Table 2.1: Illustrative Balance Sheet Framework

Liabilities		Assets	
Deposits:- Demand	[DD]	Loans and Advances	[L]
Time	[TD]	Investment in Govt. Security	[Ig]
Savings	[SD]	Reserves	[R]
Other Liabilities	[OL]	Cash Items	[Xc]
Reserves and Capital Account	[W]	Other Assets	[OA]

Table 2.1 is a simple illustration of the balance sheet framework that will be followed in this review.

For the purpose of the framework, we assume that banking firms operate in at least one asset and one liability market. We also assume that they operate in a less than perfectly competitive market, and that they maximise a single period return on stockholders' equity. We classify assets into four categories. Cash assets are notes and coins held by the banks, denoted by Xc. The rate on cash assets is assumed to be zero, and cash is also free of market risk.[1]

Loans and advances 'L' are traded in imperfectly competitive markets, due to the effect of asymmetric information, especially with respect to the banking firms' customers. Competition among banks is limited by the existence of transaction costs of search, diversification of lenders and borrowers and imperfect divisibility

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[1]Market risk refers to risk that cannot be avoided by diversifying.

of assets. Banks do not all possess the same knowledge about credit worthiness of potential borrowers. If banks were a homogeneous group, each possessing the same information about the credit worthiness of potential borrowers, the interest rate charged to each customer would be the same regardless of the bank issuing the loan. Further, banks have better information on customers of long standing and reliability. Hence, a bank's traditional customer is more likely to be offered a lower rate reflecting a lower perceived probability of default. The traditional bank will incur lower marginal cost of investigation than will banks with no previous relationship with the customer. It is also true that a potential borrower is likely to be aware of this, and will therefore limit his shopping around each time he is in need of a loan. These characteristics make it possible for banks to be able to affect the rate charged on loans as well as their loan volume. In this situation, if a bank decides to raise the rate charged on loans above the rate reflecting its estimate of customers' default probabilities, it will not lose all its customers.

Government securities [I_g] are defined to be free of default risk but subject to variations in their realizable returns due to changes in interest rates. They are also readily marketable. The banking firm's expected return on government securities is

$$i_g = \bar{i}_g \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad 2.1$$

where $\bar{i}_g$ is the rate determined by the government.

Finally, OA is other assets which consist mainly of plant and equipment; it is assumed fixed for the time period of the analysis. The same assumption holds for other liabilities which also consist of items in transit and unclassified items.

Generally on the liability side of the balance sheet, the bank is assumed to have two primary sources of funds. The first is equity capital invested in the firm. If we assume that new issues are rare and given the time frame, and if we denote capital as W, equity capital can be assumed constant. That is

$$W = \bar{W} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.2$$

We can also, for the sake of simplicity assume the existence of two types of deposits, time deposits [TD] and demand deposits [DD]. We also assume that both are characterised by upward sloping supply functions. The volume of each is a function of their explicit and implicit yields, and of the yield on alternative deposits. If, for the sake of simplifying our analysis, we define all assets net of required reserves, the interest cost of both deposits may be defined as

$$\Gamma_T = (i_T)/(1 - \alpha_T) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.3$$

and

$$\Gamma_D = (i_D)/(1 - \alpha_D) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.4$$

where i_J, (J = T and D) is the explicit payment on a unit of deposit and α is the required reserve on a unit of deposit.

If we assume further that commercial banking firms can affect the volume of their deposits through changing their explicit interest payment, we can then define their supply functions as

$$TD = TD\ (\Gamma_T,\ \Gamma_D) \quad \partial TD/\partial \Gamma_T > 0, \quad \partial TD/\partial \Gamma_D < 0 \quad \ldots\ldots \quad 2.5$$

$$DD = DD\ (\Gamma_D,\ \Gamma_T) \quad \partial DD/\partial \Gamma_D > 0, \quad \partial DD/\partial \Gamma_T < 0 \quad \ldots\ldots \quad 2.6$$

We further assume that the bank faces uncertainty in terms of deposit withdrawals. The bank also faces costs of maintaining liquidity and penalty for any deficiency of reserve asset and transaction costs associated with remedying such a situation.

If we define ψ as the cost of a unit borrowing of B, where B is the amount borrowed;

'A' as per unit transaction costs associated with liquidating securities, and

'η' as penalty cost per unit of cash deficiency, and if we further assume that banks can meet an unexpected cash deficiency through borrowing at a fixed rate, then this assumption implies

$$\psi = i_g + A = \eta \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.7$$

If this cost is a function of the amount borrowed, the bank will, therefore, liquidate securities whenever B is such that

$$\psi(B) > i_g + A \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.8$$

and the bank would borrow to meet liquidity need whenever B is such that

$$\psi(B) < i_g + A \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.9$$

If we further assume that net disbursement outflows are seen by the bank as having a probability distribution characterized by the density function $\Phi(Z)$ where Z is a random variable, further assume that net disbursements have some lower and upper bound [Xc and b] during any planning period such that withdrawals in excess of the upper bound and lower bound occur with probability equal to zero.

We can then write the liquidity cost imposed on the banking firm as

$$N = \eta \int_{X_C}^{b} (Z - X_C)\, \Phi(Z)dZ \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 2.10$$

that is the total expected cost due to net disbursement, where

Z is net disbursement [cash] outflows in excess of inflows

$\Phi(Z)$ is the probability density function

b is the largest net disbursements to which banks assign a non-zero probability

X_C is bank holding of cash as a proportion of total fund.

For the sake of our analysis, 2.10 can be simplified to

$$N = N\,[Xc] \qquad \text{2.11}$$

If we assume that bank investors are risk neutral and that the banks maximise a single period return on stockholders' equity, we can then state the bank's objective as

$$\underset{L, Ig, X_C, \Gamma_D, \Gamma_T}{\text{Max}} \{E[\pi/W]\} = \text{Max}\{[E_W]\} \qquad \text{2.12}$$

where $\pi = TR - TC$[2]

and E is the mathematical expectation operator

E_W is the expected rate of return on owner's equity

The bank, therefore, seeks to maximise 2.12 by choosing $L, I_g, X_C, \Gamma_D, \Gamma_T$ subject to the condition that net assets equal net liabilities. The maximisation problem therefore becomes

$$\text{Max}\ \{E(\pi)\}^3 = i_L(L)*L + i_g*I_g - N(X_C) - \Gamma E(TD) - \Gamma_D E(DD) + \lambda(L + I_g + X_C - TD - DD - \bar{W}) \qquad \text{2.13}$$

---

[2] TR is total revenue and TC is total cost of the banking firm.

[3] $E(\pi) = E_W$ given that $W = \bar{W}$

By maximising this objective function, that is analytically differentiating with respect to L, $I_g, X_C, \Gamma_D, \Gamma_T$ and equating to zero, the first order conditions are used to derive the optimal mix of loans, securities and any other earning asset. The importance of this framework lies in it ability to highlight some of the problems of the models that we shall review subsequently, e.g. Shull [1963] and Klein [1971]. Other factors, such as the effects of risk and the nature of the preference function of bank investors, are also important as will emerge when we examine the work of Pyle [1971].

Finally, we have refrained from deriving the results of this framework as the model presented is similar to that of Klein [1971] in many respects.

2.3 Partial Models of Portfolio Behaviour

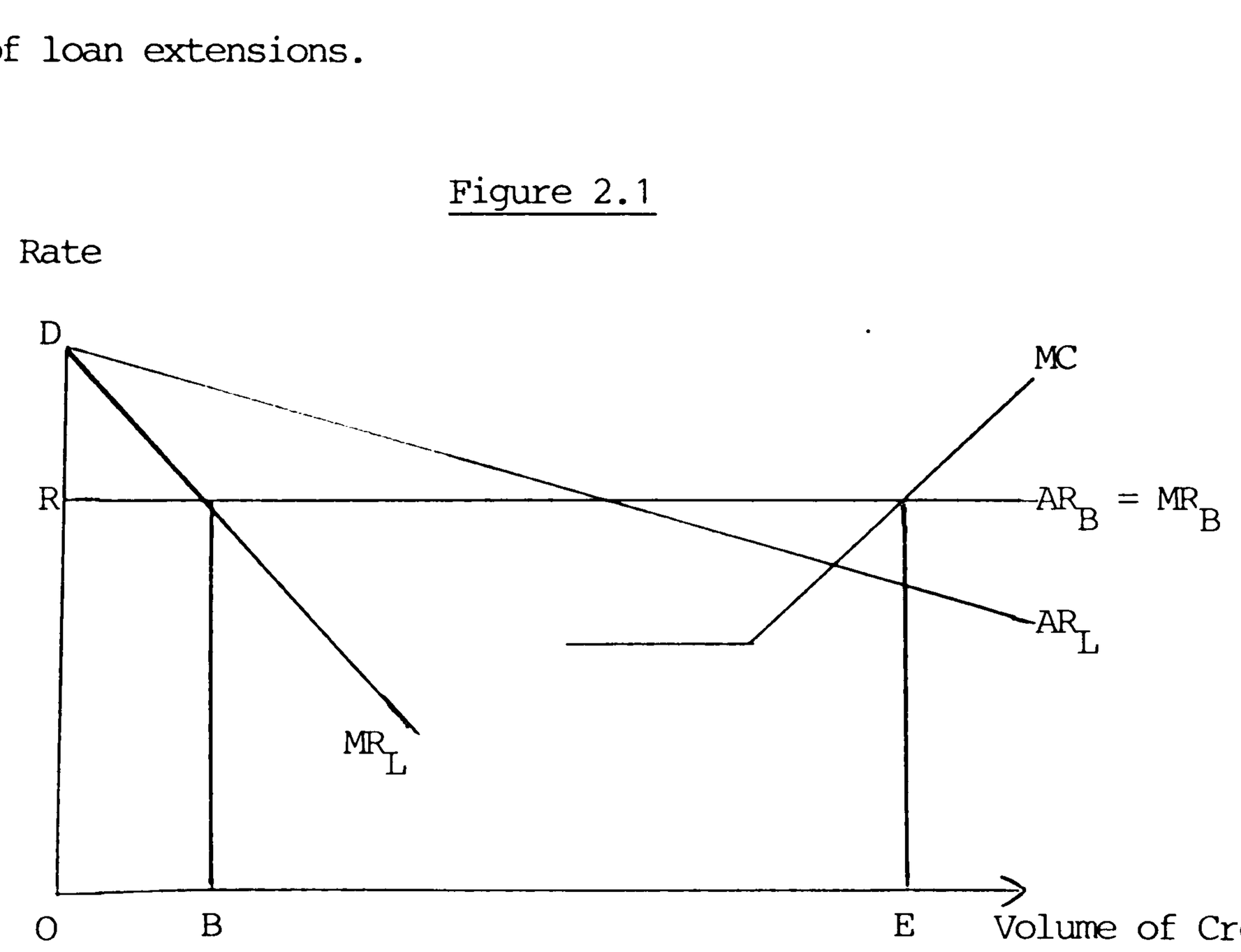
2.3.1 The first type of model considered is similar to the framework presented in that it also assumes a less than perfect market structure for the banking industry. Shull [1963] and Brucker [1970] were the first to formulate models of this kind. Shull [1963] views the banking enterprise as a profit maximising organisation which transforms bank deposits into a heterogeneous mix of credit outputs. He suggested that banking firms behave in a manner that is characteristic of a multiproduct, price discriminating firm. To him, banks operate in two markets where demand deposits are transformed into interest earning assets - the government securities and bank loan markets. Shull further assumes that demand for government securities is perfectly elastic and demand for bank loans is less than perfectly elastic. The marginal cost of credit output is further assumed dependent upon the total dollar volume of credit extensions and does not vary significantly with asset mix.

Given these assumptions, Shull showed that the desired volume of credit output will be determined at the point where the going rate of interest on government securities is equal to the marginal cost of credit output. Also, the optimal volume of bank loans is found at that point where the market rate of interest on government securities is equated to marginal loan revenue. In this model, the government securities market is the residual market for banks' investment activities. The optimal dollar volume of government securities in the bank's portfolio is equal to the

difference between the optimal aggregate volume of credit extensions and the optimal amount of bank loans.

Brucker [1970] provided a geometrical interpretation of Shull's analysis. In figure 2.1, ARL represents the loan demand function, OR corresponds to the market rate of interest on government securities and MC represents the relevant incremental cost function. The optimal aggregate volume of bank credit OE is established at the point of intersection between the marginal cost curve and the demand for government securities; OB of the bank's credit is allocated to the loans market and BE to the securities market. The desired volume of government securities is equal to the difference between the aggregate credit output and the volume of loan extensions.

Figure 2.1



Brucker's Geometrical Interpretation of Shull's Banking Model.

The importance of the Shull-Brucker analysis to us is in its prediction that banking firms will operate at the margin of profitable markets and in the relationship of this prediction to the structure of banking operations and to the regulatory implications of public policy on banking portfolio behaviour - particularly how cheap or tight money policy could impinge on banking firms' marginal market. In illustrating the implications of the model Shull argued that, in a tight money situation, an upward shift of the marginal cost of funds would take place. This would imply that banking firms would start to drop out of marginal markets as the marginal cost of funds seems greater than the marginal revenue from such markets.

Shull, however, believed that a typical example of a marginal market is the government securities market. This belief is a consequence of the abstraction of Shull's analysis from uncertainty. Once allowance is made for the existence of uncertainty, the government securities market then possesses characteristics that make it more appealing in a tight financial situation. Further, it is generally arguable that banking firms' credit markets would consist of varying levels of profitable opportunities: banking firms may therefore resort to non-price methods of rationing credit in a tight financial situation. In other words, they may decide to spread their portfolio, depending on the risk structure and maturity patterns of existing assets and liability in the bank's portfolio. They therefore need not move out of government security's market.

The analysis of Shull and Brucker is important in its introduction of market structure to the determination of bank performance, especially with respect to the effect of monetary and financial policy on these firms. Nevertheless, their assumptions ignored the effects of uncertainty, stochastic deposit flows and loan returns on banking firms' portfolio behaviour. The analysis also ignored the bank-customer relationship which is important in micro treatment of banks' portfolio behaviour. For instance, a bank may find that the market in which loan demand is inelastic and thus marginal revenue is highest, is for loans to traditional customers as already discussed in the introductory framework. In fact, as already introduced, one important determinant of banks' market power is asymmetry of information with respect to borrowers risk position; traditional borrowers are viewed as less risky and likely to have less close substitute for the bank credit. Finally, the Shull-Brucker analysis failed to account for the effect of inter-relations between the different assets and liabilities [Pyle,1971] in the bank's portfolio.

2.3.2 Liquidity Models: One of the main faults of the Shull-Brucker analysis is their complete neglect of banks' liquidity problem. In this sub-section our focus is on economists who have tried to model this problem theoretically. We will concentrate on three main attempts: Orr and Mellon [1961]; Porter [1961] and additions by Hester [1962] and, finally, the work of Kane and Malkiel [1965]. Although the work of Pringle can also be said to belong to this category, his emphasis was on the contribution of capital structure of banking firms to their portfolio behaviour.

Generally, the liquidity models differ from others considered so far with respect to the structure of objective function assumed. They usually assume a two period framework. It is assumed that banks make their portfolio choice at the beginning of the current period, knowing well that by the end of the planning period, the supply relationship for deposits may change, thus necessitating changes in the quantity of assets and liabilities held. The form of utility function and the nature of response to incentives are important tc the results derived.

The first work of this type - the Orr and Mellon [1961] model and the subsequent correction by Cooper [1971] - deals with the introduction of uncertain deposit flows and the result of such uncertainty on banks' decisions to hold reserves. They were interested mainly in investigating the impact of reserve uncertainty on the expansion of bank credit.

Orr and Mellon assumed that the banking firm would wish to extend bank credit in order to maximise its expected profit, $E(\pi)$ which is given as:

$$E(\pi) = i_L D - A \int_v^\infty \Phi(L_R) dL_R - \eta \int_v^\infty L_R \, \Phi(L_R) dL_R \quad \ldots\ldots \quad 2.14$$

where D = the volume of new deposit liabilities created during the period

L_R = the loss of reserves during the period

i_L = interest rates on loans

A = transaction cost when reserve requirements are violated

$\Phi(L_R)$ = Probability density function for LR

η = the penalty rate for each unit of which reserves are short of what is required

$V \equiv \frac{R-\alpha^D}{1-\alpha}$ is the critical value of actual reserve losses above which a deficiency will be realised

where α = the legal reserve ratio

R = Volume of excess reserves at the beginning of the period.

In this model, profit on new deposits is treated as revenue from loans minus the cost of reserve deficiency. This cost in itself has two components, the cost of administering such a violation and the penalty cost. By holding reserves, it is shown that banks are able to reduce the expected loss due to reserve deficiencies. In other words, the reduction in expected loss of a bank constitutes a unit return on the reserves which are held.

Orr and Mellon used the model to illustrate the nature of the economic trade-off between an increase in loan volume and cash to the income of the banking firm. They pinpointed the influence of this trade-off on the potential size and the likelihood of a cash deficiency, and of its effect on the expected cost associated with deposit withdrawals.

The main drawbacks of the model are that it assumes that banks will hold only two assets, loan and cash, and therefore engage only

in a simple type of diversification. It also assumes a constant liquidity response which, coupled with non-inclusion of government securities, implies that once excess cash is run off borrowing has to take place. Further, it has also been argued [Pyle, 1972, p.2014] that the kind of liquidity response assumed by this model is inoptimal if the return on cash and/or the cost of borrowing is random. Furthermore, the assumption of linear utility function can be restrictive in the sense that it abstracts from the influence of risk on the banks' portfolio behaviour. Similarly, it is not in all cases that deposit rates are set by the banking firms as assumed by the model and as it will be shown later, loan volume is only independent of the deposit rate in specific circumstances. However, if the model was modified to allow imperfect competition in the deposit market, the deposit rate would become a choice variable for the firm. The volume of loans would then depend on deposit rates.

Porter [1961] and a subsequent modification by Hester [1962] have attempted to improve upon the Orr and Mellon analysis. Porter [1961] assumes, like Orr and Mellon, that banking firms are profit maximising. They are confronted with uncertainty about future levels of their deposits but in addition they hold securities whose market value is uncertain. Banks are assumed to hold three types of assets; securities, loans and cash. Cash in Porter's model is further divided into two categories; required reserves and excess reserves. The bank is assumed to be in one of three operational stages regarding its response to an unanticipated deposit withdrawal:-

Stage 1: The bank meets net withdrawal from its cash assets as long as it can without drawing these assets down below their minimum required levels.

Stage 2: Should the cash assets prove insufficient, the bank sells from its securities' portfolio at the going price and continues to do so as long as it has securities to sell.

Stage 3: Should the sale of all its securities also be inadequate to meet the deposit depletion, the bank borrows from the Central Bank on the collateral of outstanding loans.

The level of realisable profit of the bank, therefore, depends in a particular period upon the operational stage into which its largest net deposit withdrawal forces it. In stage one, for instance, excess reserves are sufficient to meet the withdrawal; profits are therefore unaffected. In stage two, securities need to be sold and the impact on profit is then measured by its impact on the expected addition to net worth, ΔN [using Porter's notation], where

$$\Delta N = gB + \omega B + eL \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.15$$

and B = securities as a fraction of initial deposit

g = the coupon per unit worth of securities

ω = change from the beginning of the period to the time of the deposit low in the market price of the securities

L = loans as a fraction of initial deposits

e = earning rate on loans net of default risk

In the final stage, in which there is need to borrow from the Central Bank, then the expected change in net worth is given as:

$$\Delta N = gB + B + eL - q(1-m)X \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 2.16$$

where q = the unit cost of borrowing from the Central Bank

m = excess of collateral rate - a unit amount of loans as collateral enables the bank to borrow [1-m]

X = the fraction of loans put up as collateral

The amount borrowed from the Central Bank is given as:

$$(1-m)X = (1-k)(1-\mu) - (1+\omega)B \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 2.17$$

and k = the amount of cash assets which the bank holds as a fraction of current liabilities

μ = the deposit low [that is the largest net withdrawal to which the bank assigns a positive probability] as a fraction of initial deposits.

The expected addition to net worth is maximised in order to find the optimal portfolio[4] over a given period. The assets and net worth of the bank are related to the initial level of deposits to integrate the two sides of the balance sheet.

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[4] See Porter[1961] pp. 25-53.

Uncertainty is incorporated in several ways. To deal with variability of deposits a distribution function is constructed to link deposit lows as a fraction of initial deposits with their probability of occurring. Asset demand functions are related to this function in so far as profit depends upon liquidation cost which is a function of stochastic cash requirements. The effect of changing securities' prices are dealt with by postulating a distribution function for the deviation in securities prices from the start of period level.

Porter's model has been criticised on several grounds. It is argued that the optimisation framework assumed by Porter implies that as long as the return on government securities is less than or equal to the variable cost of borrowing the liquidity response imposed on the model is acceptable [Pyle, 1972]; but this will be harder to justify if the return on government securities is stochastic. Porter further assumed that cash balances are fixed with zero returns and that transaction costs on securities are zero. However, under this condition there is no reason to hold cash. On this point Pyle [1972; pp.2015-2016], has argued that when returns on government securities are stochastic then the optimal loan decision depends upon the probability distribution of the returns on government securities as well as on deposit flows and the cost of borrowing, and there is no reason for the bank not to hold cash.

Banks usually possess other sources of borrowed funds, the cost of funds from these sources increasing with utilisation. It is therefore very restrictive to assume that the marginal cost of borrowing is constant. The assumption of a linear utility function implies that diversification is only based on liquidity needs. In practice this is never true, since loans are non-homogeneous. Given this assumption, therefore, Porter's model cannot explain diversification as well as changes in the mix within the portfolio of banking firms.

The development of this model from the level of the individual bank makes it potentially a very useful model for examining the portfolio selection process of banking firms in the face of uncertainty. However, in giving empirical content to the model, the main problem confronted is deciding how the banks develop their expectations about the distribution of possible events facing them. This would pose serious problems in formulating a theory for the treatment of a number of individual banks. Further, the theoretical model poses a major problem in terms of its implied needs for statistical data, which may not usually be made available by the banks, particularly in LDCs.

So far, all of the models considered have neglected one important aspect of commercial banking operations, that is the customer-relation. Kane and Malkiel [1965] gave an explicit treatment of this aspect of banking operations. They were interested in the supply of bank loans when the borrowing experience of customers influenced their decision about where to place deposits. It is

argued that banks would prefer to grant a loan to such a customer to reduce the probability of deposit withdrawals and, at the same time, to increase their profitability.

The analytical framework of Kane and Malkiel was simply the Markowitz-Tobin model but suitably modified to take account of deposit variations. In other words, the management attempts to maximise a mean-variance preference function, deposit volume is assumed exogenous but stochastic and loan returns are assumed to vary due to default risk. The importance of the model lies in the recognition that deposit variability will be a function of the loan volume decision. If the bank has a set of customers with longstanding ties and predictable flows, refusing a loan to this class of customer may increase the variability of profit, through increased deposit variations, thus increasing the risk position of the bank. With the incorporation of profit variability into the bank's utility function, the covariability of loan returns and deposit withdrawals becomes a concern of the bank.

It is very doubtful whether these considerations are relevant in aggregative work, except im times of abnormal stress on the banking system as a whole. This point is the more important when one realises that, although large movements of funds take place between financial institutions, money tends to remain within the banking sector. However, the analysis provided a useful

insight into the customer relationship and its effects on the loan portfolio, since it implies that loan volume is a function of the characteristics of deposit portfolios. It rests upon market imperfections and, in particular, the imperfect knowledge of the characteristics of loan applicants by competing banks. This follows because the deposit characteristics of a new account are determined only with time [p.123]. To the extent that loans are granted this way rather than purely through a price mechanism system of allocation there may be some bias in the workings of the financial system.

The Kane-Malkiel model is of limited usefulness in analysing micro-economic issues of market structure changes and regulatory constraints. Because deposit volume is assumed exogenous, the initial mix of deposits is not a choice variable for the banking firm; and the analysis also concentrated on the loan decision for preferred customers to the neglect of other portfolio decisions. If the assumption of a fixed liability portfolio is relaxed, by analysing the relationship between returns of all assets and liabilities in the portfolio the effect of both liability and asset portfolio changes can be analysed.

So far, all the models considered have treated the bank's capital as constant for the decision period. Once we move from a single period horizon it is doubtful whether this assumption is justified. Pringle [1974] has dealt with this problem within the context of the liquidity management

of the banking firm. He attempted to show the effect of adding equity capital to the choice set variables. Equity capital is unique in that it is a non-withdrawable long-term obligation of the banking firm.

Pringle assumes that bank shareholders hold a well diversified portfolio of risky assets which is efficient in a mean-variance sense. This allows him to define the bank's objective function in terms of maximising the current market value of equity capital. Since, however, the current market value of equity capital does not rely upon the specific risk - return preferences of investors, the optimal bank portfolio does not depend upon the investors' marginal rates of substitution between risk and expected return [Sharpe, 1964]. The argument that the optimal bank portfolio is independent of shareholder risk - return preferences is an implication of capital market theory. If we assume that investors possess homogeneous expectations and further, that they are mean variance optimisers, it depends mainly upon the risk free lending and borrowing opportunities that are available [Levy et al., pp.429-471, 1972].

In establishing the proportion of total investment of the banking firm that is allocated to risk-free securities or the proportion of investment in risky securities that is financed through borrowing at the risk-free rate, it is only important to observe differences in investor risk-return preferences.

Therefore, within the ambit of capital market theory, the procedure for investment can be dichotomised into (a) finding the optimal mix of risky securities and (b) selecting the preferred mix between the optimal risky portfolio and risk-free lending or determining the optimal degree of leverage as applied to the risky portfolio [Tobin, 1958].

The explicit treatment of risk increases the complexity of analysis of the banking firm portfolio problem. Pringle believes, however, that an explicit treatment of risk enables one to identify more completely the potential effects of market imperfections on the bank's portfolio selection. He believed that introduction of risk neutrality [Klein, 1971] obscures important aspects of the portfolio selection process. This is especially true if demand and supply of financial instruments are imperfectly interest-elastic [1974, p.72]. Uncertainty with respect to bank decision making was therefore central to Pringle's two studies, the first of which focussed on a short run analysis of bank asset portfolios, while the second, using the same normative model, extended the analysis into a long run setting by examining explicitly banks' capital decisions.

Pringle formulates the bank's objective function within the context of the capital asset pricing model (CAPM) as developed by Sharpe, Lintner/Mossin (SLM). He assumed that bank managers maximise the present value of terminal cash flow less the

required outlay. The objective function is written as

$$\underset{L,\ C}{\text{Max}}\ W = V - C \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.18$$

where V is the market value of the bank's equity capital

C is capital at the beginning of the period. The market value of equity is equal to the risk-adjusted present value of the expected terminal cash flow to shareholders of the banking firm. Analytically from SLM theory we can write

$$V = \left\{\frac{1}{1+R_f}\right\} [E(T) - \lambda Cov\ (T, R_m)] \quad \ldots\ldots\ldots \quad 2.19$$

where $\lambda = [E(R_m) - R_f] / \sigma m^2$

$E(T)$ = expected termrinal cash flow

R_m = return on the market portfolio

R_f = is the risk-free rate of interest

σm^2 = is the variance of the return on market portfolio

λ = is a positive constant reflecting the equilibrium rate of exchange of risk and expected return for all investors.

If we define T = P + C that is terminal cash flow accruing to shareholders as profit for the period plus the end-of-period value of assets less liabilities and doing some rearrangement then gives

$$W = {}^{1}/_{1+R_f}\ [E(P) - R_f C - \lambda Cov(P, R_m)] \quad \ldots\ldots\ldots\ldots \quad 2.20$$

If this is modified in such a way as to take account of market imperfections in the analysis the objective function then becomes

$$\underset{L,\ C}{\text{Max } W} = \frac{1}{1+R_f+\Phi}\ [\,E(P)-(R_f+\beta)C-\lambda Cov(P,R_m)\,] \quad \ldots\ldots \quad 2.21$$

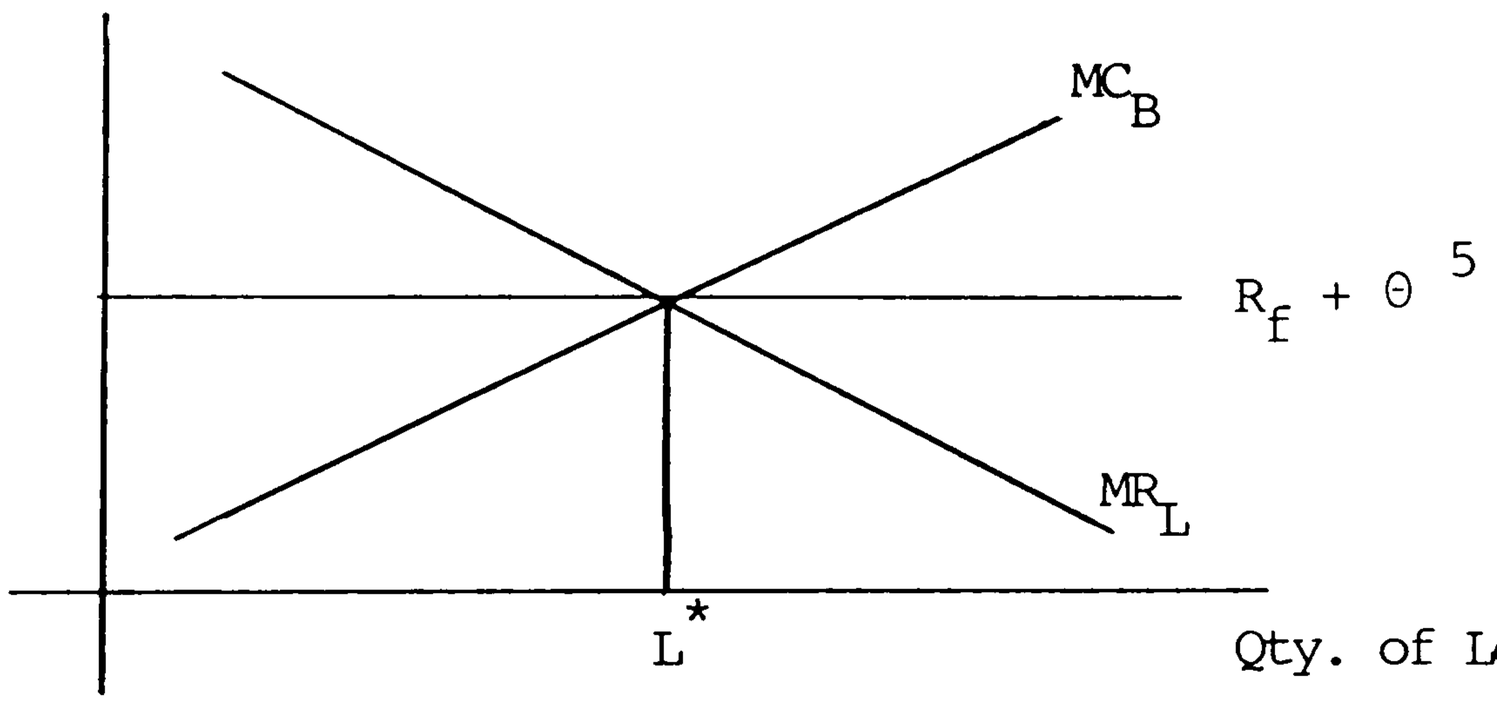
Where $\lambda = [E(R_m)-R_f-\Phi]\ /\sigma m^2$

Φ, β are both premium and excess costs due to uncertainty; they both have dimensions of interest rate.

Pringle assumed that banks may invest in either government securities or risky loans. Government securities are riskless and the rate of returns on these issues is assumed to be exogenous to the bank. The demand for bank loans is assumed to be imperfectly elastic. The bank issues three types of assets: deposits which are exogenously determined and stochastic, borrowings, that is loans which are interest bearing and completely controllable and equity capital which is completely controllable and non-stochastic. The bank also acquires two types of assets, loans and securities. Securities are purchased in a perfectly competitive market. Further, it is assumed that all risks are borne by equity claimants such that the remaining two liabilities are riskless. Loans and capital are the bank's active decision variables. Pringle assumes that interest rates are such that banks would never borrow and hold securities simultaneously. Since deposits are exogenously determined, the liquidity position of the bank is determined from the solutions for loans and capital. Managers must establish the optimal value of risky loans and bank capital based upon conditional probability distribution of deposits and the parameters of the loan and borrowing functions.

Implied in the model is the fact that once determined the balance sheet remains fixed until the end of the period - decisions regarding loans and capital are made prior to the realised values for bank deposits. Thus, in this model, risk is entirely related to the stochastic nature of bank deposits and the corresponding way in which these stochastic funds affect the firm's net cash flows.

Figure 2.2



Optimal Volume of Loans

In the analysis, the optimum volume of bank loans corresponds to the point at which expected excess marginal loan revenue (MR_L) is exactly equal to the expected excess marginal cost of bank funds (MC_B) [see figure 2.2]. Loan volume is dependent on only the loan demand function and the cost of capital. Loan volume does not depend on the mix of the liability portfolio. This follows from the assumption that capital is available elastically.

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5 is the expected excess marginal loan revenue.

Larger loans imply larger acquisitions of capital at a constant marginal cost. The volume of loans does, however, affect the liabilities held even though loans are not dependent on the mix of the liability portfolio. The volume of loans affects borrowing needs and thus the amount but not the cost of capital. The optimal loan volume can be written as

$$L^{*}[6] = f(\Theta, \alpha, g(D), \lambda, c) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.22$$

where Θ is expected excess marginal loan revenue

α is expected excess marginal cost of funds

$g(D)$ is the probability distribution of next period's deposits

An interesting finding of Pringle, is that this function is independent of R_f the risk free rate.

Finally, the analysis indicates that in a perfect capital market, where the certainty equivalent cost of borrowing is equal to the certainty equivalent cost of capital and equal to R_f, the capital-borrowing decision is a matter of indifference. But in an imperfect financial market it depends upon the relative degrees of imperfection.

The volume of loans does affect liabilities held even though loans are independent of the mix of portfolio liabilities.

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[6] Indicates optimal loans.

The volume affects the borrowing requirements and the amount required, but not the cost of capital. Further, given fixed deposits, the bank will raise additional funds from the least cost source to make additional investments as long as the marginal return from additional investments is greater than the cost of financing.

The least cost source in this model is assumed to be equity financing. This allows the model to yield a determinate solution for the capital position of the firm without taking the risk position of the firm into consideration.

On the issue of the capital position of the firm Baltensperger [1980] has argued that in considering the deposit-capital decision, the cost of insolvency is important. He argued that insolvency is very costly and can therefore force firms to arrange their portfolio in such a way as to avoid this costly event.[7] The bank's optimal decision with regard to its liability structure, therefore, involves balancing the expected insolvency against the cost of equity capital rather than deposit funds. This condition will hold even when deposit insurance exists except that the risk premium which is paid on deposit accounts without insurance is then earned by the insurer.

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[7] See Appendix 2.

In discussing the capital decision problem Pringle [1974] omitted the insolvency cost. As Baltensperger argued, if the least cost source of finance were assumed to be different, the firm would use no equity capital. If the demand for loan function was such that the firm is just investing deposit funds, the marginal revenue of loans would be driven below the marginal cost of capital and the firm would use no equity capital. Further, if there was perfect competition in the loans market such that marginal revenue from loans is constant, the optimal capital position would be indeterminate. This is because other sources of funds were assumed to be exogenously fixed or more expensive. Furthermore, the use of the CAPM in determining returns on loans creates problems that are specific to the assumptions upon which the model (CAPM) is based. For instance, the fact that loan returns must be skewed towards capital losses violates the assumptions of the CAPM. Unlike the other portfolios upon which CAPM is based, loans are not marketable, that is they are not traded on public markets. Finally, the Pringle model also assumes that loans are homogeneous and therefore diversification occurs only for liquidity requirements of the banks and because imperfection exists in the market place. Curiously enough the model failed to account for the interrelationship of asset and liability yields and changes in the mix of liability portfolio of the banks.

The models considered up to this point have all failed to take into account all the ramifications of bank operations. They have ignored the interdependence of commercial banking portfolio decisions. In the models that follow, attempts are made to take account of the interdependence of this process.

2.4 Complete Models

2.4.1 The Klein model: In most cases, these categories of model start by assuming that banks simultaneously choose the volume and mix of their asset and liability portfolios. It is assumed that banks operate in at least one asset and one liability market in a situation which is less than perfectly competitive. In Klein's model, it is also assumed that investors or the bank owners are risk neutral.

The Klein model assumed that banks have the opportunity to choose among three types of asset, cash reserves, government securities, and loans. On the liability side, it is also assumed that there exist three categories, cheque account deposits, time deposits and equity capital. Equity capital is assumed exogenously determined for the time period concerned and therefore plays no real part in the outcome of the model. The bank is also assumed to attempt to maximise the single period return on the stock holders' equity. The problem to be solved by the banking firm can therefore be paraphrased as:

$$\underset{R, I_g, L}{\text{Max}} \; [E(\Pi)] = i_g I_g + i_L(L)*L - i_D(DD)*DD - i_T(TD)*TD - \rho[R, \tau, k(DD, TD)] \quad \ldots\ldots\ldots\ldots\ldots 2.23$$

$$\text{S.t} \quad R + Ig + L - DD - TD = 0$$

where R = Reserves

Ig = Government securities

L = Loans

DD = Demand Deposits

TD = Time deposits

$\rho[\ \cdot\ ]$ = expected cost of adjustment due to reserve deficiency or liquidity cost

τ = cost per unit of reserve deficiency

i_g = rate of return on government security

i_L = loan rate

i_d = deposit rates

Banks are assumed to be price takers in the securities market, but face an upward sloping supply curve in the deposit market and a downward sloping demand curve in the loans market; that is

$$i_g = \bar{i}_g \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.24$$

$$i_D = i_D(DD) \qquad i_D'(DD) > 0 \quad \ldots\ldots\ldots \quad 2.25$$

$$i_T = i_T(TD) \qquad i_{TD}'(TD) > 0 \quad \ldots\ldots\ldots \quad 2.26$$

$$i_L = i_L(L) \qquad i_L'(L) < 0 \quad \ldots\ldots\ldots \quad 2.27$$

Further, banks face a stochastic flow of deposits and they are assumed to incur a constant penalty cost for cash deficiency.

The expected loss from bank's holdings of reserves is given by

$$\rho(\cdot) = \tau\int_{R}^{C}(x-r)\Phi(x)\,dx \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 2.28$$

where x is the outflow of deposits and $\Phi(x)$ is the bank's subjective probability density function. C is the largest outflow. By assuming that $\Phi(x)$ is uniformly distributed representing a diffuse prior distribution with mean zero and further assuming symmetry, with the range defined as 2η then,

$$\tau\int_{R}^{C}(x-R)\,\Phi(x)\,dx = \tau/_{4\eta}\,[C-R]^{2} \ldots\ldots\ldots\ldots\ldots\ldots \quad 2.29$$

Incorporating this relation into the objective function and optimizing, Klein arrived at the optimal structure of assets and liabilities for a banking firm's portfolio. According to this model, the optimum volume of loans in the bank's portfolio will be found by setting their marginal expected return on loans equal to the return on government securities. Similarly, cash will be held in the optimum portfolio of banking firms up to the point at which the marginal implicit return on cash holding is equal to the expected return on government securities.

Further, the optimal yield on deposits is equal to the expected gross yield on the asset portfolio. The total portfolio of credit of the bank would be allocated in such a way as to make the marginal return associated with each credit product equal to the average revenue on government securities.

The main implication of Klein's model is that since the banks are price takers in the government securities market, the operations of this market serve as a benchmark for the system. It, therefore, follows that as long as a positive amount of government securities is held, the loan market and the deposit market are independent of one another. If this result holds it follows that regulation of deposit markets to increase the level of competition and to alleviate destructuve competition of the banks in the loans market may be unnecessary.

It is possible to link up the implication of Klein's analysis with that of Pyle [1971]. He considered a more general case where maturities and holding periods are unequal. Unlike Klein, however, he concluded that assets and liabilities are interdependent.

Although Pyle's main concern was the theory of financial intermediation under perfect competition, with the multiperiod character of the intermediary decision environment taken specifically into consideration, he showed that the incentive for financial intermediation to take place is greater (i) the smaller the risk premium on deposits and the larger the risk premium on loans; (ii) the greater the positive dependence between loan and deposit yields and (iii) the larger the standard deviation of deposit yields and the smaller the standard deviation of loan yields [Pyle, 1971, p.745]. Pyle concluded that asset and liability portfolios cannot in general be chosen independently of the parameters of liability and asset yields. According to the Pyle analysis, the degree of

correlation between asset and liability yields is a key determinant of the attractiveness of financial intermediation.

Though the assumption about the underlying market structure differs from that of Klein, Pyle was able to show that asset and deposit liability decisions cannot be taken as independent. The existence of a relationship between maturity and the holding period causes asset and liability yields to be correlated, and it is this correlation that causes interdependence. However, Pyle demonstrated that where asset and deposit yields are uncorrelated, then loan and deposit decisions are independent. He also showed that risk aversion has portfolio effects, particularly correlation between yields affect the variability of total return. To Pyle, therefore, it is important to incorporate risk aversion into the analysis of banking firms' behaviour - the variability of total return is an argument in the utility function of the banking firm.

The implication for the Klein analysis is, therefore, that his result holds only under the type of risk assumed. For instance, as Pringle [1973] argued, an investor who is risk neutral will expect a return no greater than the risk-free rate of interest on all investments, regardless of the degree of risk; such an investor will not impose a premium for risk. If risk averse behaviour is incorporated into Klein's analysis, the independent result would cease to hold.

The other important issue in the analysis of both Klein and Pyle is the implied market structure. Whilst Pyle assumed perfect competition, Klein assumed less than perfect competition. Klein's analysis paid careful attention to the structure of the financial markets in which the bank operates. The bank is assumed to face a downward-sloping demand curve for loans and a upward-sloping supply curve of deposits. Models like this, that explicitly take account of market imperfections, seem more useful in analysing commercial banking behaviour than others that assume away such imperfections. The absolute answer, however, is an empirical question.

2.4.2 Real Resource Models: This group of models, while in the same spirit as the complete portfolio models discussed in the previous section, are more versatile in the sense that they concern themselves with the effects of real resource inputs on the portfolio behaviour of financial firms. They explicitly attempt to model the real resource or production aspect of banking firms into their portfolio behaviour.

The real resource models, essentially explain the size and structure of bank liabilities and assets in terms of the real resource costs involved in generating and maintaining them, especially the cost of deposit production [Pesek, 1970; Saving, 1977] and earning assets [Sealey and Lindley, 1977]. Two examples of this type of model are dealt with here; the Sealey and Lindley model and the Niehans [1978] model.

2.4.3 The Sealey and Lindley Model: These authors' important contribution lies in their emphasis on a unique definition of banking output. They reasoned correctly that this had been neglected in most portfolio analyses of commerical banking firms before them. Like Shull [1963] they argued that banking output should centre on banks' earning assets. Other studies have emphasised a different concept of output.[8] They criticised other studies for relying exclusively on portfolio theory, which they claimed had resulted in total omission of production and cost constraint considerations under which all firms must operate. They, therefore, proposed a model which allowed the role of production and cost to be evaluated for a profit-maximising bank.

The first problem considered is the determination of what are inputs and outputs for a financial firm. The first candidate considered for output is the financial services provided to bank depositors. However, Sealey and Lindley conclude that these services are not the real output of the bank but are provided only to maintain deposits. To them, the bank is principally concerned with the production of earning assets, which are its actual output. Production of any other services are secondary and are undertaken only in so far as they further the production of earning assets.

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[8] See [i] Saving [1970]
[ii] Pesek [1977]
[iii] Benston [1982]

The production function used by the banking firms is therefore, best described in their own words:

> "The production process of the financial firm, from the firm's viewpoint, is a multistage production process involving intermediate outputs, where loanable funds, borrowed from depositors and serviced by the firm with the use of capital, labour and material inputs, are used in the production of earning assets. This type of production is essentially analogous to the manufacturing firm where one production department produces and supplies an output which is used directly as an input in another process. Eventually, the intermediate outputs culminate in the final economic output of the firm, that is, earning assets. The output of the financial firm is therefore produced with capital, labour, material and loanable fund inputs where loanable funds are 'produced' through other production operations of the financial firm".
>
> [Sealey and Lindley, p. 1254].

This framework led Sealey and Lindley to construct a model of a profit-maximising bank. The bank is assumed to face the following constraint:

$$R + \Sigma L_i + \Sigma I_j \leq \sum_g D_g \quad \ldots\ldots\ldots\ldots\ldots\ldots \qquad 2.30$$

$$i = 1,2,\ldots,m; j = 1,2,\ldots.n; \quad g = 1,2 \ldots p;$$

where R is required reserves,

L is loans, of which there exist m types

I_j is securities

Dg is deposits

The inequality in the constraints is due to the possibility of excess reserves being held. The supply of deposits to the bank is expressed as

$$Dg = Dg\ (\tau_D) \qquad \underline{\partial} D_g / \underline{\partial} \tau_D > 0 \quad \ldots\ldots\ldots\ldots\ldots \quad 2.31$$

where τ_D is the interest rate on the g^{th} deposit.

The output from the first stage of the production function, that is loanable funds, acts as a constraint on the quantity of earning assets produced. The constraint at this stage is expressed as:

$$\Sigma L_i + \Sigma I_j \leq \Sigma (1-\alpha_g) D_g \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.32$$

where α_g is the reserve requirement on the g^{th} deposits.

The services required of banks to their customers are two-fold: they are required to provide services to those continuous holding deposits and to those who have borrowed from the bank. The first category of services can be described as:

$$Dg = Dg\ (V_\zeta^g) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.33$$

where V_ζ^g is the ζ^{th} variable input used to service the type of deposits.

The second category are the services associated with the different categories of loans and securities. We can represent their production functions as

$$L_i = L_i(V^i_\zeta) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2.34$$

$$I_j = I_j(V^j_\zeta) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2.35$$

where the V^i_ζ and V^j_ζ are used directly to process the ith and jth categories of loans and securities respectively.

The bank's production function is further constrained by:

$$\sum_i L_i + \sum_j I_j = \sum_i L_i(V^i_\zeta) + \sum_j I_j(V^j_\zeta) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots 2.36$$

Combining 2.32, 2.33 and 2.36 the production function can be expressed as

$$\sum_i L_i + \sum I_j = \min\left\{ \Sigma(1-\alpha_g) Dg(V^g_\zeta), \Sigma L_i(V^i_\zeta) + \Sigma I_j(V^j_\zeta) \right\} \ldots\ldots 2.37$$

the minimum indicates that total output is restricted by the minimal value of the two counstraints 2.32 and 2.36.

Sealey and Lindley define profit as the difference between total revenue and total cost. Total revenue is derivable from interest payments on loans and securities, while costs are mainly the result of servicing the earning assets and deposit liabilities. The equilibrium level of output is obtained when the marginal revenues from each category of loans and security are equal to the marginal costs of producing each category of loans and securities. Marginal cost of producing loans and securities, that is earning assets include the marginal costs of acquiring deposit funds.

Sealey and Lindley conclude that the optimization process yields optimal combinations of Li, Ig, Dg and Vi. They also conclude that a significant role is played by production and cost conditions in determining scale size and output mix of the financial firm. Decisions regarding asset and liability structure and the scale of operations cannot be independent of each other but will be made jointly in accordance with this model. Klein's conclusion with respect to asset selection is that "neither the cost of deposits nor the parameters of the deposit supply functions appear in the optimization condition and therefore cannot affect asset selection" [Klein, 1971, p.215]. This model asserts that asset and liability selections decisions are not independent. The model has, however, been criticised for its limited integration into the main stream of portfolio analysis; factors such as liquidity and solvency management, which traditional portfolio models stress are neglected.

2.4.4 Niehan's Midel: Niehan's [1978] model combines several features of the Sealey and Lindley model, but is less explicit in its treatment of what constitutes a banking output. It is based on the assumption that banks strive to maximize expected value of pure profits in excess of the normal competitive return on equity given a price taking behaviour in all markets by the banking firms.

The balance sheet constraint in the model is described as:

$$R + L = D + W \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.38$$

where R = Reserve

L = Loans

D = Deposits

W = Equity capital

The production relation is described as

$$f[K,N,L,D] = 0; f_k > 0, f_N > 0, f_L < 0, f_D < 0 \quad \ldots\ldots\ldots 2.39$$

$$\text{and} \quad dL/dK\ [\bar{N},\bar{D}] = -f_K/f_L > 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2.40$$

where K and N stand for Capital and labour inputs respectively.

All deposits and loans are assumed to be equal of size and

In addition, there exist two stochastic constraints, the withdrawal risk constraint and default losses on loans.

The unit amount of deposit withdrawal after one period, X, is assumed to possess a distribution $\Phi(X)$ with zero mean and standard deviation, σ_x. When $X > R$ the bank experiences deficiencies. The deficiency has to be financed by borrowing at a penalty: $X < R$ also implies excess liquidity. The expected value of the reserve deficit is defined as

$$\rho = E[X-R] = \int_R^{\infty} (X-R)\ \Phi(x)\,dx \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 2.41$$

$$= p[D,R].$$

Similarly, the maximum expected bankruptcy loss can be specified as:

$$\Pi_o = \int_W^{\infty} (F-W)\,\psi(F)\,dF = \Pi(L,W) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 2.42$$

$$\text{and} \quad \Pi_L > 0,\ \Pi_W < 0$$

where Π_o is a particular maximum that cannot be exceeded,

and F is the distribution of default losses on loans with mean β and standard deviation σ_F

If F > W, the bank fails. Given these conditions, the bank's objective function is, therefore, specified as:

$$\text{Max } [E(P)] = (i_L - \beta)L - i_D D - i_\rho \rho - kW - wN - rK \quad \ldots\ldots\ldots\ldots 2.43$$

where i_ρ is penalty rate

k is normal profit rate

w is wage rate

and r is capital goods rental.

Subject to 2.38 through 2.42.

Like the Sealey and Lindley model, the result of the optimisation process indicates the interdependency on the banking firm's asset and liability selection decision. It indicates that if loan rate should rise, the volume of loans would rise, thus giving rise to an increase in demand for deposits. It becomes more profitable to transform deposits into loans in these conditions. At the same time, the likely effect on reserves is that they would fall as loans were substituted for them. The scale of bank operation is also likely to be affected as banks assume a more risky posture.

Conversely, under the Niehan assumptions, an increase in the deposit rate would be likely to lead to a reverse effect, as demand for deposits would contract, so also will loans and equity requirement. Demand for reserves would also decline as the fall in

deposits reduces the expected reserve deficit. The reduction would, however, be less than in proportion to the fall in deposits - the law of large numbers would raise the reserve ratio for a given reserve deficit. Consequently, the reduced margin between the penalty rate and deposit rate reduces the willingness to accept deficits, thus leading to a rise in reserve ratio.

The results also have implication for the size of banks and their structure of operation. They indicate that larger banks are always better off under pure competition, unless the stochastic scale economies are outweighed by diminishing returns to the factor inputs. However, the size of the banking firm will be limited by the size of the market as the stochastic economies appeared to be different for different types of banks. For instance, demand deposits appear to be characterised by large withdrawal risk and loans with relatively large default risk, in which they differ from time and saving deposits and mortgages respectively. Abstracting from regulatory effects, the implication, therefore, is that banks of different size would tend to have different balance sheet structures. Smaller banking firms would tend to concentrate on assets and liabilities with low risks, while the higher risk market would be dominated by larger banks. Large banks would tend to hold large size deposits and loans while small banks would concentrate on smaller deposits and loans with low risks.

2.5 Bank Portfolio Analysis Applications and LDCs.

There have been several applications of the models considered in the past sections, but they have found little or no application in less developed countries. Generally, the extent of applied work varies from country to country, with the large number of studies and applications in the U.S. The predominance of the U.S. can be attributed to the lack of availability of data on banks in many other countries. The available data and information on banking operations in any country depends on the internal rules and regulations governing their practice and disclosures. Apart from lack of basic data and disclosure rules, the failure to apply these models to less developed countries in particular has reflected the differences of structure and institutional conditions which exist. There has been a general tendency towards descriptive rather than analytical work. In this section, we therefore discuss applied work that has found its way into empirical studies on banking portfolios in LDCs.

Before examining the few studies that have been carried out on LDCs, it is helpful to look briefly at one empirical study that has influenced a lot of work on banking behaviour in LDCs. The study by Goldfeld [1966] seems to represent the spirit of most efforts on empirical application of banking behaviour, probably because this model requires little theorising about the underlying behaviour of banks and, therefore, requires only a very weak specification.

The model assumes that banks have some desired composition of their asset portfolio, which depends on the entire constellation of yields on all financial assets that they are legally allowed to hold. The desired composition is to be viewed as a set of long-run preferences which, because of time and uncertainty, must depend on expected as well as current yields. These preferences for individual assets are assumed to be consistent with rational maximising behaviour by the banks. This implies, for example, that the desired volume of loans would depend positively on its own yield and negatively on other yields.

Goldfeld's analysis assumes that adjustment of actual assets to the desired level takes the form of a partial stock adjustment process and additional variables which impinge on quantity flows are introduced additively.

Goldfeld's results were obtained with the help of extensive data mining. The underlying assumption that the banks' asset preferences are consistent with rational maximising behaviour is questionable, as also is the assumption that all assets are gross substitutes.

This work has influenced analysis of banking behaviour in LDCs. Studies along these lines include, among others, Diaku [1972], Tomori [1976], Soyode [1975], Ajayi [1978], Masih [1978] and Adewunmi [1981]. Diaku, Soyode, Tomori and Ajayi sought in different ways to analyse and explain certain aspects of

commercial banks' behaviour, particularly in Nigeria. Their analysis was not general, being concentrated on very small aspects of portfolio behaviour of banks. Diaku, for instance, was interested in differentiating between the loan function of banks, especially the indigenous owned and foreign owned banks. This was done without resort to any micro-economic explanation of the determinants of the differences in behaviour of the two groups of banks. Ajayi and Tomori were also interested in the same issue as Diaku, while Soyode was interested in the effect of its branch networks on a bank's profitability. On the other hand, Adewunmi [1981], while examining the same issue of the loan function of commercial banks in Ngeria, went into greater detail than previous analyses. Using the results of a survey, he attempted to measure the determinants of banking management attitudes towards risk.

Finally, Masih [1978], using a weakly specified simultaneous model, attempted to explain the behaviour of banks within the financial sector in Pakistan. He was mainly interested in how the behaviour of banks affects credit and private sector investment. To achieve his objective, he specified (i) the supply and demand for bank credit, (ii) banks' borrowing from the central bank and (iii) banks' holding of government securities. His analysis was partial in terms of a total examination of banks' balance sheet positions. The use of annual data was also not very appropriate for the short term nature of financial policy. However, he found that private investment in Pakistan is linked with

availability of funds rather than price of funds, which is a good indication for monetary and financial policy.

Most other studies have concentrated on long-term issues of banking development and financial policy, and are not therefore directly relevant to the main theme of our study.

2.6 Summary of Review

We have now examined several efforts at providing a micro-economic explanation of banking portfolio behaviour in the financial process. Our objective was to determine the factors most likely to be important in the portfolio behaviour of commercial banks, and to isolate their effect on the process of financial policy formulation.

We started by showing the futility of lumping commercial banks' behaviour into the fixed multiplier framework. In other words, we showed why the kind of analysis concerned in this study is essential for macro-economic application. We indicated that the assumption of exogeneity, upon which the money and credit supply process is based, is unrealistic as far as the role of commercial banks is concerned, especially for open economies and the less developed countries.

The contributions surveyed were broadly categorised into partial models and complete models. In addition, we examined

particular works in LDCs. The first set of models was concerned with different perceptions of what constitutes the major decision problems of the banking firm. They included models with varying assumptions about competition, liquidity decision problems, objective optimisation, risk and uncertainty. The second category of models considered was the so-called complete models, which treated portfolio problems by analysing in totality the operations of the banking firm. They examined different aspects of banking operations with a view to determining the overall effect of important influences on portfolio selection as well as the effect of public policy on the realisable values of the portfolio variables.

An important conclusion arising from the survey is that, to capture the importance of banking portfolio behaviour for financial policy, a detailed micro-economic analysis of the underlying structure and institutional arrangement is necessary [Klein, 1971; and Niehans, 1978]. The knowledge of interrelations of portfolio variables and the perception of risk and uncertainty by the owners and operators of banking firms have to be taken into account. The more detailed the models, the better their ability to capture real banking phenomena - they are, however, likely to get more intractable analytically.

Despite their relevance to policy, these analytical models have found little or no application in LDCs, as was indicated in

the survey. Nevertheless, the survey has met our basic objective of highlighting important issues and factors for consideration in our modelling exercise.

CHAPTER THREE

PORTFOLIO BEHAVIOUR OF COMMERCIAL BANKS AND THE BANKING SYSTEM: DETERMINANTS AND APPROACHES IN LDCs.

3.1 Introduction

This chapter examines some salient features of banking firms and commercial banking systems in the less developed countries. The nature and objectives of banking firms, structure and ownership, and the banking environment are analyzed, with the aim of deriving their implications for portfolio selection. The activeness or passiveness of banks is examined in relation to their objectives. Comparative figures illustrating the competitiveness of the banking environment in LDCs and the international banking scene are presented. Finally, regulatory policies and the extent of regulation, money markets, and the interrelatedness of components of the system and their operations are discussed.

The main objective of the chapter is to highlight those micro-issues that underlie aggregate data of the kind that will be employed in our empirical analysis. The interest in banking firms, their interrelation and structure, derives from viewing them as a microcosm of the banking system. Thus, section two of the chapter examines the objective and ownership of banking firms, and discusses the structure of ownership, and section three examines the profit maximization objectives of firms within the banking industry in relation to other objectives. Section four and five analyse

competition and regulation within the industry, six deals with the interrelations of banks and the money market, and seven summarizes the chapter.

3.2 The Banking Firm: Objective and Ownership Structure of Banking Firms in LDCs.

3.2.1 Introduction

The banking firm as an economic unit is differentiated from other firms by the nature of its product, something which makes it one of the most controlled economic decision making units. The objectives of banking firms depend crucially on their evolution, organisation and owernship, and the nature and structure of these factors determines to a large extent whether their role is passive or active in the process of economic activity. Banking firms' portfolio behaviour, unlike that of other firms, forms an important explanatory factor for the levels and growth of aggregate economic quantities such as money supply and credit. Banks' portfolio behaviour is also an important determinant of the cost and flow of credit to specific sectors within the economy. These factors explain why banks' objectives need to be consistent with the goals of the economy.

In addition to its economic involvement the very strong social involvement of the banking industry in the production and social process is a further reason for policy makers and economists to take an active interest in the industry. In less developed countries, this is reinforced by the prominence of these firms and the industry in comparison with other firms and industries. Consequently, sight

is often lost of the fact that commercial banks are commercial entities-policies which make it difficult for the firms to pursue their objectives (by reflecting the preferences of their owners and occasionally those of their management team) are, therefore, not uncommon. One cannot, however, overlook the fact that ability to realise preferences may be subject to influences which may be due neither to internal factors in the firm (industry) and to the external regulatory environment. Nevertheless, it is these factors which are of paramount importance to the determination of banks' objectives and to their portfolio behaviour.

It is difficult in practice to pin a particular firm to a particular objective. In LDCs, because of the structure of ownership, firms are likely to possess a mixture of objectives. A predominantly privately owned enterprise, for instance, is more likely to set a profit maximization objective (if at least in the long term), whereas a public sector owned enterprise may not do so. On the contrary, depending on public goals, the objective may be construed in terms of employment generation or some form of developmental objective, in which case profit maximization may be secondary or, even further down the line.

Nevertheless, because of their industrial, economic, political and social environment, it is still likely in these countries that firms will combine some measure of profit maximization with other objectives, possibly to a greater degree than in EACs. Complete discretionary behaviour may be impossible, particularly as profit

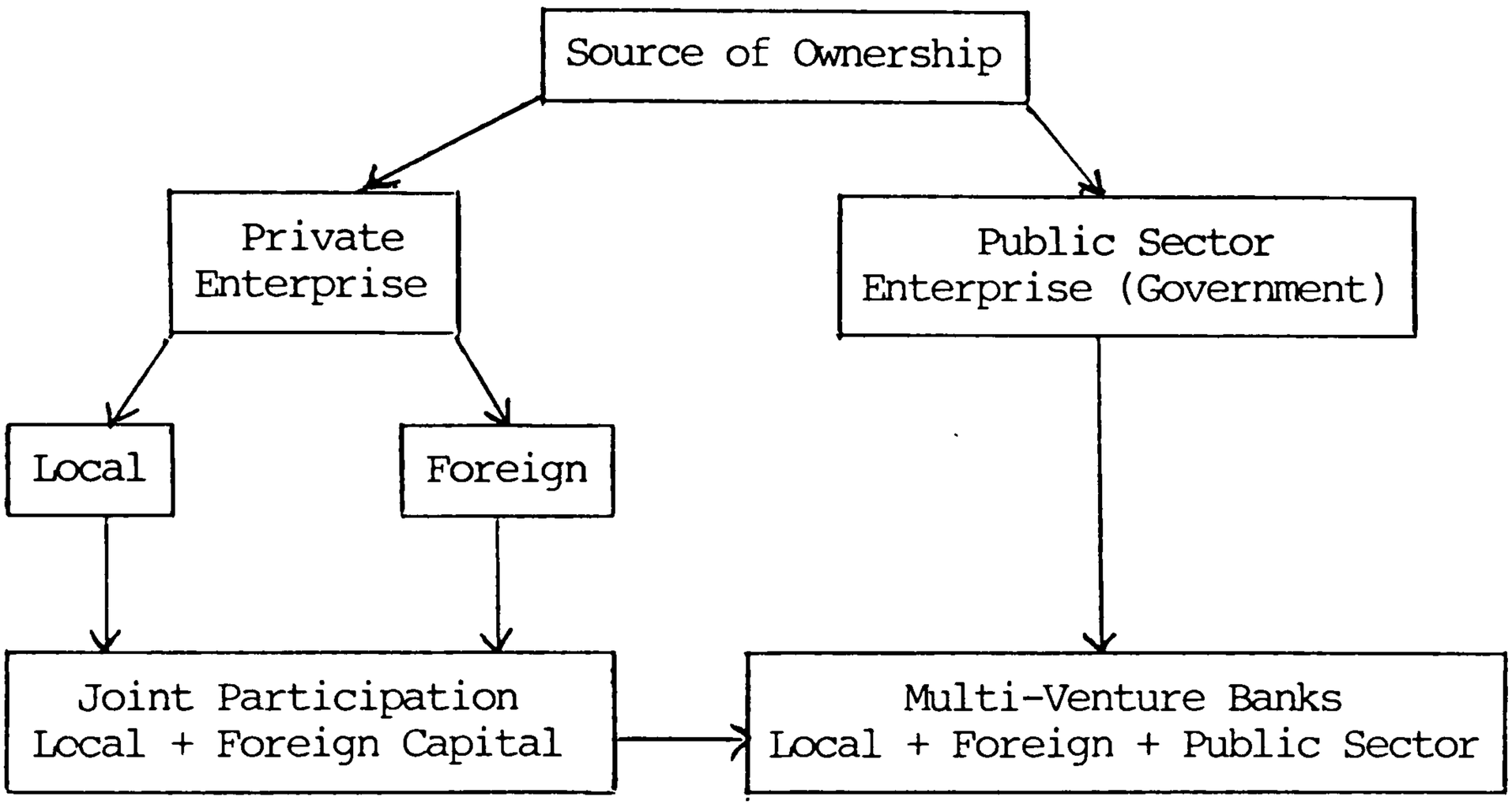
maximization offers a better avenue for measuring performance of commercial firms than other objectives. Banking firms are therefore unlikely to drop the profit maximization objective completely, if only to employ it as a benchmark. What determines the dominant objective in any country depends on the structure of its industrial organization, including the extent of government intervention in the industry.

In LDCs, the fact that historically a substantial proportion of equity of banking firms was owned by non-residents may also have affected the banks' objectives. [Unavoidably the equity owners were far away from the operations, thus giving room for freedom on the part of the resident management team. Despite this situation, however, managers are more likely to reflect the objectives of their owners at home at least in the long run than that of the management team: we, therefore, believe that the objective of banking firms should first be analyzed from the basis of ownership of the firm].

From the standpoint of ownership, banks can be classified into two categories, private and public sector enterprises. The first category can be further subdivided into those whose owners are indigenous to the country in question and those operating in a number of sovereign states apart from the country in which they are owned, whose equity owners are usually non-residents of the host country. These are the so-called Multinational Banks (MNB).

The second category are banks owned and sometimes managed by the public sector (government owned banks). In most LDCs, there are various mixtures of this category with private enterprise [see Figure 3.1].

Figure 3.1: Schematic Diagram for Ownership of Commercial Banks in LDCs



The schema indicates the different bases of ownership of banks in LDCs. In order to determine the importance of each type of ownership in LDCs, data on their contributions to the total business of the industry would be required, but no data in such a sufficient detail is available. However, Table 3.1 shows the number of banks in the different ownership categories in some selected countries - a much better measure would have been the proportionate contribution of each category to total deposits or total asset (the presence of MNB can reflect to some extent the importance of each country as an international financial centre).

Table 3.1: Ownership of Banking Firms by Origin in Some Selected Less Developed Countries

Countries	Number of Locally Owned Banks	MNB
Nigeria [1980][a]	13	10
Malaysia [1978]	19	17
Philippines [1980][b]	28	4
Ghana	8	3
Ivory Coast	-	-
Kenya	-	-
Thailand [1978]	16	14
Hong Kong [1979]	34	71
South Korea [1979]	15	27

(a) separate ownership has in most cases merged into joint ownership.
(b) excluding offshore banking units.

Sources: Central bank report for individual countries.

3.2.2 Motivating and Objective Factors Affecting Multinational Banks:

The motivating and objective factors which lead a national bank firm to extend its operation to other countries have been explained in terms of certain enabling factors [Dunning, 1977 and 1979]. These factors induce particular banking firms to adopt a multinational organisational form [Grubel, 1977]. The main enabling factors are ownership specific advantages, internalization incentive advantages and location-specific opportunities [Dunning, 1977 and 1979]. These factors are recognized as necessary for multinationals to evolve in banking services. However, the advantages they confer are sequential in the sense that internalization efficiencies are only available for exploitation if ownership specific advantages exist;

and are further conditional on the existence of some form of location specific inducement to open foreign branches.

These advantages can be broken down into specifics. For instance, there are factors due to imperfection in both the product and the input markets. In most countries, the national banking market is heavily regulated, thus engendering imperfections in the form of barriers, product differentiation and segmented markets. In these situations multinational banks will benefit from their ability to exploit the opportunities for differential returns which this sort of situation should engender. The superior ability of the multinational banks, in comparison with domestic banks, in marketing their services can be associated with quantitative as well as qualitative differences in the technology available to each group, and with their experience in marketing particular financial services.

Furthermore, the access of the MNBs to modern techniques of information is very important. Knowledge and availability of funds are clear gains and advantage over the local firms. When one of the enabling factors is the presence of a non-financial multi-national corporation in the host country, the continuity of contact and co-operation with a MNB could foster a reciprocal flow of information to which local banks may not have access. The existence of a fast growing market or the need to diversify the foreign exchange base of bank's operation in order to reduce risk may act also as propelling forces.

The above factors may take a slightly different form and may also differ between periods of pre and post-political independence. In the earlier periods it was not so much competitive opportunities as the need to finance trade engendered by colonial governments that led to the establishment of bank firms of the Metropolitan countries. It was, therefore, a case of trade following the flag and the banking firm following trade. Even in the later period, the growth of multinational retail banking was not a response to competitive opportunities - the banks came at a very early stage of economic development when there was no competition domestically to speak of. Instead, growth was fostered mostly by resource induced changes in LDCs, for example, in response to a sudden burst of activity as a result of the discovery of gold or oil in large quantities (as in Southern Africa for gold, the Arab countries, Nigeria, Gabon among others for oil).

The importance of these factors in relaiton to the objectives of the banks is no doubt clear. Firms were willing to accept the additional risk and take the initiative necessary to enhance their long term profitability positions by extending their operations abroad. The driving objective of this group of firms will be the improvement of the relative wealth position of their owners and the desire to maximize the stream of returns to their equity, allied perhaps to the desire of a strong management team to increase their prestige.

3.2.3 Public Sector Ownership/Participation:

The factors underlying public sector ownership or participation in the banking industry are different to those of multinationals discussed above. In the case of the public sector the general motivation is the desire of governments to provide something which is missing where it is thought that private enterprise has failed to meet the necessary financing needs of the country. There are, of course, also other factors, such as the political philosophy of the government. Indeed, this factor may sometimes be paramount in government intervention and ownership, irrespective of the wisdom and benefits that can be derived from such a policy.

In LDCs, as elsewhere, the motivational factors have been mixed - both political and certain economic factors have been important. In some cases a certain minimum level of participation in the industry is required, possibly because a substantial proportion of industries are controlled and/or owned by non-indigenous enterprise. Also where the current philosophy of the government is socialistic,[1] it may be a means of divesting private enterprise of their ownership. Or it may simply the the result of the inadequacies of the facilities provided by the private sector, as when the government is interested in making the services of commercial banking available to particular geographical or economic units within the economy (an example is rural banking).

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[1] As in Ghana during Nkrumah's era, India in the late 50s and early 60s, and Tanzania after the Arusha declaration.

Given these motivational factors, it is open to contention whether profit or some measure of wealth maximization will be pursued by firms owned by the government. What the factors considered so far point to is some maximization of the government objective function by the management team of the banks. Whether this objective function represents the welfare function of the ultimate owners (the taxpayers) is beyond the scope of this study. It is however doubtful whether such management team can afford not to try to reconcile the short term non-profit maximizing objective with profit maximization objective in the long term (if only because it is easier for the management team to point to its success in terms of profitability than other objectives).

However, there are always pressures, not only on government banks but also on other banks operating in LDCs, to adopt principles which may be contradictory to the profit objective; for instance, in Nigeria, India and other developing countries it is believed that banks should be actively involved in the transformation of the largely rural and undeveloped sectors of these economies. Particularly, in the Nigerian case it is argued that banks should use a significant proportion of their profits to improve the quantity and quality of the services they offer, by promoting rapid expansion of banking facilities and services in rural areas.[2]

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[2]Federal Government of Nigeria, White Paper on the Nigerian Financial System [1977].

Transforming these conditions into operational objectives with implications for portfolio behaviour of banking firms is our concern. If government owned banks behave no differently from other banks in the market place, as the evidence seems to suggest [Loxley, 1966], then there will be no justification for modelling their behaviour differently from other profit maximizing, private enterprise owned banks. Moreover, in modelling terms the multi-farious nature of the government objectives may not lend itself to easy quantification. Adopting a profit maximization framework would, therefore, provide a consistent basis with which to measure the effect of policy.

3.2.4 Private Enterprise Ownership:

The bulk of neoclassical analysis of the theory of the firm is based on the concept of private ownership of firms. Hence, the predominance of the belief that the objective of the firm reflects the preferences of its owners. In earlier times when industry was small and its structure was not very diverse there was little to reject or question about this theory. However, the industrial revolution and modern commerce and industry have given rise to the divorce of ownership from management in modern corporations. This has implications for firms' objectives and portfolio behaviour.

This raises questions about the motivation and objectives of firms, even if they can be categorized as private enterprise.
Is it legitimate to adopt profit maximization as the objective, or should some other objective such as managerial discretion be used in

our analysis? Different frameworks lead to differing criteria regarding banking firms' portfolio behaviour, and also have different policy implication for the monetary and financial authorities.

These differing implications have been the basis of several studies by economists, especially in the advanced countries [Reid, 1968; Lawrence, 1970; among others]. A brief discussion of the issues is therefore called for.

3.3 Profit Maximization Versus Other Objectives.

As was argued earlier, the bulk of neoclassical theory of the firm rests on the profit maximizing objective. Analytic tools that have been developed from this framework for studying firms and industry form the basis of industrial organization analysis [Bain, 1956; Caves, 1980; and Sherer, 1980 among others). This body of analysis has concentrated on manufacturing firms, and applications to banking firms have been minimal, despite the fact that this type of analysis has implications for firms operating in the banking industry.

The body of industrial organisation analysis, which comes under the heading of structure, conduct and performance, has specific implications for the behaviour of firms. It is believed that the structure of the market will always influence the conduct and behaviour of firms. For example, if a market is composed of a relatively small number of firms and high barriers to entry are the norm, it is believed that firms' pricing decisions will be aimed at

joint profit maximization either by collusion, price leadership or some other form of tacit agreement. To some extent, this framework seems an apt description of what obtains in the banking industry in some LDCs [Loxley, 1966].

The implication of applying traditional micro-economic theory to analysing banking firms and banking systems in LDCs, if the above framework is correct, is that profit maximization association will prevail, and that/of higher prices with greater concentration will be observed. It is an accepted fact that prices and profit will be higher the more highly concentrated the relevant market [Rhoades et al., 1971].

High concentration, however, acts as an inducement for management to experiment with other objectives, because managerial discretion is apt to be rife where a monopoly benefit is conferred on the firm by some form of external or internal factor. In LDCs, these include regulatory factors such as capital and other forms of prudential conditions which act as entry barriers, and there are also other controls, such as control of pricing or services and activity, offices and branching regulations. Other factors reinforcing a tendency towards increasing divergence between ownership and control may also exist. In large banks, like most large firms, ownership of stocks tends to be dispersed among a large number of stock holders, with the effect that no group is large enough to exercise dominance and control over the firm. Furthermore, in LDCs, imperfections in both

the capital and goods markets are the norm rather than the exception. In such a situation, the discretionary ability of firms is enhanced - imperfections provide the management with monopoly power, which makes it easier to attain some targeted rate of return on equity, and thereby increases their ability to pursue alternative objectives.

The foregoing seem to justify the reason for keeping the different objectives of banks in mind in studies of this nature. However, while the incorporation of objectives other than profit maximization seems desirable, unlike profit maximization they give rise to ambiguities in the predictions of theory for policy, and they also present problems for data collection in this kind of analysis. Moreover, the aggregation assumed in looking at the banking system as a whole given the profit maximization assumption, does not carry over to other types of behaviour. Therefore, although taking account of the differing background of ownership on the objective functions of banks in LDCs would add qualitatively to the analysis of banks' portfolio behaviour, the measurement problems seem intractable both in econometric and data terms. Thus, the only feasible solution is the adoption of the profit maximization objective as a benchmark.

3.4 Competition and the Banking System

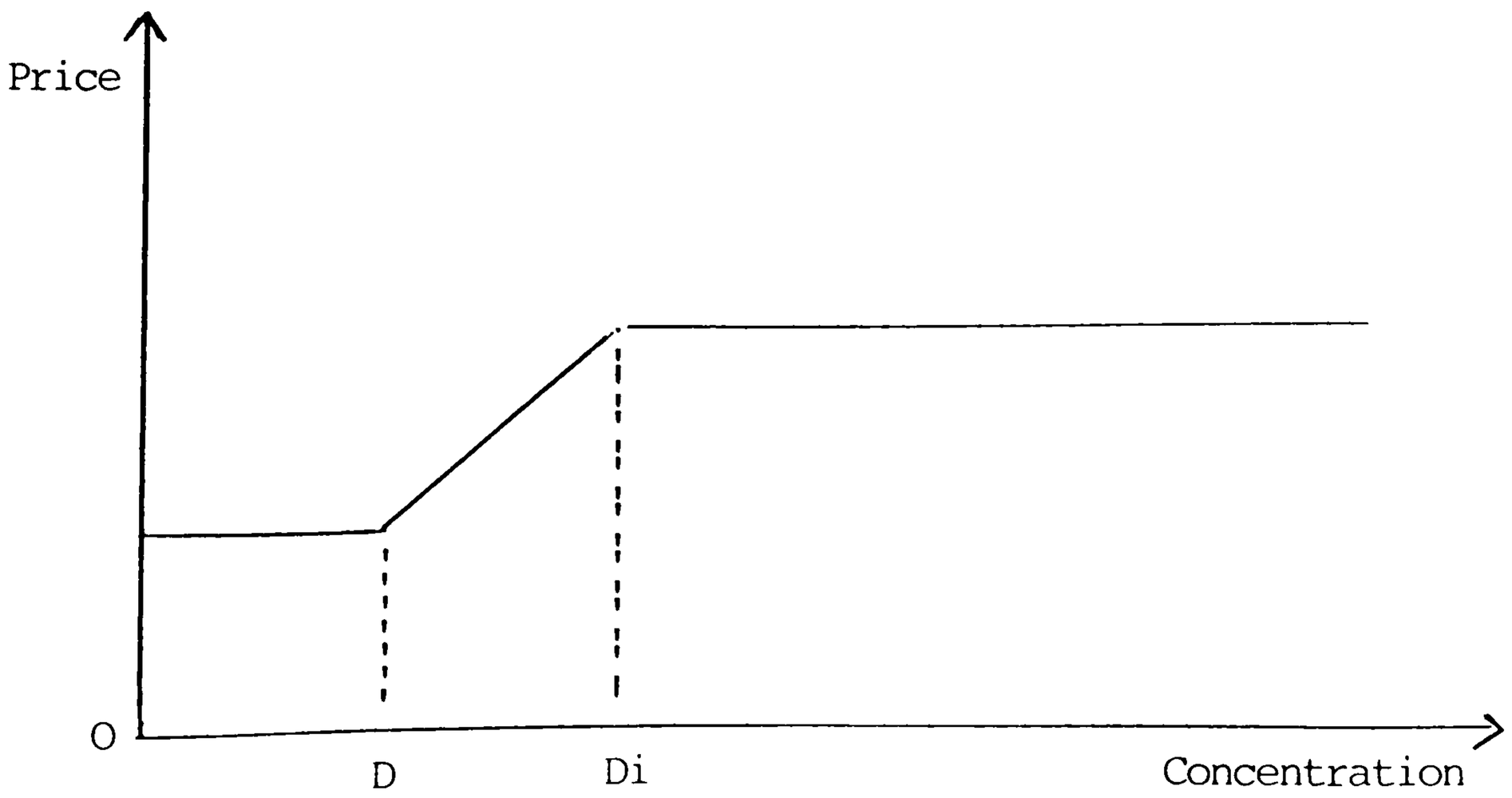
We have now discussed the main determinants of banking firms' objectives. In this section we are concerned with other factors that are important for the determination of their portfolio behaviour and their overall effect on the configuration of assets and liabilities of the banking system. In particular, the extent and degree of competition are very important in determining both the behaviour of firms within an industry and the configuration of output and price schedules of the industry as a whole. As noted earlier, the extent of competition can determine whether the posture of firms is active or passive in the economic decision process.

The mode of banking practice is also a very important determinant of the structure and nature of competition within the industry. For instance in the U.S., where a unit banking system exists, the nature of competition differs from that found in countries with a branch banking system; again, competition between specialised banks differs from that in a universal banking such as in Germany. In most LDCs, except the Philippines, branch banking predominates; this system tends to generate an industry with a very few large banks, which are responsible for oligopolistic behaviour in the industry. In most LDCs, therefore, the oligopolistic structure determines the extent of competition and rivalry among firms.

The theoretical implications of the structure of the banking system are easy to derive. For instance, if theory holds, the more competitive the firms within the industry the greater the output and

the nearer the price to unit cost. Coversely, the greater the degree of monopoly, the lower the output and the higher the surplus to the banking firm (the higher the price of output). Chamberlain [1956, pp. 46-55] postulated that the degree of monopoly and the monopoly price depend on the number of firms in the industry. For a very small number of firms, monopoly price would prevail, but as the number increases the price would only prevail as long as the firms recognise their interdependence. In other words, firms will be price takers in the market up to a certain level of concentration (e.g. D in Figure 3.2). As the concentration increases price will start rising (say up to the point Di). Beyond this level the recognition of mutual interdependence by participants makes it possible for firms to achieve the monopoly price-output configuration. Prices are unlikely to increase further but firms may enter or leave the market as a result of technological change or of a shift in demand.

Figure 3.2: Price Configuration and Concentration of in a Typical Industry.



Evidence of concentration in LDCs is very scanty due to lack of data on individual bank's operations in the different countries. Economists have used various measures of the degree of concentration which take account of both the number and size of firms. In Table 3.2, we show one such measure, the Herfindahl-Hirshman (or H) index. [3]

Table 3.2: Comparison of Concentration in the International Banking Industry with Some Selected LDCs (H Index)

Years / Country	1975	1977	1979
World Top 100 Banks	.0135	.0137	.0135
Malaysia	-	.0843	.0759
Nigeria	-	.1632	.0931
Philippines	-	.0556	.0931
Thailand	-	.1884	.1872

Sources: (a) Tschoegl [1982]
(b) Calculated from various bank reports and yearbooks.

The H index compares competition in some selected countries with what exists on the international banking scene. The maximum of H is unity and its value decreases with an increase in the number of firms. Table 3.2 indicates that the level of competition is greater in international banking than in our selected countries. Moreover, although H may be a good measure of concentration on an economy-wide basis, it may understate the degree of monopoly power possessed by banks on a local basis in these countries, which may vary widely within a country depending on the degree of urbanization and other factors.

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[3] where H is defined as :

$$H = \sum_{i=1}^{N} S_i^2$$

is the Herfindahl-Hirshman index and S_i the market share of the i^{th} firm.

3.5 Regulations: Banks and the Industry

3.5.1 Theoretical Issues of Regulations:

The framework for regulation of industry has always been based on the question of whether in the absence of regulation private firms will provide the pattern of resource allocation which would be in the best interests of the economy at large. Regulation of the banking industry has been based on similar arguments. Policy makers always believe that banking firms possess some degree of monopoly power, and can therefore affect the pricing and output of the industry in such a way that the outcome will not be optimal so far as the economy at large is concerned. The implication is that in the long run the consumer would pay a higher price for and receive less of the product than if the industry was perfectly competitive. Further, it is believed that the existence of monopoly could also lead to a less than efficient utilization of scarce productive resources. In a perfect and certain world, the firm would use an input up to the point at which the price of that input say:

$$Xi = MC\ (MPi) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 3.1A$$

or

$$MC = Xi/MPi \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 3.1B$$

where X is the price of input

MC is marginal cost of output

and MP is marginal product of factor input;

and the firm's marginal cost would equal its selling price that is

$$P = MC \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 3.2$$

where P is price of output, this holds under perfect competition. This, in other words, implies that the value of marginal product, P(MPi) is equated to the price paid for factor input. In contrast, under monopoly, marginal cost would be equated to marginal revenue, i.e.

$$MR = MC \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 3.3.$$

or, in other words, marginal cost of input would be equated to marginal revenue product of the input.

If we assume the same demand curve for the competitive industry as for the monopoly, and further that the marginal cost curve of the monopoly is the industry supply curve for the competitive industry, then the monopolist marginal revenue, MR must be less than price, P for the competitive industry. If the factor price remains constant, then for the factor price to be equal in both situations, the marginal product must be larger in the monopolist case. Assuming that diminishing marginal returns prevail, then the monopolist must be using less of any factor input than would the competitive industry. This implies under-utilization of resources and further, the value of the marginal product is greater than the marginal revenue product for the monopolist.[4]

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[4] Since MC = Xi/MP
and P = MC (under competition)
Hence P = Xi/MPi
But MR = MC (under monopoly)
that is MR = Xi/MP
and since MR $<$ P under monopoly
and Xi is given
MPi (monopoly) $>$ MPi (competition)
hence Output (monopoly) $<$ output (competition)

In relation to the banking industry it is often argued that the industry is characterized by scale economies which lead to concentration and hence monopoly. The argument for regulation therefore rests on the belief that the movement of the banking system towards greater competition would help in achieving maximum efficiency in allocating resources in the rest of the economy. Greater competition, it is believed, would enable funds to go to the most productive borrowers. Competition would also imply an optimum division of internal and external financing, securities would reflect the preferences of individuals (savers) and they would minimize costs to individual borrowers. The prices of outstanding financial claims would reflect only inherent differences between claims.

There is also another argument for regulation, which runs counter to that given above. It is argued that banking, as well as the rest of the financial industry, should be regulated because the prevalence of competition and ease of entry may lead bankers to take excessive risks, and so lead to bank failures.

The major points for consideration in these arguments are the criteria which should guide the financial authority in the determination of regulatory policies. It is also important before any further policy is implemented to determine the effectiveness of the existing set of regulations in achieving the desired goals.

3.5.2: Types of Regulations and Controls:

The banking industry is one of the most regulated industries, partly because of the opportunities which exist for fraud and other malpractices. Regulation of the banking system involves different rules and laws depending on the country and time. Generally the set of prevailing regulations and controls consist of a combination of institutionally imposed regulations (self-regulation) and government regulations, that is statutory regulations. Self-regulation deals mainly with intra bank relations.

Statutory regulations and controls are usually classified into two main categories. The first are monetary and financial regulations which refer to the set of variable controls imposed by the monetary authorities, and which are designed to ensure the consistency of banking behaviour with government economic objectives. They relate essentially to the issue and management of money and financial variables within the economy. The other category are prudential controls, a set of regulations imposing fixed or invariant requirements on the banks to maintain sound policy, to ensure the health and solvency of the banking system and the protection of depositors. It is often difficult in practice to differentiate between the different categories and the authorities usually fail to distinguish between them. Some controls on banking firms possess both monetary and prudential effects. Generally, whatever the object of the control, they act essentially as constraints on banking operations; they affect the banks in such a way as to influence their portfolio behaviour.

Some of these controls relate to the theoretical background for controls discussed in the last subsection. However, because (the objective) or motivations of government action and policy can be multifarious, it is difficult to pin down particular regulation or control as being designed purposely to encourage or discourage competition. It is therefore not surprising to discover that controls may have varying effects on the operations of the banks. For instance, minimum reserve requirements apart from possessing prudential effects may also limit the size of the bank by restricting its ability to expand credit. The same goes to capital/asset requirements institutionally or legally imposed on banks. Further, all sorts of restrictions on establishment of new banks which are common in most countries acts to reduce competition while differential reserve requirements applied to banks according to size and limitation on the ability of the banks to acquire other banks or to merge with other banks, do tend to encourage competition by reducing the monopoly powers of the existing banks.

3.5.3 Monetary and Financial Regulations:

The first among the economic regulations that is important for the banks' portfolio behaviour is the requirement to hold reserves, in the form of vault cash or deposits, with the Central Bank. In some countries reserve requirements on deposits vary among different classes of banks and variations may also reflect economic factors as well as institutional requirements and practices. This type of regulation goes with the institutional restriction on the banks' portfolios which enjoins banks to be prepared to honour without

notice requests by demand depositors for cash or cheque withdrawals up to the amount of their balance. The restrictions have the effect of constraining the amount of bank assets that may be held in non-cash assets and thereby restricting banks' net income. A reserve requirement diminishes the maximum percentage of non-cash assets that must be liquidated per unit of cash withdrawn from the bank. Likewise, an increase in the reserve requirement will cause banks to hold a higher proportion of their assets in the form of cash, with a subsequent distribution effect on holdings of non-cash assets.

Furthermore other regulations, such as minimum cash ratios and liquidity ratios can affect the choice of the portfolios of banks. Examples of other regulations abound in different countries; for instance in United States, one particular type of regulation is the law that forbids banking firms to invest in common stocks of non-banking enterprise. Restrictions exist on the upper limit of lending to any particular individual, on underwriting corporate debt or equity instruments, on opening and closing branch offices. The same goes for interest payable on deposits of commerical banks. Other regulations require that all deposits of funds in tax and loan accounts of the banks be secured by approved liabilities of the government or its agencies.

The impact of these regulations on the portfolio behaviour of the banks has been effectively to prohibit the holding of the most attractive portfolio and thereby affect their process of optimization.

Furthermore, apart from the economic aspect, governmental guarantees of the liabilities of the banking system and the regulatory impact are designed to assure the solvency and liquidity of the institutions. Regulations and controls have had the effect of forcing the banks to adopt portfolios that have a lower probability of failure.

3.5.4 Regulation in LDCs:

In LDCs, bank regulations in addition to those already discussed have a further purpose. It is believed that commercial banks have a contribution to make to the development objectives of the country. For this reason, further statutory obligations, which vary across countries and over banks, are often imposed on the banking firms. In some cases, they are in the form of regulations on sectoral/ industrial loans and advances of the commercial banks. In others they relate to rural development objectives of the government, for example they require the banks to open so many rural banks per some specified number of urban branches. Usually these regulations are imposed irrespective of the income-lending policy of the banking firms. Such regulations affect both the portfolio selection of the banking firms, as well as the configuration of the assets and liabilities of the banking system.

3.6 The Commercial Banking System: Interrelations and Money Market

3.6.1 Interaction between Domestic/Foreign Banks:

We seek to examine the interaction of banking firms in the industry with a view to isolating basic issues affecting their portfolio behaviour as well as impinging on monetary and financial policy. Commercial banks are easily the most important monetary and financial institutions in LDCs, and their role has been aided by the establishment of central banks in these countries.

The first point for analysis of the interaction within the banking system is the so-called foreign component of the system. The foreign component usually poses its own peculiar problems for monetary and financial analysis. Foreign banks represent a significant proportion of the banking system, and foreign ownership has sometimes also been the basis of some government policies in these countries, for instance policies which seek to divest owners of foreign equities of their shares in banks operating in these countries (as in Malaysia, India, or Nigeria). Where this is not so, public policy is usually used to promote a national bank which, with government support and patronage, competes with the foreign owned banks (as in Ghana, Philippines, Uganda among others). These policies are not mutually exclusive. It is, therefore, not uncommon to observe a combination of policies in practice in any of these countries.

The usual reason for singling out the foreign banks is their superior ability in competing with the indigenous banks. In some cases the banks are far removed from easy control by the local monetary and financial authority (as in Malaysia and sometimes in the past Nigeria). In most cases, their head offices are located in the Metropolitan countries, which gives them access to greater sources of finance and capital than indigenous banks. Thus, it is quite common for their domestic lending and investment activities not to be governed by their ability to obtain funds locally. Unlike domestic banks, they can rely on a non-deposit source of liquidity, and can therefore operate at a lower level of liquidity than domestic banks. Moreover, in their host countries, they often possess guaranteed customers in the form of local branches of their metropolis clientele.

If the relevant data had been available, it would have been desirable to study the portfolio behaviour of these banks separately, or in relation to the rest of the banking industry. It is important to evaluate the extent to which their position poses difficulties for the monetary and financial policies of their host countries. Liability adjustment may form an important part of their total portfolio behaviour, as a result of their multinational structure. Excess funds may be invested in foreign instruments, depending on the return, and the portfolio calculus of these banks may be subjected to greater influence from external factors than the local banks. To the extent that a substantial proportion of banking business is in the hands of these firms, it is important to examine

the relative importance of external factors and influences on the portfolio of the banking system, and consequently to incorporate these effects when modelling financial policy in LDCs.

3.6.2 Domestic Money Market:

The domestic money market in LDCs forms an important source of short-term adjustment instruments for the commercial banking system. Though this aspect of the financial market is relatively young and relatively underdeveloped compared to those of the economically advanced countries of Europe and America, money market transactions are a significant part of the interactions between banking firms. Indeed, it is through the money market that most interbank operations take place.

The types of activity that take place in these markets varies, depending usually on the country and the colonial experience (as between Nigeria or Malaysia and the Philippines or the Francophone developing countries). The bulk of money market instruments traded are short-term government securities. The role of commercial banks in determining the prices of these securities is therefore minimal because of the extent of government intervention. In some cases the banks can only affect the spread between the benchmark of the discount rate and the market determined rate, even when it is so, it is to a lesser degree than what obtains in the EACs.

The degree of market responsiveness varies from country to country. In Malaysia, for instance, some of the money market rates are market determined; examples are the rate paid on interbank loans and very short rates, such as call money rates and the discount house call rate. Nevertheless, these rates tend to move with treasury bill rates. The Malaysian example does not reflect the general trend, especially where the degree of market intervention by the government is very high.

Money market instruments act as the main buffer assets of the banking system in most LDCs. The use of short-term funds or excess reserves as a means of adjustment in hard times by the banks is, therefore the norm, especially where short-term rates are allowed to fluctuate. Furthermore, where they exist, the discount houses act as a temporary source of adjustment for the commercial banks. Although the portfolios of these institutions are highly regulated, they are allowed to perform their role of providing liquidity for the banks in place of less liquid holdings, e.g. government securities.

The most active security market in these countries is the Treasury Bill market, which is expanding fast as a source of short-term earning assets for the commercial banks, which generally form the most important single holder of these bills. Bills are usually issued on a tap and the rates are determined by the financial authority. In some countries, however, the sale is by offer and bid; allotment is then made to the highest offer price [Farrel and

Baball, 1981]. Other markets exist for government long term securities, of varying terms of maturity. Thougn not insignificant banks are less important in these markets, and their implications for the portfolio behaviour of the banking system cannot be neglected.

3.6.3 Characteristics of Assets and Liabilities of the Banking System:

Lastly, in this section we briefly examine the essential feature of assets and liabilities of banks in LDCs.

In LDCs, the structure of assets and liabilities, unfortunately, lacks the same depth as that in the EACs. They therefore offer less opportunities for diversification in the banking system. In fact, the asset structure tends to comprise more of very liquid non-interest bearing assets. Where there are securities, they are predominantly government securities and unlike those in the EACs, credits tend to be relatively short-term. For instance, in Nigeria between 1966 and 1970, the proportion of loans with less than one year's maturity, was about 90 per cent. Although hard evidence on banking operations in LDCs is very hard to come by, there is no doubt that the Nigerian trend is likely to typify what obtains in other developing countries.

Although there is little hard information on the term transformation carried out by banks, there is no doubt that the banks' assets are strongly on the short side. This view is confirmed, if one regards capital plus reserves, savings and time

deposits of the banking industry as of a medium term maturity. Examination of the liability structure of the banking industry in these countries could indicate that a substantial proportion of total liabilities are potentially available for medium term lending.

The asset and liability structures, the maturity pattern of loans, the extent of term transformation performance of the commercial banks have provided the grounds for criticism of commercial banks in LDCs, and have also partly accounted for government intervention and control of the industry. It is part of this study's objective, therefore, to examine the relative significance of banks' choice of assets for financial policy. By examining the portfolio behaviour of the banking system within a micro-theoretic framework we should be able to determine the consistency of banking system portfolio choice with government policy.

3.7 Summary

In this chapter, we have tried to isolate those factors considered to be important in the study of portfolio behaviour of commercial banks in less developed countries, and have related these factors to the formulation of financial policy.

The chapter started by discussing how banking firms' objectives might be related to their ownership. The motivations for owners and managers were discussed especially with respect to the

objective of profit maximisation versus other competing hypothesis. While it is argued that strong factors exist in the LDCs' banking industries which would give rise to a movement away from profit maximization, it is realised that profit maximization gives a clearer policy indication and is also easier to adopt for modelling, especially where data are sparse. Furthermore, the micro issues help to highlight the elements determining the aggregate information used in the analysis.

Secondly, competition and regulatory conditions in the banking industries were examined. The view expressed was that the relatively low degree of competition, reinforced by the regulatory effects of monetary and financial policy, was likely to exert a greater effect on the portfolio behaviour and selection of the banking industry in LDCs than in the advanced countries.

In the concluding section, we examined the interrelations of firms in the industry. The issue of local banks was put in perspective; their operations in conjunction with other banks, their influence on the domestic money market and the special adjustment problem that existence of foreign banks poses for the financial authority were all examined, with a view to deriving their importance for the banking system's portfolio behaviour.

CHAPTER FOUR

THE FRAMEWORK MODELS OF COMMERCIAL BANKING PORTFOLIO BEHAVIOUR

4.1 Introduction

The main objective of this chapter is to provide the theoretical framework upon which the empirical evaluation of the importance and effects of commercial banking portfolio behaviour will be based. In chapters two and three we surveyed the different theories of commercial banking portfolio behaviour, and investigated factors which were important in the banking industry in LDCs. We saw that commercial banks form a very important link in the development process. In this chapter our objective is to explore the theoretical and empirical bases for analyzing the impact and effects of commercial banks' portfolio behaviour on government financial policy. We consider whether existing analyses of the banks can be adopted for use in an LDC situation.

We have employed two types of model in our analysis. The first is based on the earlier work of Parkin [1969, 1970]. This model, which is basically static and in the spirit of studies by Tobin [1967] and Markowitz [1959], provides a framework for analysing the portfolio behaviour of commercial banks in relation to their choice set of portfolio variables, and enables us to derive the demand for the choice set of variables within a micro-theoretic optimizing set up. However, it tells us little about the behaviour of banks in a disequilibrium and dynamic situation.

The second model extends the framework and allows our analysis to relate to macro policy. It is therefore a macro framework, emphasizing a dynamic approach which is capable of explaining banks' portfolio behaviour in disequilibrium situations. It involves both stock and flow elements. The second model is derived from the Tobin - Brainard [1968] framework, with extensions that have been made subsequently.[1] This model offers the opportunity of carrying out a simulation exercise on Nigeria.

The chapter is subdivided into six sections. Section two examines the balance sheet configuration and choice variables of a typical commercial bank in LDCs. Three examines institutional factors important to the determination of the choice variables. Sections four and five present the static and dynamic frameworks respectively, and section six summarizes the chapter.

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[1]See Ladenson [1971] and [1973]; Clinton [1973] and Smith [1975].

4.2 Balance Sheet and Portfolio Choice

The portfolio behaviour of banks is complex and can be understood only in the context of their balance sheet structures. Table 4.1 illustrates a simple consolidated balance sheet for an LDCs banking system. As discussed in Chapter three, the diversity and depth of the variables in Table 4.1 varies from that of EACs.

For the individual bank's portfolio behaviour, the configuration of items on the balance sheet should be treated as the outcome of the interaction of the bank's decisions with respect to its choice variables and of externally determined magnitudes. These are subject to the bank's decision with respect to its planning horizon. Banks are usually faced with the problem of deciding and developing each balance sheet position. The interaction of sources and uses have to be considered along with other features as well as environmental parameters for the banking industry.

Table 4.1: A Typical Balance Sheet of Banking Systems in LDCs

Primary Reserves	Capital plus Reserves A/C
Secondary Reserves	Foreign Liabilities
Treasury Bills	Borrowings
Treasury Certificates	Deposits
Foreign Assets	Other Liabilities
Investments	
Loans and Advances	
Other Assets	

This is the background on which the bank management has to make decisions about these variables within its control, bearing in mind those that are externally determined.

In this study, for reasons that will be explained later, we classify the balance sheet components into choice and non-choice items. This is done in a simplified form in Table 4.2. The important distinction between choice and non-choice variables is the degree of management discretion. The sequential process of banks' decision making allows items to be classified into the broad categories shown in Table 4.2, after which the decision about the desired composition within each category of portfolio instruments can be made [White, 1975; Tishler, 1976].

Table 4.2: Consolidated Operational Balance Sheet

Choice Set Items	Non-Choice Set Items
Net Secondary Reserves	Primary Reserves
Investments	Net Foreign Assets
Government Securities	Deposits
Loans and Advances	Capital Plus Reserves
Certificate of Deposits	Net Other Assets

In Table 4.2, we have consolidated the balance sheet into net secondary reserves (NSR), Investments (I), Government securities (Ig), Loans and Advances (L), and Certificate of Deposits (CD). These items are classified as the choice items of the bank. The predetermined items are denoted as vault cash plus balances with the central bank, or primary reserves (R), net foreign assets (NFA),

which will be discussed further in chapter six, deposits (D), capital plus reserves (CRS) and net other assets which consist of other assets less other liabilities and other miscellaneous items of the balance sheet.

4.3 Institutional Background and Choice Variables in LDCs.

4.3.1 Introduction

In order to put the presentation of our theoretical models in a proper perspective, we discuss briefly here the background and institutional conditions within which important variables in our analysis should be construed. For this purpose the banks' operations are categorized into those affecting the liability side of their balance sheets and those affecting their assets. We shall concentrate here on a few relevant and important variables, which can be generalized later without detracting from our analysis. The asset variables are loans and advances of the banks to the different sectors of the economy excluding the public sector (L); Commercial banks' investments, mainly in government securities (Ig), reserve requirement (R) and net secondary reserves (NSR). Liabilities include capital plus the balance on reserve account of the banks (W), and deposits, that is demand deposits (DD), time deposits (TD) and savings deposits (SD). In Chapter three we discussed briefly the market conditions affecting some items of secondary reserves, particularly treasury bills and certificates and some forms of government securities.

It would be desirable to present a general market framework for these instruments in LDCs in order to help in understanding the typology of issues to be discussed. However, we recognise that it is hard to arrive at any such general framework that will not need modifications for individual countries.

The financial markets of LDCs are dichotomized into the so-called unorganized market and the institutionalized market. Analyses are usually localized within each of the segments, as if the segmentation was perfect. This study deals with the institutional aspect of the financial market, in line with the conventional wisdom which shows that the institutionalized financial market has a very important effect on the non-institutionalized sector financial variables.[2] We therefore assume that our discussion of banks' portfolio choice variables is general for the typical LDCs economy.

As earlier indicated the commercial banks play a very important part in the financial sector of LDCs. The main determinants of the volume and prices of their assets and liabilities in relation to their market are :

(a) their importance in relation to other financial firms and economic decision agents;

(b) their relative power, i.e. their dominance within the market structure;

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[2]Yung Chul Park [1973].

(c) the size of the market, coupled with the extent of government control and intervention in the market.

This section therefore analyses the bearing of these factors on the portfolio variables enumerated earlier on.

4.3.2 Government Securities:

This category of assets forms an important item in commercial banks' portfolios. In LDCs it is also a relatively new component, whose nature varies from country to country and also according to government issuing policy. Government securities in LDCs range from short term money market instruments such as treasury bills to long term government loan stocks. In between there are bills and certificates, varying in maturity from one year to three/five years depending on the country.

As was argued earlier, in some countries, such as Malaysia, market forces determine both the quantity and the price of securities. In such countries, therefore, the outcome in terms of price and quantity depends on the countervailing forces reflecting the bargaining power of the commercial banks and the financial needs of the monetary and financial authority. However, in most LDCs the institutional set-up is different. It is usually the government which determines the quantity of issues of each type of security, according to its needs for finance from each particular source. The banks then determine their holdings given the price set for each type of instrument by the government. Usually, the volume of

issues is so large that an individual bank can hold as much as its management deems profitable at the offered rate. This view has led to the belief that banks are complete price takers in the market for government securities [Wai and Patrick, 1973].

In terms of this study, our categorization puts short-term securities (that are essentially money market instruments) together into one portfolio item in the first part of the analysis [TBCD]. Other liquid items essentially interbank trading balances and excess reserve holdings are classified as NSR.

4.3.3 Loans and Advances/Commercial Loans Market

Like government securities market, the loans market is not free of government intervention and control. These controls are of two types. There is usually a rate or price regulation, which controls the rate chargeable on loans by banks. However, this control usually specifies a band or a range, thus giving the banks some power over rate setting on loans. The second type of regulation is the so-called sectoral control of loans and credit. It usually takes the form of guidelines to the banks which attempt to specify the proportion of credit in aggregate that should be made available to particular sectors of the economy. These sectors are classified and ranked for the purpose of sectoral allocation on the basis of the developmental objectives of individual countries.[3]

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[3]Examples of the so-called monetary and financial circulars are issued periodically by governments of developing countries, such as India, Pakistan and Nigeria.

The diveristy of borrowers and the size of the market, especially in terms of the strength of demand for loans in these markets, has given the banks the power to affect the rates on loans. The banks are, however, even more powerful in terms of determining the volume of loans. Although the financial authorities do attempt to ration the availability of loans, these attempts have failed because the ultimate source of funds is not completely in the authorities' hands. In addition, the prevalent price and quantity rationing has done nothing to stem the excess demand for credit, which has tended to enhance the power of the banks in the loans and credit market. Therefore, while the banks will exhibit some aspects of a price taker's behaviour in the market, they will behave more as quantity setters. This stems from their ability to use non-price rationing techniques, particularly in the loans' market. The extent of monopoly power of the banks will, however, depend on the degree of government intervention and its ability to police such intervention effectively.

4.3.4 Liabilities:

The main liabilities of the commercial banking system were enumerated earlier. Among the liabilities, capital forms a very important source of funds and variable in banking operations. Nevertheless, we have assumed for the sake of analysis that it is not a choice variable for the activity period under consideration. The justification for this lies in the fact that banks capital plus reserves varies in the short period in response to prudential regulatory conditions imposed by the financial authority, among

others, but not a choice that can be varied with everyday operations. A typical example is the requirement for a minimum ratio between a bank's paid up capital and reserves and its total loans and advances. In our time frame, therefore, the most important source of funds in the calculus of banks is bank deposits. This is so in terms of their overall portfolio and especially the liability management problem to which they give rise. The variability of deposits and their dynamic nature offer special challenges to banks. Deposits are, therefore, considered here as the only liability of interest.

4.3.5 Deposits:

Deposits are not only sources of funds to banks, they are also sources of money to the economy at large (especially demand deposit and to some extent time and savings deposit) created by the private economy. In the EACs, this form of money forms a very significant proportion of money in circulation. The proportion is, however, low for LDCs.

The market for deposits varies from country to country. Generally, however, the supply of deposits to the unit of any bank, at the going rate of interest can be said to be very elastic in some cases approaching infinity. This situation is created by a number of factors, among which are the extent of banking facilities available in each market environment, and government monetary and financial policy, particularly price and rate control. Evidence to support this conclusion in some countries can be sought in attempts by individual banks to restrict the inflow of deposits. In Nigeria,

for instance, there is a required minimum by banks on opening of a savings account. At the same time a stricter condition is imposed on the opening of a current account. In Ghana, it is documented that outright refusal of deposits has been the order in recent times,[4] except for the payment of salaries and wages by the government.

In most LDCs the deposit rate is rigidly determined by the financial authority. So the banks are important only in the determination of the volume of accepted deposits. On a micro level the different components of deposits have varying advantages and disadvantages for the banks. Demand deposits are acquired with a nominal rate of zero, whereas the other forms of deposit are acquired with a positive rate. However, demand deposits tend to be more volatile and therefore offer banks greater liquidity problems; though experience in some LDCs has shown that deposit accounts are sometimes treated no differently from chequing accounts by their holders, thus increasing the liability problem of the banks. On our analysis however (if this statement is right) it is thus doubtful whether there is need to separate the different components of deposits in our analysis. Secondly, if the supply of deposits is near perfect to the individual bank at the going rate, the relevant market frame of reference for analyzing deposits in these countries is therefore, the bank's demand for deposits. However,

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[4]Leite, S.P. [1982].

this may be different if the totality of banks within the industry should simultaneously increase their demand for deposits. Then the private/household supply of deposits as well as the banks' demand would become the relevant frame of analysis.

The brief background here is relevant for all types of deposits, although modifications may be necessary for individual countries. Though the subsequent models are applied to aggregate banking data, the micro market conditions are reflected in the empirical work.

4.4 Model I

This model is derived from the theory of choice under conditions of risk, and uncertainty. It assumes that the institutions under study follow an optimization procedure, whose result is then used to derive a verifiable empirical model which can be estimated. The model is a static model of banking portfolio behaviour.

4.4.1 Assumptions of the Model:

We assume in this first model, following Borch [1969], Jones-Lee [1971] and Parkin [1970] that the utility derived from a bank's portfolio can be described by a general utility function. We also assume that the managers of the bank are interested in maximizing the owner's expected utility of terminal wealth. To do this the managers choose or select their portfolio so as to maximize the expected utility of wealth of the owners. Given these assumptions

the bank's utility function can be characterized in terms of the mean and variance of its overall portfolio rate of return. The optimal proportionate combination (composition) of the portfolio is that which maximizes the mean-variance utility index subject to the balance sheet constraints and regulatory requirements.

To make this model operational involves solving a general programming problem. However, we have assumed that the expected utility function is twice differentiable and can therefore settle for simple differential calculus in our analysis.[5]

Without loss of generality, the end of period terminal wealth can be proxied by the net profit earned by the banks, especially when the activity period is very short. The utility function of the firm can then be characterized as:

$$U = U(W[P]) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 4.1$$

where U = is the utility index

W = is wealth

P = is profit

---

[5]We need to take note here that the uses of differential calculus would call for equality constraints on the objective function of the firms. This procedure is, however, relevant to us here because the Kuhn Tucker Conditions call for a non-linear programming only when the inequality are binding. This is important in our analysis, only when negative quantities of some or all the securities concerend cannot be held, that is short selling of some or all the securities is not permitted; this is not, however, so in our case.

The model can be formulated in terms of the first and second moments of the frequency distribution of returns, provided the management of the banking firm maximizes the expected utility of wealth of the bank owners. This method is guaranteed to produce unique results if the following conditions hold: (i) the Pratt-Arrow (Pratt [1964] and Arrow [1965])[6] measure of risk aversion for the individual (banking firm) is constant[7] - a sufficient condition for this to hold is that the utility of the end of period wealth function is exponential; (ii) the owners and the managers believe that portfolio rates of return are normally distributed.

4.4.3 The Model :

We start by defining the vector of portfolio variables. For notational convenience, we denote the vector of asset and liability variables as Z; where

$$Z_{n \times 1} = (NSR, Ig, L, OL, \ldots\ldots\ldots, CRS)' \quad [8] \quad \ldots\ldots\ldots\ldots \quad 4.2$$

and the vector of yields and rates is denoted as

$$X_{n \times 1} = (i_{NSR}, i_g, i_L, \ldots\ldots\ldots, i_{CRS})' \quad \ldots\ldots\ldots\ldots \quad 4.3$$

---

[6] Let U(W) be the utility of end period wealth function, and U'(W) and U"(W) be the first and second derivatives respectively. The Pratt-Arrow measure is defined as

$$Ra = \left(- \frac{U''(W)}{U'(W)} \right)$$

[7] Ra is constant if

$$\frac{d(Ra)}{dW} = 0$$

[8] The prime indicates transpose.

If the firm maximizes expected utility of wealth, then the objective function for the firm would be

$$E(U) = E\left\{ U\,[W(P)] \right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.4$$

To operationalize, we adopt the Parkin [1970] framework. That is we assume that profit, P, is stochastic, that uncertainty exists about yields and the cost of borrowing from the Central Banking Authority, we also make the strong assumption that

$P \sim N\ (\mu_p, \sigma_p)$, and that the utility function of the bank owners is lognormal.

These assumptions enable us to write 4.4 in a more explicit form as

$$E(U) = \alpha - \beta\ \{Exp(-c/2\ \mu_p + \frac{c^2}{4}\ \sigma_p{}^2)\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.5$$

To maximize 4.5, all we need do is to choose the values of μ_p and σ_p such that $\mu_p - \frac{c}{2}\sigma_p{}^2$ is a maximum. In other words the operational objective to maximize is

$$M^* = \mu_p - \frac{c}{2}\ \sigma_p{}^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.6$$

Using definitions 4.2 and 4.3 we can now define the profit of the firm as

$$P = X'Z \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.7$$

further, if actual yields are defined as

$$X = \hat{X} + \mu \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.8$$

and the vector of assets and liabilities is

$$Z = \hat{Z} + \omega \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.9$$

where the hats represent forecasted values and μ,ω represent errors of forecast,

Using 4.8 and 4.9 in 4.7 we have

$$P = (\hat{X} + \mu)' \ (\hat{Z} + \omega)$$

$$= \hat{X}'\hat{Z} + \hat{X}'\omega + \mu'Z + \mu'\omega \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.10$$

Expected profit or the mean profit is

$$= E(P)$$

$$= E(\hat{X}'\hat{Z}) + \hat{X}'E(\omega) + E(\mu')\hat{Z} + E(\mu'\omega)$$

$$= \hat{X}'\hat{Z} + \hat{X}'E(\omega) + E(\mu') \ \hat{Z} + E(\mu'\omega)$$

$$= \hat{X}'\hat{Z} \text{ for } E(\omega) = E(\mu) = E(\mu'\omega) = 0$$

$$= \mu_p \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.11$$

μ and ω are independently distributed with mean zero.

Similarly the variance of profit is

$$\sigma_p^2 = E[P - E(P)]$$

$$= E[(X'\omega + \mu'Z + \mu'\omega)^2] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.12$$

Given the assumption about the distributions of μ and ω; we have

$$\sigma_p^2 = \hat{X}'E(\omega\ \omega')\hat{X} + \hat{Z}'E(\mu\ \mu')\hat{Z} + E(\mu'\mu\ \omega'\omega)$$

$$= \hat{X}'\Sigma\omega\omega\hat{X} + \hat{Z}'\Sigma\mu\mu\hat{Z} + Q \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.13$$

Given 4.11 and 4.13, 4.6 is then maximized subject to balance sheet constraint and other institutional as well as legal constraints especially the reserve requirement and liquidity requirement. The binding constraint in this case is the adding up constraint

$$i'Z_1 + i'Z_2 = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.14$$

(where Z_1, Z_2 are vectors of choice and non choice portfolio items respectively, and i_s are vector of units) that is the sum of assets must always equal the sum of liabilities.

The bank's optimization problem can now be stated as

$$\underset{Z,X}{\text{Max}}\ M = \mu_p - {}^{c}/_{2}\,\sigma_p^2$$

$$\text{S.t} \qquad i_1'\hat{Z}_1 + i_2'\hat{Z}_2 = 0$$

The maximizing function is then formed using a Lagrangian multiplier which gives

$$L = \mu_p - {}^{c}/_{2}\,\sigma_p^2 + \lambda(i_1'\hat{Z}_1 + i_2'\hat{Z}_2)$$

$$= [(\hat{x}_1' \ \hat{x}_2')\begin{bmatrix}\hat{Z}_1\\ \hat{Z}_2\end{bmatrix}] - {}^{c}/_{2}\,\{\hat{x}'\Sigma\omega\omega\hat{x} + (\hat{Z}_1' : \hat{Z}_2')\begin{bmatrix}\sigma^{\mu}_{11} & \sigma^{\mu}_{21}\\ \sigma^{\mu}_{12} & \sigma^{\mu}_{22}\end{bmatrix}\begin{bmatrix}\hat{Z}_1\\ \hat{Z}_2\end{bmatrix}$$

$$+ Q\} + \lambda[i_1' : i_2']\begin{bmatrix}\hat{Z}_1\\ \hat{Z}_2\end{bmatrix} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.15$$

Differentiating with respect to the choice variables

Z_1 and λ, we have

$$\delta L/\delta 2_1 = X_1 - C(\sigma^{\mu}_{11}\hat{Z}_1 + \sigma^{\mu}_{12}\hat{Z}_2) + \lambda i_1 \qquad \ldots\ldots\ldots \quad 4.16$$

$$\delta L/\delta\lambda = i_1'\hat{Z}_1 + i_2'\hat{Z}_2 = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.17$$

Re-arranging and solving for the choice variables.

$$\begin{bmatrix}\hat{Z}_1\\ \lambda\end{bmatrix} = \begin{bmatrix}c\,\sigma^{\mu}_{11} & -i_1\\ -i_1 & o\end{bmatrix}^{-1}\begin{bmatrix}\hat{X}_1 - C\,\sigma^{\mu}_{12}\hat{Z}_2\\ i'\hat{Z}_2\end{bmatrix} \qquad \ldots\ldots\ldots \quad 4.18$$

Non singularity of σ^{μ}_{11} a variance-covariance matrix, enables us to invert this matrix. Using inverse by partition matrix, the solution is then obtained to be

$$\hat{Z}_1 = {}^{1}/_{c}\,G\hat{X}_1 - G\,\sigma^{\mu}_{12}Z_2 - Hi_2'\hat{Z}_2 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.19$$

$$\text{where } G = \sigma^{11}_{\mu} - \frac{\sigma^{11}_{\mu}\, i_1 i_1'\, \sigma^{11}_{\mu}}{i_1'\sigma^{11}_{\mu}\, i_1} \qquad \ldots\ldots\ldots\ldots\ldots \quad 4.20$$

$$\text{and } H = \frac{\sigma^{11}_{\mu}\, i_1}{i_1'\,\sigma_{\mu} i_1} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.21$$

4.20 and 4.21 are possible because σ^{μ}_{11} is positive definite - thus any quadratic form formed from the matrix must also be positive definite.

Following Parkin (1970 pp 236-238), G can be shown to be symmetric and H has a column sum of -1. With suitable rearrangements of 4.19 and where $\hat{Z}_2$ and $\hat{X}_1$ are the vectors of pre-determined portfolio variable and interest rates respectively, the portfolio equation applicable to individual banks can be shown to be

$$Z_1 = A\hat{X}_1 + B\tilde{Z}_2 \text{[9]} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.22$$

To put this model into an implementable form, we need to aggregate over all banks. To achieve this we need to assume that all the banks hold the same expectations about interest rate movements and that they possess the same subjective covariance matrix of forecasting errors. If further it is assumed that forecasted rates are averages over the period then

$$\hat{X}_1 = \bar{X}_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.23$$

Then 4.22 can be written as

$$\hat{Z}_1 = A\hat{X}_1 + B\hat{Z}_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.24$$

Where 4.24 is summed over all firms in the industry.

Further if forecasting errors are zero in aggregate, then the actual behaviour of the banking industry is given by

[9] See Appendix 4A

$$Z_1 = AX_1 + BZ_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.25$$

Assuming that actual behaviour is stochastic then

$$Z_1 = AX_1 + BZ_2 + \varepsilon_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.26$$

4.26 is then the operational equation specifying the portfolio behaviour of the commercial banking industry in terms of some set of predetermined non-choice variables, the vector of yields and rates, and of course the parameters of the system.

4.26 will be suitably modified for estimation in the empirical section. We should, however, note that structurally this model is static whereas we need a model that is capable of accounting for the changes in banking behaviour in a dynamic sense, especially when the system is in disequilibrium. In the next stage of the study, we therefore adopt the Tobin-Brainard framework to study the behaviour of the commerial bnaking system.

4.5 Model II

4.5.1 Introduction

The second model arose out of the need to take account of the dynamic conditions within which the bank has to operate, in order to incorporate the adjustment behaviour of the banking system into our model. The most common technique is to incorporate a partial stock adjustment mechanism into the model. Banks are assumed to attempt to minimize the deviation between the desired and actual levels of portfolio instruments.

Most early studies in this vein were interested only in explaining the relationship between commercial bank portfolio behaviour and the money supply. The framework has been extended, by De Leeuw [1965] and Goldfeld [1966] among others, to deal with demand and supply of the various financial instruments of the commercial banks. The bulk of the analysis has been partial, in terms of reflecting the framework within which the banks operate: the Tobin-Brainard approach is, however, more general and has gained wider acceptance. In addition the model can be made consistent with the Tobin-Markowitz framework used in developing Model I [White, 1975].

The Tobin-Brainard model contains a general equilibrium model of the financial sector as well as a general disequilibrium model of the dynamic process by which endogeneous variables in the model adjust from one set of equilibrium values to another in response to a change in one or more exogeneous variables. Variables in the

model are linked up by behavioural equations and identities, which imply some set of restrictions on the structural model. In the case of the banking sector, the model emphasized the importance of interrelationship imposed by the balance sheet identity, in particular the application of the balance sheet conditions to both equilibrium relationships and to dynamic models describing the financial system in disequilibrium.

4.5.2 The Assumptions :

The underlying assumptions are that all desired assets are dependent linearly on their own returns and the returns on competing assets. If assets and liabilities are assumed to be gross substitutes, the sum of total effect of a change in the rate of interest across the whole portfolio should be zero. Further, if it is assumed that desired asset shares are homogeneous in wealth, any change in wealth would be allocated over all items in the portfolio in constant proportions, given the levels of interest rates.

The demand for each instrument depends not only on the deviation between the desired and actual values of that particular instrument but also on all such deviations contained in the model. This implies that dynamic cross adjustment effects have to be specified explicitly and the sum of cross-effects over all assets should add to zero.

A modified form of the original model is presented here, which will enable us to explore the dynamic effects of government policy on the portfolio behaviour of the banking system.

4.5.3 The Model:

The structural equations of the model are as follows:

$$Z^{e}_{it} = B_o W_t + B_1 X_{1t} W_t \quad \text{..... 4.27}$$

$$i' Z_{it} = W_t \quad \text{..... 4.28}$$

where Z^{e}_{it} is a vector of desired holding of assets and liabilities

W_t is a scalar of net worth

B_o, B_1 are structural parameters

X_{it} is a K x 1 vector of explanatory variables (made up of expected holding period returns on portfolio items and exogenous explanatory variables)

4.27 is the structural relation and

4.28 is the balance sheet condition

If we assume that banks operate a partial adjustment mechanism, we can define the asset demand functions as

$$\Delta Z_{it} = L(Z^{e}_{it} - Z_{i,t-1}) + \gamma \Delta W_t \quad \text{..... 4.29}$$

where L is an n x n matrix of adjustment parameters

γ is vector of co-efficients which determine the initial allocation of a change in wealth on component assets.

Substituting 4.27 into 4.29 gives

$$\Delta Z_{it} = L[(B_o + B_1 X_{it}) W_t - Z_{it-1}] + \gamma \Delta W_t \quad \text{..... 4.30}$$

4.30 is the reduced form equation of the model. This model involves n equations in 2(n + 1) unknowns.

Finding a unique solution for the model in this form is impossible. We therefore have to impose a set of restrictions on the parameters of the structural model. The balance sheet constraints of the banks and the need for consistency can be used to provide most of these restrictions:

(a) $i'B_o = 1$ and $i'B_1 = 0$ 4.31

that is the sum of the constant terms should be one and the interaction effects should add up to zero.

(b) $i'Z_t = W_t = i'Z_t^e$ 4.32

it is assumed that the sum of the desired asset holdings equal total available funds.

Taking account of these restrictions does not however remove the exact linear relation which exists between Zit-1, ΔW_t and W_t because

$$W_t = \Delta W_t + i'Z_{i,t-1} \quad \text{.....} \quad 4.33$$

Several solutions have been suggested for dealing with this problem. It has been argued that the estimation of the model does not require substantitive behavioural assumption as has been previously suggested. Instead, it was demonstrated that the redundant variable could be eliminated with the effect only on the

form in which the model is written [Smith, 1975]. Essentially, that the redundant variable can be eliminated by substitution and that the re-arrangement in the parameters of the model did not require any behavioural assumptions. Specifically, that the identity

$$(Z_{it} - Z_{it-1}) = \Delta W \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.34$$

can be substituted into 4.29 to eliminate ΔW_t to give

$$\Delta Z_{it} = L(Z^e_{it} - Z_{it-1}) + \gamma(Z^e_{it} - Z_{it-1})$$
$$= \Psi(Z^e_{it} - Z_{it-1}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.35$$

where $i'\Psi = 1$ $\ldots\ldots\ldots\ldots\ldots\ldots\ldots$ 4.36

and $\Psi = L + \gamma,$ $\ldots\ldots\ldots\ldots\ldots\ldots\ldots$ 4.37

using these in the reduced form equation 4.30 can now be expressed as:

$$\Delta Z_{it} = \Psi[\beta_o + \beta_1 X_{it}]W_t - \Psi Z_{it-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 4.38$$

and $Z_{it} = \Psi\beta_o W_t + \Psi\beta_1 X_{it} W_t + (1-\Psi)Z_{it-1}$ $\ldots\ldots\ldots\ldots\ldots\ldots$ 4.39

The implications of these restrictions on the model are that, if a gap between the desired and actual amount of a particular asset induces an increase in the actual value of that asset, it induces corresponding decreases/increases in the actual value of other assets/liabilities. This condition, requires the adjustment co-efficients summed over a particular gap to add to zero. It also requires that the co-efficients of the change in net-worth term sum to unity, since net worth must be fully distributed over the assets and liabilities.

Estimation of equation 4.39, is not without problems, as has been demonstrated by Smith [1975] and discussed earlier on. These issues, and other matters concerning the empirical treatment of variables, parameters and adjustment process will be taken up in Chapter seven.

There is one further aspect of the Brainard-Tobin framework to which we need to draw attention: the framework implicitly assumes that decisions with respect to the allocation of funds among various categories of instruments are made simultaneously. In terms of model building and analysis, this implies a requirement for a substantial amount of data that may not easily be available. Moreover, it is an aspect of the model which has been criticized on the grounds that it contradicts the institutional practices of banks. White [1975] and Tishler [1976] have suggested that a sequential procedure would correspond better with the process of decision making in the banking business - a suggestion which has been followed in applying the model in this study.

4.6 Summary

In this chapter, we have presented two complementary frameworks for analysing banking portfolio behaviour in LDCs. The first is an equilibrium framework in which the bank's portfolio is treated as adjusting completely within the period of analysis. We provided a model to explain banks' portfolio behaviour given that the underlying structure of decision making at the micro level is characterized by uncertainty and risk. This mode assumes the profit maximization objective. At the empirical implementation stage, however, this framework will enable us to evaluate the regulatory effect of government policy.

The second stage of the analysis tries to take account of the adjustment problem of the banks. Their adjustment process is modelled by assuming that the underlying structure is characterized by a stock adjustment process. Using the Brainard-Tobin framework, portfolio variables are dichotomized into choice and non-choice variables. The framework is then used to derive estimable asset and liability demand equations for the banking industry. This analysis has the advantage of being dynamic, so that banks' portfolio behaviour can be studied both in and out of disequilibrium. This model should enable us to derive both the long and short run properties of the system. Moreover, by incorporating real sector variables an attempt will be made to examine real sector effects on portfolio variables, without building an elaborate real sector model. The model also can be employed to carry out a simulation exercise.

CHAPTER FIVE

THE NIGERIAN FINANCIAL SYSTEM: STRUCTURE AND ORGANIZATION

5.1 Introduction

This chapter presents a brief clarification of the structure and organization of the financial system in Nigeria and discusses some issues connected with it. While we present the important features, as a background to the understanding of the subsequent empirical chapters, it is not the intention of the chapter to provide a complete description of the entire Nigerian Financial System. This has been adequately treated elsewhere.[1]

Our principal objectives are to highlight the relevance of the structure of the financial system to the portfolio behaviour of the commercial banking system: by isolating important connections and interrelations within the system; and the extent and influence of the composition and organization of the system on the portfolio formation, choice and management of the banking firms.

To achieve these objects section 5.2 discusses the evolution, growth, structure and organization of the financial system. Section 5.3 examines the evolution and development of the banking sector within the financial system. Section 5.4 deals with the characteristics of banking operations in Nigeria. Finally, section 5.5 discusses the interactions of institutions within the financial market.

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[1] See Adewunmi and Ojo [1981], Ajayi and Ojo [1980], Nwankwo [1980], Ojo [1979] and Okigbo [1980].

5.2 Structure, Growth and Organization

Modern trends in the Nigerian Financial System can be traced to the establishment of the Central Bank of Nigeria (CBN) in 1958 and the Banking Ordinance of that year which replaced the Banking Ordinance of 1952 (the first Banking Law enacted in Nigeria). Before this time, there was not much that could be referred to as a financial or banking system - banking was very skeletal and there were very few portfolio opportunities. Thus, the Nigerian financial system was very much undeveloped.

The establishment of the CBN and the statutory creation of other financial institutions and instruments in the early 60's ushered in the beginning of what is now known as the Nigerian Financial System. For instance, the Treasury Bill Ordinance [1959] formed the basis of the first issue of Treasury Bills in April 1960. New institutions were established, for example the Investment Company of Nigeria [1959], later changed to the Nigerian Industrial Development Bank [1964], and the Lagos Stock Exchange [1961], later converted to the Nigerian Stock Exchange.

Similar transformation were taking place at the same time within the private sector. Apart from the growth of commercial banking firms, money and capital market institutions were gradually taking off. In 1960, for instance, Philip Hill Nigeria Limited, a subsidiary of Philip Hill, Higginson, Erlangers Limited of London was established. This was followed in 1961 by the establishment of Nigeria Acceptances Limited, a subsidiary of John Holt Group of

Liverpool. This trend, once started, has continued ever since, although it was slightly interrupted by the civil war.

Compared to other LDCs, the Nigerian Financial System is relatively developed, and in recent years it has become increasingly sophisticated, responding to opportunities in the field of intermediation in a particularly innovative way. The flow of funds through the system has continued to increase. If we use the ratio of M2[2] to gross national product (Table 5.1) as a rough measure of the flow of funds through the system the Nigeria Banking System, with an average of 0.29, compares with developing countries like India 0.32, Philippines 0.21, and Turkey 0.24. However, it has lagged behind fast growing countries like Japan, Taiwan, Singapore and Germany. Furthermore, in 1962 the ratio of assets of the financial system to national wealth was 16.8 per cent, in 1972[3] it was 30.2 per cent and in 1975, it was 42.3 per cent, which indicates a more than two-fold growth in total financial assets.

At the same time, the intermediation function of the system improved; for instance, total financial savings generated through the system as a percentage of gross domestic saving increased from an average of 13.11 per cent in 1961/66 to 35.47 per cent in 1972/79. As a percentage of gross national product it increased from 1.32 per cent to 9.67 per cent.

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[2] M2 is defined conventionally as the broad definition of money.

[3] Ojo [1976].

Table 5.1: Banks Loanable Funds as Proportion of GNP in Rapidly Growing Countries Compared to some LDCs and Nigeria [1970 - 1980]

Years / Countries	1970	1975	1977	1980	1970/80 Average
Germany	0.583	0.727	0.777	0.542	0.657
Japan	0.863	1.026	1.087	0.878	0.963
South Korea	0.325	0.323	0.334	0.365	0.338
Singapore	0.701	0.668	0.750	0.703	0.705
Taiwan	0.162	0.588	0.702	NA	0.484
Nigeria	0.126	0.252	0.288	0.480	0.286
India	0.264	0.295	0.341	0.394	0.323
Philippines	0.235	0.186	0.212	0.209	0.210
Turkey	0.237	0.222	0.281	0.203	0.236

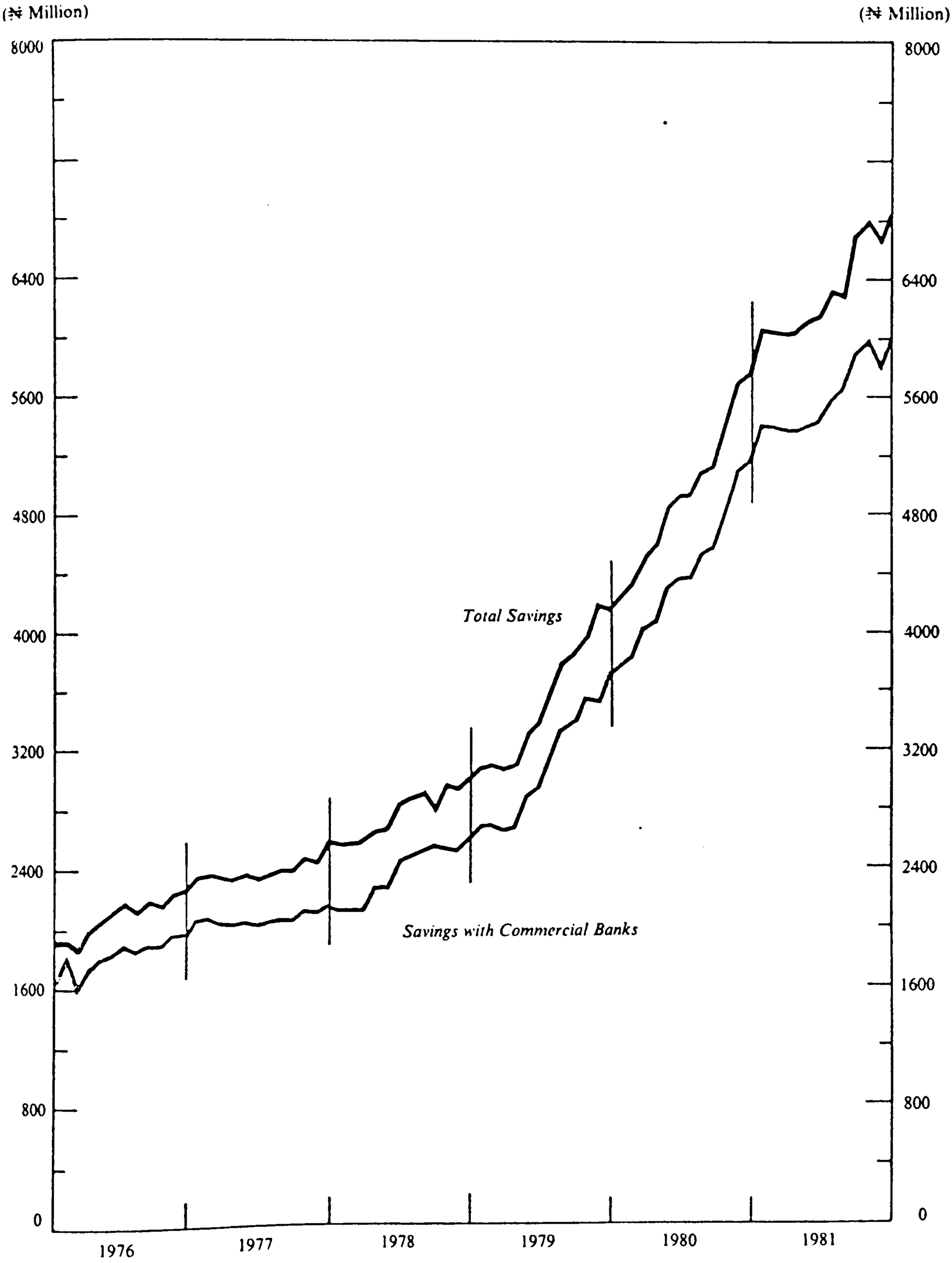
Sources: (i) David Wall et al., 1980.
(ii) IMF Financial Statistics, various issues.

Over the same period, the commercial banking sector remained dominant both in terms of the sizes and of the relative activities of individual components within the system. Between 1970 and 1980, it accounted on average for about 51 per cent of total assets of the financial system (Table 5.2); and in terms of institutionalized savings through the system it accounted well over 80 per cent (Figure 5.1). In addition an array of institutions has emerged at different stages of development to perform specialized functions, such as development, agriculture, mortgage, cooperative and thrift banks.

There is a growing capital market and a gradually developing money market, mostly centered on the Capital city of Lagos and other urban centres.

Figure 5.1 : INSTITUTIONALISED SAVINGS

(End of Month)



The prominent issues within the system during the period covered by the analysis are:

(i) the extent of importance of the activities and behaviour of the financial institutions on monetary and financial objectives of the financial authorities.

(ii) the dichotomy of ownership of the institutions and its implication for policy.

(iii) the extent of public participation and control of the system.

The most glaring shortcoming of the system is the dichotomy of the financial market. Transactions still take place in two separate segments, the formal and non-formal sectors. Comparison of these two segments is impossible because of lack of information and data on the latter (traditional) sector. Wai [1977] has suggested using the ratio of total agricultural indebtedness to the claims of the banking system on the private sector as a measure of the relative importance of the non-formal sector. In the case of Nigeria this measure would show a fast shrinking sector. For obvious reasons, however, our analysis will concentrate on the formal sector of the financial market.

Table 5.2: The Structure of Assets of Financial Institutions in Nigeria [1971 - 1980]

Institutions	1971	1975	1980	% 1971/80 Average
CBN	26.8	51.5	33.4	37.2
Commercial Banks	54.3	40.7	58.0	51.0
Federal Savings Bank	0.2	0.1	0.1	0.1
Merchant Banks	0.7	1.0	3.0	1.6
Total Banking Institutions	82.0	93.3	94.5	89.9
Building Societies/ Mortgage Banker	0.6	0.5	1.0	0.7
Insurance	2.9	2.4	0.8	2.0
Pension Funds	5.3	-	-	-
National Provident Fund	3.3	2.2	1.4	2.3
Finance Companies	0.4	-	-	-
Cooperative/Thrift Institutions	0.7	0.1	-	-
Special Credit Institutions	4.8	1.6	2.3	2.9

Sources: (i) Central Bank Annual Reports and Economic and Financial Review.

(ii) Adewunmi and Ojo [1981]

5.2.1 Structural Transformation:

The Nigerian Financial system has expanded and developed as financial intermediaries have evolved. Its contribution to National product is still very low, but it is rising over time. For instance, the sector's contribution to GNP was only 1.29 per cent in 1973 but by 1980 it had risen to 2.49 per cent, which implies an average growth of about 7.62 per cent per annum for the period. Only the manufacturing sector, with an average of about 8 per cent, per annum had comparable growth in the period.

There was no spectacular growth of financial resources until the first half of the 1970s. New issues by financial institutions increased dramatically, both the level of total assets and the number of institutions being transformed from the low levels of the sixties. Total asset and liability holdings of the system more than tripled, from ₦ 1152.0 million (Naira) in 1970 to ₦ 4308.0 million in 1975, while at the same time total shareholders' funds increased from ₦ 202.5 million to ₦ 811.1 million in 1975.

The end of the civil war [January 1970] gave rise to a host of new construction and reconstruction activities, whose financial needs from both private and public funds led to the evolution of new and the growth of existing institutions, including several Housing Authorities created by both the regional and federal governments and some development financing institutions such as the Nigeria Bank for Commerce and Industry (NBCI). There were also increased opportunities for existing and new financial institutions. The boom was reflected in a number of development and reconstruction plans, especially the 1970/74 and 1975/80 plans. The enormous injection that these spendings entailed, combined with the speed of reconciliation, gave rise to increased confidence in the future of the country and thus enhanced further financial growth from both domestic and foreign sources. Particularly benefiting from this upsurge of activities were the commercial banks and others, such as the merchant banks, insurance firms and specialized saving institutions. It must also be added that the production of oil, which was discovered in 1957 in commercial quantities, and whose

development was interrupted by the civil war/August 1967 - January 1970, was now at a level far higher than that envisaged when it was first discovered. The level of oil production, coupled with the price dynamics on the world oil market, had a strong effect on the foreign exchange position of the country, and thus the strengthening of the country's international solvency reinforced the factors encouraging growth within the economy in general and the financial system in particular.

5.3 Commercial Banking

With about 53 per cent of the total financial resources and 59 per cent of total banking resources (Table 5.2), commercial banks (including The Merchant Banks) play a dominant role in the Nigerian Financial Sector. Commercial banks are the primary mobilizers of funds even though in most cases their allocation of resources is geared mainly towards the short end of resource allocation. In fact, a prominent issue in LDC's is whether the commercial banks should concentrate on the traditional form of banking activity, especially as other specialized institutions in LDC's, particularly development banks, insurance firms and other special credit institutions, do play a limited role in the provision of long term domestic financing to productive sectors of the economy.

Commercial banking, started early in Nigeria (by West African standards). The first set of banks were mainly expatriates, with the establishment of banks by domestic enterprise coming later.

Several conflicting explanations for the growth of indigenous Nigerian banks are available. One line of argument is that the first set of expatriate banks operated discriminatory credit policies which were particularly unfavourable to indigenous businesses [Nwankwo p.47, 1980]. The establishment of Native banks were therefore a response to the policies of the established expatriate banks. However, Rowan [1953] rejected this argument. He contended that a combination of factors, which include the social background as well as the commercial background of the Africans, determines the stance of the banks. In particular, apart from lacking the required form of collateral for a strictly defined commercial credit, African businesses operate no accounting system, which made it very difficult for the banks to evaluate their business.

Whichever view one subscribes to, the expatriate banks increased steadily over the years, in terms of both size and number. In contrast, although the indigenous banks did grow, their growth was rather spasmodic, and failure among them was frequent. For instance, between 1947 and 1952, 185 banks were registered in Nigeria but by 1960 there were only six survivors.

As noted earlier, after 1960 the establishment of the CBN brought order and stability to the Nigerian financial sector, and the organization and administration of the financial sector (including the banking sector) became regularized. There were changes in both the institutions themselves and in the portfolio

operations of the banks.

The number of operating banks started to grow, as did their offices and branches. The number of banks operating in Nigeria was transformed from 12 in December 1960, with total branch offices of 160, to 20 in 1980, with total branch offices of 740. By 1982 there were 27 banks with 785 branch offices.

Another wind of change was the increased indigenization of the ownership structure of Nigerian banks. The issue of indigenous versus expatriate banks, which had dominated the Nigerian banking system for a long time, became blurred as a result of government participation in the so-called foreign banks and the implementation of the indigenization decree.

In recent times, the bias in policy has changed from being against foreign banks to being against big banks. The banks themselves have grown in terms of assets and liabilities. For instance, the total assets of the banking system were ₦ 232 million in 1960, but by June 1980 they had risen to ₦ 12,709 million, an increase of almost 55 times in twenty years.

The major issues at the different stages of banking development have centered on the banks' liabilities and assets portfolio. It has been argued that the observed structure of their assets and liabilities did not reflect the overall objectives of the economy - in other words their portfolios were socially inoptimal. In their

industry transformation function they failed to take account of the financing requirements of the economy. In order to rectify these weaknesses government policies over the years have been designed to effect changes in the ownership structure of the banks as well as enforcing short term measure which impinged directly on the term structure of their portfolios.

5.4 Characteristics of Banking Operations

The characteristics of the operations of any business organization depend to a large extent on the nature and structure of its objectives, the industry to which it belongs and the set of regulatory conditions governing that industry. In the Nigerian case these characteristics can be traced through the changes in ownership structure, capitalization, competitiveness and regulatory conditions of the industry which have taken place as well as through the effects of these factors on the banks' assets, liabilities and other performance measures.

As was stated earlier, banking in Nigeria started as a predominantly private enterprise business (private foreign, to use Chapter three's classification), even though initial encouragement might have come from the Colonial Office. The same was also true of the growth of indigenous owned commerical banks. The introduction of public capital into banking business did not come until the late 50's and early 60's, the spur lying in the banking failures and rampant mismanagement of funds that characterized the industry in the late 50's. Since, the expatriate-owned banks were completely

insulated from these crises, it was the 'African banks' [Rowan 1953] that had the public capital injection. Thus, contrary to common belief, it was a combination of undercapitalization and inefficiency of management of the African banks that brought the first public intervention, rather than bias in the credit policy of the expatriate banks. The weakness of the African banks was highlighted by Rowan [1953] and Olakanpo [1963], both of whom foresaw a need for public action.

However, by the early 1960's, with political independence, a central bank and a plan for desired growth and development, there was a greater need for finance. These needs exerted greater pressures on official policy, for changing and influencing the portfolio policy of the commerical banks. At the same time the inability of these institutions to cope with greater official demand for finance, as witnessed by the shortfall in the financing of the first National Development Plan 1962/68, led to further direct intervention by governments on the operations of the commercial banking system.

In 1973, the Federal Government of Nigeria acquired a 40 per cent equity participation in each of the three biggest expatriate banks. This was followed by indigenization policy in 1976, which raised indigenous participation in all banks to 60 per cent (where there was a shortfall of private participation , the slack was automatically taken up by the government). Thus, the policy of diluting foreign enterprise can be said to have come full circle. However,

However, by 1980 equity participation in the Nigeria Banking industry averaged 66 per cent government, 16.58 per cent private - Nigerian and 17.42 per cent foreign. Whether the turn around of equity ownership and representation in the boardrooms of the individual firms has achieved any changes in the banks' portfolio configuration, as desired by the financial authority, remains a very open question.

5.4.1 Capitalization:

Bank's capital is normally regarded as an input into the production process of banking firms. It is needed to attract deposit funds, which are also a necessary input in banks' production of their final product [Peltzman 1970; Mingo 1975; Sealey and Lindley 1977]. Since bank capital remains the best means of guaranteeing the solvency of banks, financial authorities everywhere are concerned about the capital adequacy of their banks.

Since the failure of many banks in Nigeria in the early fifties, prudential regulations have been concerned mainly with banks' capital adequacy and reserves. Regulatory policy regarding capital structure of banks in Nigeria discriminates between indigenous owned and foreign owned banks. In 1952, for instance, foreign owned banks were required to have a paid up capital of ₦ 400,000, whereas Nigerian owned banks were only required to have ₦ 25,000. These levels have been progressively stepped up over time. The need to increase the minimum capital requirements is pressing in countries like Nigeria where, unlike in developed countries, there are no opportunities for deposit insurance.

The structure of capital varies across banks. Most bank capital is derived from equity participation, loan capital having remained relatively insignificant. With the exception of the quoted banks, this method has not been widely adopted by banks in Nigeria. The level of equity capital varies among the banks. In 1974, for instance, one bank, the Union Bank had an equity capital of ₦ 12 million while there were two banks with just ₦ 1.5 million (see Table 5.3). The size of a bank's capital varies naturally according to its age and the size of its operations. Banks' equity capitalization is generally larger than that of firms in other sectors within the economy.
In insurance, for instance, equity capital is smaller than for the banks, although banks tend to be larger than most insurance firms.[4]

Table 5.3: Commercial Banks' Equity Capital[5] 1971/80 (₦ Million)

Year Banks	1971	1974	1978	1980
Union Bank of Nigeria	12.00	12.00	30.24	36.29
First Bank	7.75	9.70	61.14	70.00
National Bank	6.49	6.49	10.00	10.00
United Bank for Africa	4.50	6.00	20.00	30.00
Bank of the North	3.00	6.99	14.70	14.70
I.B.W.A.	1.50	2.10	10.00	20.00
Savannah Bank	1.50	1.50	6.00	18.00
Mercantile Bank	1.10	1.10	4.50	6.10
New Nigeria Bank Ltd.	1.41	1.41	10.00	10.00

Source: Various Annual Reports of Banks and CBN Annual Reports.

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[4] In most cases bank size compares favourably with the size of most industrial firms in Nigeria.

[5] Equity capital here refers to fully paid share capital of the individual firm.

5.4.2 Regulations:

The first attempt to regulate the Nigerian Banking Industry was made through the 1952 Banking Ordinance. It introduced bank supervision and licensing, based on minimum capital and other requirements, and set guidelines on liquidity and reserves. The Banking Ordinance [1958] which established the Central Bank of Nigeria, with the 1962 Amendment Act, the 1968 Companies Act which made it obligatory for all companies to incorporate locally under Nigeria Company Law and the 1969 Banking Decree, laid the foundation for a more modern banking system. As stated in Chapter three, these various Acts and Decrees set up the conditions for both prudential and economic regulation of the Nigerian Banking Sector.

Over the period [1960 to 1981] covered by this analysis, the perceived structure of the banking industry has been a further cause for government action, particularly the belief that the industry is oligopolistic. Whether this justifies action depends on what is considered an appropriate competitive structure for the industry. A comparison of Table 3.2 in Chapter three and Table 5.4 should indicate some degree of concentration in the industry. Table 5.4, using both the 3 and 5 firms' concentration ratios, indicates a decline in concentration over the years. It is, however, hard to say whether the observed decline is due to the effect of official policy or is a reaction to the dynamics of the industry by the firms within it. Nevertheless, the belief that the industry is oligo-polistic has led to attempts on the part of the monetary and financial authority to enhance competition, mainly by encouraging

new ventures (usually joint participation between foreign capital and private/public domestic capital). In addition, the regulatory laws have usually prohibited sudden mergers of existing firms and the ownership of equity stock of other banks and companies.

Table 5.4: Structure of Concentration in The Nigerian Banking Industry (in Percentages)

	3 Firms' Ratio	5 Firms' Ratio	3 Firms' Ratio	5 Firms' Ratio
	1977		1980	
Deposits	53.8	69.3	52.1	62.8
Loans and Advances	38.6	62.9	44.5	54.3
Branches	46.7	62.0	49.7	67.5
Total Assets	41.5	61.0	37.6	46.4
Capital Accounts	62.7	69.4	62.6	69.2

Sources: Computed from various Annual Reports of banks and CBN Economic and Financial Review.

5.4.3 Assets:

. Overall, there has been a significant increase in the total assets of commercial banks during the period covered. There have also been significant variations in the structure of assets, particularly the proportion of liquid assets in total assets.

Loans and advances to the non-banking private sector increased dramatically, their proportion of total assets varying between 30 per cent and 60 per cent over the period (Table 5.5). There was a significant year to year variation, depending on the real changes within the economy and the policy being pursued by the financial authorities, and there were qualitative as well as quantitative

Table 5.5: Nigerian Commercial Banking System Portfolio of Assets 1960 - 1981 (Percentages)

Year	Cash & Cash Items	Balance with Domestics	Balance with Banks Abroad	Treasury Securities	Other Advances	Loans & Advances	Other Assets	Total
1960	8.0	2.7	17.8	1.5	0.8	47.8	20.2	100
1961	7.5	0.8	24.7	2.0	0.9	40.7	23.3	100
1962	8.6	2.0	15.1	2.3	1.2	54.0	16.8	100
1963	7.2	2.9	16.4	0.7	0.7	55.0	17.0	100
1964	7.3	2.0	8.5	2.7	0.8	61.8	16.9	100
1965	5.9	2.2	9.5	3.0	0.7	62.2	16.5	100
1966	5.9	1.7	9.8	4.6	1.3	60.5	16.2	100
1967	5.6	1.7	6.6	6.3	0.3	61.2	18.1	100
1968	4.8	1.7	0.3	36.0	0.3	40.3	16.8	100
1969	4.9	1.4	0.5	44.0	0.3	31.8	17.0	100
1970	6.5	1.4	0.4	43.4	0.5	30.5	17.3	100
1971	4.9	2.0	1.0	22.8	0.8	39.3	29.2	100
1972	5.3	1.6	0.6	26.2	0.7	43.1	22.6	100
1973	5.7	1.4	2.0	21.5	0.4	42.5	26.4	100
1974	11.8	1.7	2.2	26.9	0.8	33.4	23.2	100
1975	19.2	6.2	1.9	18.4	1.1	35.7	21.0	100
1976	17.2	2.1	2.5	16.5	5.3	33.3	23.1	100
1977	10.0	2.6	2.6	13.5	10.1	36.0	25.1	100
1978	8.1	2.4	1.9	10.5	6.8	45.1	25.1	100
1979	7.1	2.4	2.1	19.1	4.3	41.1	23.9	100
1980	9.4	3.7	1.5	14.9	4.2	39.0	27.3	100
1981	7.1	3.2	1.3	9.1	3.0	44.2	32.2	100

Sources: (a) Twenty Years of Central Banking - Nigeria.

(b) Economic and Financial Review (CBN)

responses to attempts by the authorities to divert credits to the so-called productive sectors, particularly manufacturing. Over the period, the pattern of maturity of loans seems to have remained the same. In 1966, for instance, over 88 per cent of loans granted had a maturity of not more than one year. In 1979 the proportion was slightly higher, 90 per cent. At the same time over 67 per cent of loans were overdrafts and 29 per cent were repayable by specific instalments.

Another interesting change in the asset pattern was the increase in the proportion of assets devoted to investments[6] - this rose from only about 2.5 per cent in 1960 to 20.2 per cent in 1978.

At the individual bank's level, structural analysis of assets should indicate the efficiency of the bank's utilization of resources. Unfortunately, information on individual banks is incomplete. However, comparison of the ratio of loans and advances to deposits gives a partial indication of resource utilization (Table 5.6) - the higher the ratio, the more the bank can be said to be making resources available for use in generating returns. A discernible pattern from Table 5.6 is that the ratios of the three banks, the largest in the country, are lower than the smaller banks, particularly the so-called indigenous banks, National Bank, Bank of the North, Mercantile Bank, etc. It is believed in official circles that these ratios can be regarded as index of liberalization [Oyejide

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[6]Investments consist mainly of long term government securities and bank participations in corporate syndications.

and Soyode, 1975]. To the extent that they can be regarded as such, the big banks may be considered as less liberal in their portfolio of loans. However, this conclusion may not be justified because it overlooks the management function of the banks - the lower ratio may reflect the management perception of profitable banking opportunities, particularly since the banks are reputed to be more efficient in their portfolio management than the small banks [Olakanpo, 1963; Teriba, 1979]. Furthermore, it is conceivable that requirements on the big banks to hold higher level of reserves constrained the holding of higher levels of loans and advances in their portfolio. This latter reason is crucial if one accepts the arguments of Niehans [1978] that portfolio of deposits of big banks tends to be big and much more volatile than small banks, it is therefore only rational for them to hold a less than proportional portfolio of loans because of greater penalty from reserve deficiency.

5.4.4 Liabilities:

The Liabilities of the banking system have increased tremendously. Between 1960 and 1970, total liabilities increased from ₦ 238.5 million to ₦ 1,152 million, or by a little under 500 per cent. By 1978 total liabilities had increased to ₦ 9,105 million, an almost ten-fold increase on the 1970 figure. This dramatic growth has been accompanied by changes in the structure and growth of individual components. Deposits remained the most important component of banks' liabilities and have also grown dramatically over the period.

Table 5.6: Ratio of Loans and Advances to Deposit of Banks in Nigeria 1971 - 1880

Banks	1971	1972	1973	1974	1976	1977	1978	1980	Average
First Bank	0.35	0.48	0.43	0.53	-	0.35	0.45	0.52	0.44
Union Bank	0.41	0.45	0.38	0.36	0.42	0.52	0.80	0.57	0.49
U.B.A.	0.16	0.38	0.36	0.51	-	0.48	0.57	0.55	0.43
National Bank	0.87	0.87	0.90	0.69	-	0.29	0.35	-	0.66
Nigeria Arab Bank	0.45	0.59	0.49	0.44	-	0.47	0.40	0.31	0.45
Bank of the North	0.67	0.68	0.74	0.46	-	0.28	0.41	0.52	0.54
I.B.W.A.	0.80	0.70	0.79	0.60	-	0.58	-	0.59	0.67
Savannah Bank	-	0.68	0.71	0.48	-	0.47	-	1.06	0.68
Mercantile Bank	-	-	-	-	0.27	0.51	0.60	0.73	0.62
African Continental	-	-	-	-	0.26	0.65	0.73	0.67	0.58
Allied Bank	-	-	-	-	0.61	0.37	0.44	-	0.47

Source: Computed from various banks' Annual Reports.

Time and savings deposit have grown more than demand deposits. In 1960, demand deposits accounted for 60 per cent, whereas time and savings deposit accounted for 17.9 and 26.9 of total deposit liabilities respectively. However, by 1980 (June) the proportion of demand deposits declined to 43.9 per cent, whereas time and savings deposits increased to 38.2 and 17.9 per cent of total deposits respectively.

The fall in the relative proportion of demand deposits has a number of possible causes. One is the fact that the conditions for opening current accounts are more restrictive than for other accounts. Another is the inefficient communication system, which can reduce the flexibility of the chequing system with consequences for the job cf clearing by the banks. Furthermore, the extensive opening of rural banks has had the effect of increasing savings deposit collection centres. Time deposits have also been swollen because of the desire by the business community to optimize earnings from temporary surplus funds without jeopardizing their liquidity position. Time deposits have also remained a favourite means of holding funds waiting for repatriation due to the indigenization policy - the alternative investment outlets in the country are very limited.

5.4.5 Profitability, Dividends and other Performance Measures:

Very few of the Nigerian banks are publicly quoted, so it is very difficult to acquire information which can shed light on their operations. However, banking business has remained very lucrative

for investors over the period covered, particularly if the bank was well managed. The ratio of net profit to capital employed (Table 5.7) indicates that some of the selected firms performed fairly well during the period.

Table 5.7: Ratio of Net Profit before Tax to Capital[7] Employed for Selected Banks (in Percentages)

Banks	1974	1975	1976	1977	1978	1979	1980	1981	Average
First Bank	2.4	2.7	2.1	1.8	2.7	3.2	1.4	2.1	2.3
Union Bank	3.1	3.0	2.3	3.1	3.9	1.7	2.1	2.5	2.7
United Bank for Africa	3.7	2.2	2.3	2.6	3.2	2.9	2.5	1.7	1.6
African Continental Bank	N/A	2.7	2.7	3.7	3.1	1.4	0.2	0.5	2.0
National Bank of Nigeria	N/A	6.4	3.8	6.5	5.8	1.7	N/A	N/A	4.8

Sources: (i) Annual Reports of Banks.
(ii) Nigeria Company Handbook 1980 - 1983.

The average measure of performance of the big banks is not very dissimilar to the small banks (African Continental Bank and National Bank of Nigeria) although the information for these banks is less complete than the big banks. Due to the incompleteness of information, it cannot be said that the National Bank, with an average of 4.8 is better than the others. However, the overall picture can be described as fairly good. A similar picture emerges from Table 5.8, the ratio of net profit to share capital.

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[7]Capital Employed = Share Capital + Statutory Reserve + Profit and Loss Account + Deposits.
Or Shareholders' Fund + Deposits.

Table 5.8: Ratio of Net Profit to Paid Up Capital 1971 - 1980

Banks	1971	1972	1974	1978	1980	Average
First Bank	0.21	0.41	0.61	1.66	0.56	0.69
Union Bank	0.24	0.46	0.63	1.20	0.97	0.70
Unit Bank for Africa	0.21	0.36	0.78	1.74	1.43	0.90
National Bank	0.07	0.04	0.04	0.77	0.83	1.35
African Com. Bank	-	-	0.08	1.27	0.09	0.48
Nigerian Arab Bank	0.14	0.26	0.55	0.82	0.80	0.51
Bank of the North	0.14	0.37	0.24	1.14	1.42	0.66
Allied Bank	-	0.24	0.21	0.65	1.06	0.54
Coop Bank Ltd.	0.28	0.11	0.23	0.20	-	0.37
I.B.W.A.	0.01	0.11	0.55	0.96	1.32	0.59
Savannah Bank	0.39	0.67	0.59	1.00	0.69	0.62
Mercantile	-	0.01	0.24	0.04	-	0.09
Wema Bank	0.09	0.01	0.04	0.03	0.18	0.07

Sources: Computed from (i) Annual Reports of Banks for several years.

(ii) Nigeria Company Handbook 1980 - 1983.

Although, due to the invariance of share capital in the short-term, it is a poor measure of banks' performances. However, its relative availability enables one to make comparison over a longer period of time. Moreover, data on paid up capital is readily available for most of the banks.

Table 5.9: Ratio of Net Profit to Shareholders' Fund for Selected Firms in the Banking Industry and Other Sectors of the Economy (in Percentage)

Firms/sectors	1976	1977	1978	1979	1980	1981	Average
First Bank	60.8	55.9	66.8	63.0	31.2	35.8	53.3
Union Bank	55.2	64.7	62.4	34.0	43.0	57.4	52.9
United Bank	60.1	66.2	66.2	53.9	53.3	45.4	57.7
National Bank	33.7	34.5	68.8	52.9	59.8	21.5	45.2
A.C.B.	63.3	142.2	122.3	68.3	9.1	52.1	76.2
Nigerian Arab Bank	-	51.5	51.2	42.5	39.6	-	46.2
Savannah	-	64.2	58.8	55.9	35.7	22.4	46.4
Allied Bank	58.3	40.4	65.1	38.0	51.3	58.3	51.9
I.B.W.A.	75.0	77.3	82.3	61.9	68.2	61.6	71.1
/Total Average for the firms							55.7
Commercial Conglomerates							
Leventis	29.3	27.4	20.9	15.9	18.2	17.9	21.6
U.A.C.	57.8	51.5	40.5	18.9	22.9	28.2	36.6
P.Z.	0.3	-	27.6	11.3	20.4	22.2	16.4
/Total Average							24.9
Manufacturing							
Boots	86.0	58.1	31.0	26.2	26.1	0.2	37.9
N.B.L.	32.8	16.9	36.4	45.6	43.2	37.2	35.4
Levers	49.2	30.6	34.5	24.6	16.2	24.8	30.0
/Total Average							34.4
Oil							
Texaco	94.9	61.2	81.9	117.6	133.0	104.6	98.9
National Oil	14.1	70.9	54.2	48.3	58.5	60.5	51.1
Total Oil	93.1	50.5	75.8	101.5	89.9	95.2	84.3
/Total Average for the firms							78.1
Insurance							
Amicable	3.5	3.7	14.1	20.9	30.2	21.2	15.6
American International	27.6	2.2	1.5	2.5	1.9	1.6	6.2
Great Nigeria Inc.	21.3	28.7	18.6	27.8	19.7	-	23.2
/Total Average							15.0

Sources: Computed from (i) Annual Reports of Comapnies.
(ii) Nigeria Company Handbook [1980 - 1983].

In terms of comparability of performance with other sectors of the economy, Table 5.9 compares the ratio of net profit to Shareholders' funds of the banks with firms from four other sectors of the economy, conglomerates, manufacturing, oil and insurance. Apart from the oil sector, this measure indicates that with an average of 55.7 per cent, the banking firms outperformed the firms in the other sectors. Manufacturing firms come next to the banks, firms with an average of 34.4 per cent. Bearing in mind the fact that the manufacturing sector is about the fastest growing sector of the economy, then the significance of the banks' performance is clear.

The trend of dividends has varied from bank to bank. However, dividends have been constrained by a number of factors, among which is government policy with respect to dividend payouts. Especially relevant is the government ceiling on dividends and taxation of banks' earnings, which have acted to limit the growth of dividends over the years. Other factors, such as the reserve policies of the banks, had the same effect.

A comparison of the cream of the Nigerian banking industry with some of the world leaders confirms the optimistic statements made earlier about the profitability of banking in Nigeria, Table 5.10 compares the pre-tax earnings on assets, pre-tax earnings on capital, capital-asset and net interest earnings to asset ratios for the three leading banks in Nigeria with selected leading banks internationally. These indicators (in percentage terms) showed the

Table 5.10: Some International Comparison of Performance of Banks (1982) (In Percentages)

Nigerian Banks	Pre-Tax Earning/ Asset	Pre-Tax Earning/ Capital	Capital/ Assets	N.I./ Asset
285 United Bank for Africa	1.79	36.72	4.75	5.35
296 First Bank of Nigeria	1.50	29.72	4.82	5.95
306 Union Bank of Nigeria	2.26	55.55	4.05	5.11
British Banks				
6 Barclays Group (London)	0.91	19.68	4.68	3.61
7 National Westminster, London	0.89	18.39	4.68	3.05
14 Midland Bank, London	0.50	16.68	3.25	3.16
French				
3 Banque National De Paris	0.36	27.20	1.34	2.60
5 Credit Lyonnais, Paris	0.43	33.84	1.25	3.18
9 Societe Generale, Paris	0.29	17.94	1.56	0.21
Canada & USA				
30 Canadian Imperial Bank of Commerce	0.55	17.08	3.38	2.24
17 Royal Bank of Canada	0.38	17.54	2.00	0.86
1 Citicorp, New York	1.11	28.49	3.98	3.02
2 Bank America Corp, San Francisco	0.44	11.85	3.97	2.60
Japan				
12 Mitsubishi Bank	0.49	16.12	2.90	-
18 Bank of Tokyo	0.38	17.54	2.00	0.86
Other LDC s				
19 Banco do Brazil	2.48	34.66	7.50	7.7
83 Bank Leumi le Israel	1.06	55.61	1.98	1.31
89 Banco Central, Madrid	0.96	16.58	5.25	4.70
99 Rafidain, Baghdad	4.12	82.52	5.30	2.80
141 Korea Exchange Bank, Seoul	0.38	5.73	6.70	1.01
190 Banque National de Mexico	1.12	29.10	3.64	3.12

Source: The Banker [1982].

Nigerian banks performing favourable. For instance, their pre-tax earnings ratio was on average twice those of the leading banks, and the same is true of their pre-tax earnings on capital ratio. Their capital-asset ratio possessed the same structure as the leading British Banks. They also compared favourably with leading banks from other LDC's, except Banco do Brazil whose pre-tax Earning/ Asset and Net Interest/Asset is greater than that of the Nigerian Banks. It must be noted, however, that these indicators are not necessarily a guide to the quality of services in the whole industry, even though the three banks control about 50 per cent of the business in Nigeria. They do, however, indicate in a quantitative manner the profitability of banking business.

5.5 The Financial Market

5.5.1 Introduction

Several of the issues raised earlier have assumed implicitly the existence of a fairly well-developed market for financial claims and instruments. The existence of markets in these claims not only enhances their liquidity but also facilitates and improves their efficiency in the allocation of scarce financial and real resources.

Nigeria's financial market is of very recent vintage, and has yet to have any visible effect on the economic performance of the country. Trading in negotiable financial instruments and securities has remained restricted to a small proportion of the economy. The dichotomy between the formal and non-formal segments of the market has also contributed to the market's problems. Despite these difficulties, capital and money market institutions and instruments

in the market are gradually growing. In recent times, however, developments within the economy have inhibited the growth of the market, particularly in terms of diversification of instruments. For instance, the soaking of the economy with oil funds has retarded the growth of existing money market instruments and restricted the evolution of new ones. The same effect can be adduced to the influence of monetization of oil funds on the financial markets. Attempts to control these processes by the financial authorities often end in controls and regulations which inhibit the flexibility of the financial market.

5.5.2 Money Market:

The early 60's marked the beginning of the evolution of a money market in Nigeria. The development of money market institutions (apart from commercial banks) started at this time, which also witnessed the evolution of money market instruments, such as Treasury bills (1960) and call money funds (1962); with the encouragement of the CBN several other instruments were established later. The Bank also led the way in establishing discounting facilities for some types of credit such as produce advances and export credit. Later, the addition of the Treasury certificate (1968), Bankers' Unit Fund (1975) and Certificate of Deposit (CD) (1975) extended the options available to participating institutions. These and other actions of The Central Bank laid the foundation of the Nigerian money market.

The organization of the market has been determined from its inception by the short term funding requirement of the government. This has tended to give the market a loose form of organization. Its trading activity pivots mainly around the operations of the commercial banks and acceptance houses.[8] Probably because there are few finance houses in the country, their influence on the money market has been minimal up to date. The market consists of an interbank segment, which is particularly active in instruments such as bankers' unit funds, interbank balances and the call money funds (which have since been stopped). There is also trade in government short term fixed interest instruments, particularly treasury bills and treasury certificates.

The fact that the Financial Authority do not use open market operations techniques has reduced the discounting opportunities in the market. However, the growth and evolution of the money market by readily providing a domestic source of liquid asset to participating institutions, transformed the composition of their portfolios over the period of study. Before the advent of the money market, the only domestic source of liquidity to banks was the holding of cash assets. Occasionally the foreign banks had access to external securities' markets, but the same avenue was either not available or very expensive to the domestic banks.

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[8]All the acceptance houses are now merchant banks. They also act as discount houses in Nigeria.

Commercial banks have remained the most important holders of money market instruments. Between 1960 and 1980, they held on average 48 per cent of total money market issues (Table 5.11). Heavy involvement of government has also had a great influence on the activity of the market. To a large extent the rate of activity on the market can be said to have been determined by government financial needs. At the same time the Central Bank has acted as a buffer to government issues on the market. In terms of total holdings of money market instruments, the Central Bank has been second to the commercial banks - its holdings have reflected monetary and financial policy objectives as well as the pressure of government issues as explained above. In recent times the merchant banks have increased in importance within the market, particularly in terms of holdings of treasury certificates and treasury bills. It is noted in Table 5.11 that the others accounted for an average of about 16 per cent; this category consists mainly of savings institutions and finance firms.

Over the latter period covered by the analysis [i.e. 1972-1980], the Nigerian money market has contributed immensely to easing the problem of short term illiquidity in the portfolios of the banking system. Despite this contribution, however, there is still much room for further growth of the market, both in terms of its size and of the number of instruments traded.

Table 5.11: Holdings of Money Market Instruments.
Monthly Average in ₦ Million.

1971	TB	TC	BUF	CP	CD [9]	Total	% Total
Central Bank	149.5	4.0	-	-	-	153.5	17.7
Commercial Banks	197.8	221.2	-	-	-	419.0	48.4
Call Money Fund	10.4	-	-	-	-	10.4	1.2
Acceptance Houses	-	3.5	-	-	-	3.5	0.4
Governments	135.2	23.4	-	-	-	158.6	18.4
Others	118.4	2.2	-	-	-	120.6	13.9
Total Outstanding	611.3	254.3	-	-	-	865.6	100.0
1978							
Central Bank	216.5	668.4	-	-	-	884.5	31.4
Commerical Banks	479.5	664.2	175.4	29.5	50.5	1399.1	49.6
Merchant Banks	21.5	2.7	14.1	6.2	6.4	50.9	1.8
Governments	34.2	-	-	-	-	34.2	1.2
Others	405.6	48.0	3.6	-	-	457.2	16.2
Total Outstanding	1157.3	1383.3	193.1	35.7	56.9	2826.3	100.0
1980							
Central Bank	8.6	1553.3	-	-	-	1561.9	30.6
Commercial Banks	1437.2	857.2	37.5	34.6	115.9	2482.4	48.7
Merchant Banks	48.7	15.4	2.1	3.1	7.6	76.9	1.6
Governments	41.5	-	-	-	-	41.5	0.8
Others	586.3	349.1	-	-	-	935.4	18.3
Total Outstanding	2119.0	2775.0	39.6	37.7	123.5	5098.1	100.0

Sources: (i) Annual Reports of The Central Bank, Nigeria.
(ii) Economic and Financial Review (CBN)

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[9] TB = Treasury Bill
TC = Treasury Certificates
BUF = Banker's Unit Fund
CP = Commercial Paper
CD = Certificate of Deposits

5.5.3 Capital/Security Market:

Before 1960, the market for securities in Nigeria was almost non-existent except for few holdings of colonial government stocks, and there was no active trading in securities.

The establishment of the Lagos Stock Exchange laid the formal foundation for trading in securities in Nigeria, and also marked the formal beginning of the Nigerian Capital market. Unlike most capital markets, which evolved out of the private sector's desire for an organized arrangement for transactions in long term funds and instruments, the Nigerian market was promoted and organized through public policy. It was the Central Government, acting through the Central Bank, that prompted the establishment of the Stock Exchange. The Control and Organization were therefore from the start placed in the hands of the Central Bank.

Like the money market, the Central Bank has contributed immensely to the growth of the Capital market in Nigeria. Its contribution has been important, particularly through its function in setting rules and procedures for the organization of the market and by creating a congenial atmosphere for the growth of the market. At the initial stage the Central Bank also provided the support needed for participating institutions. Although, the regulation and control of institutions and activities in the capital market have now passed on to the Capital Issues and Exchange Commission, the Central Bank's influence on the market is still very important.

Although twenty years old, the Nigeria capital market is still in its infancy, both in terms of its size and its contribution to channelling funds within the system. No fixed organization or pattern has emerged in the market. In fact, there is virtually no information on the informal aspects of the market. The operations of the formal market pivot around the Nigerian Stock Exchange and the few participating members and institutions.

Trading on the Nigerian Stock Exchange can be separated into two main categories, fixed interest securities and shares. The issue of fixed interest securities is dominated by Government issues. These issues are bought by financial institutions as part of their portfolio. In holdings of government securities, particularly development stocks, the savings institutions have been dominant (see Table 5.12) over the period with about 50 per cent of total holdings. The other major holder has been the Central Bank. The Commercial Banks have been relatively less important in the stock market than in the money market, although their importance seems to be increasing over the years. In addition, the size of the savings institutions' holding does not indicate their intra-marginal importance, especially in terms of the influence of their action on the rest of the market. The bulk of the institutions buy stocks to hold, this is in addition to holding cf government stocks being obligatory on some type of savings institutions, particularly the Pension Funds. From Table 5.12 for instance, the relative

Table 5.12: Holdings of Development Stocks (Percentages)

	1965	1970	1975	1978	1980	1965/80 Relative Dispersion
Central Bank	27.66	25.37	26.61	39.46	45.08	27.04
Commercial Banks	0.82	2.41	7.25	6.53	17.10	93.10
Individuals	0.39	0.23	0.19	0.08	0.08	65.98
Insurance Firms	1.62	3.25	2.87	3.15	2.68	23.95
State & Local Governments	4.91	6.28	0.35	0.18	0.11	125.50
Savings-type Institutions	51.74	55.69	36.97	30.95	27.55	30.88
Statutory Corporations	10.92	4.65	0.95	0.42	0.41	130.26
Merchant Banks	-	-	-	0.42	0.05	NC[10]
Other Corporations	0.86	-	0.76	0.56	0.26	NC
Federal Governments	-	2.12	17.96	-	5.92	NC
Agric. Credit Scheme	-	-	-	0.41	0.76	NC
Miscellaneous	-	-	4.24	18.23	-	NC
Total	100.00	100.00	100.00	100.00	100.00	100.00

Sources: (i) Central Bank of Nigeria's Annual Reports.

(ii) Economic and Financial Review (CBN). Several Years.

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[10] NC stands for not calculated because of insufficient data.

measure of dispersion[11] showed the portfolio of these institutions to be only one third as active as that of the commercial banks (30.00 per cent to 93.19 per cent).

The primary market for bonds has grown in absolute terms over the years, from about ₦ 60 million in 1970/71 to about ₦ 450 million in 1977/78. The dominance of government stock in the primary issues market is overwehlming. In 1971, for instance, there were three issues by the public sector worth about ₦ 60 million, compared with 5 private sector issues worth about ₦ 27 million and this public sector proportion of about 70 per cent was the minimum for the decade.

The dominance of the market by government stocks is also carried over into the secondary market for securities. On the Stock Exchange the total value of transactions was ₦ 4.4 million in 1961/62 of which corporate stocks accounted for only ₦ 0.3 million, that is only 6.8 per cent of total value of transactions. As Table 5.13 indicates, the total value of transaction has increased over time but the structural imbalance remains the same. The proportional value of government securities is not, however, indicative of the structure of listings and markings on the exchange.

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[11] Relative dispersion $= \frac{\text{Absolute Dispersion}}{\text{Average}}$

$=$ Coefficient of variation

Table 5.13: Trading Activities on the Exchange 1961 - 1980.

Period	Value of Transactions (₦ Million)			Markings (Nos.)		
	Total	Govt. Stocks	Corporate	Total	Govt.	Corporate
1961/62	4.4	4.1	0.3	-b	-	-
1962/63	8.5	7.9	0.6	-	-	-
1963/64	12.5	11.5	1.0	-	-	-
1964/65	16.1	13.7	2.5	-	-	-
1965/66	16.8	15.7	1.1	-	-	-
1966/67	14.2	11.7	0.7	-	-	-
1967/68	12.9	12.6	0.3	-	-	-
1968/69	17.4	17.3	0.1	-	-	-
1969/70	15.9	15.7	0.2	688	290	348
1970/71	33.6	30.5	3.1	884	244	640
1971/72	28.0	26.7	1.3	906	233	673
1972/73	36.8	36.1	0.7	859	289	570
1973/74	100.6	99.3	1.3	2243	273	1970
1974/75	64.2	63.7	0.5	1456	174	1282
1975/76	81.4	80.6	0.8	904	294	610
1976/77	156.1	153.8	2.3	1633	337	1296
1977/78	229.7	226.7	3.0	2171	257	1912
1978/79	145.5	143.5	2.0	2851	145	2706
1980[a]	522.8	512.0	10.8	8165	263	7902
1981						

a
15 months total, due to change in accounting year.

b
Not available.

Source: Nigeria Stock Exchange Annual Reports.

At the end of 1978 for instance, out of a total of 197 listed securities, 60 were corporate and 47 were government securities. The proportion of corporate securities was even higher in 1980, 1981 and 1982 as indicated in Table 5.14. If also the level of activity in both types of securities is compared (Table 5.13 and Table 5.14), it emerges that the number of markings and transactions is higher in corporate stocks, though this is not reflected in value terms.

The low level (judged by the relative proportions of values) of activity in corporate securities and the dominance by government securities is explained by a number of factors, among which are

(i) the disparity between the potential size of the market and the active size of the capital market - this is explained by the habit of Nigerians in buying stocks to hold and lack of speculation even when the opportunity can be profitable;

(ii) the substantial involvement of institutional investors thus reducing the number and size of securities that are available for daily transactions;

(iii) the rules and regulations of the Stock Exchange which are alleged to be very restrictive for the stage of development of the capital market, and which therefore tend to deter some corporate firms from utilizing the Exchange.

Table 5.14: Nigeria Issue Market 1970-80

	Number of Issues at the End of Year			Number of Listed Securities			Quoted Companies	Cumulative Value of Shares (₦ Millions)
	Govt.	Corporate	Total	Govt.	Corporate	Total	Total	
1970	11	15	26	30	19	49	12	15.7
1971	12	19	31	32	24	56	18	59.4
1972	13	25	38	34	31	65	28	69.2
1973	15	28	43	38	40	78	28	83.4
1974	16	39	55	40	44	84	28	98.2
1975	17	39	56	42	44	86	38	99.6
1976	19	41	60	44	48	92	41	109.1
1977	21	48	69	46	54	100	42	164.8
1978	22	54	76	47	60	197	48	173.4
1979	-	-	-	-	-	-	-	-
1980	-	-	-	50	107	157	90	285.7
1981	-	-	-	52	107	159	93	391.3
1982	13	1	12	57	111	168	93	441.0

Sources: (i) Daily listings Nigerian Stock Exchange.
(ii) Nigerian Stock Exchange Annual Reports.
(iii) Okigbo (1981).

CHAPTER SIX

NIGERIAN BANKING SYSTEM: PORTFOLIO BEHAVIOUR AND DECISION FRAMEWORK

6.1 Introduction and Balance Sheet Decision Framework

The portfolio behaviour of banks is constrained at any point in time by the balance sheet identity, thus all portfolio allocations are made subject to the overall balance sheet. In this section we are concerned with providing explanations for the items which constitute the portfolios of the commercial banks in Nigeria.

Following the approach outlined in Chapter Four, we first assume that banks do not make decisions simultaneously[1] with respect to the allocation of their funds. Our explanation is therefore based on the assumption that certain portfolio decisions are made only with prior knowledge of that and that funds have been pre-empted for other portfolio items, i.e. banks employ a hierarchical pattern of decision-making. The more general pattern of this work is therefore to assume that banking firms' portfolio behaviour reflects this sequential decision-making process.

First, we present a consolidated balance sheet of the Nigerian banking system, and also discuss some of the notations to be used in the analysis (Table 6.1). The total set of portfolio terms of the

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[1]This will not prevent us from testing the appropriateness of this methodology. In fact, model I will do this indirectly.

system are defined as

$$STP = CP + NCP$$

where STP is the set of all portfolio items

CP is choice portfolio items

NCP is non-choice portfolio items

i.e. those items that belong to the choice set (or the endogenous items) plus those that belong to the non-choice (or oxogenous items). Further, required reserves are denoted as R; net domestic assets as NDA; net foreign assets as NFA; and secondary or supplementary reserves as SR.

The total funds available to the banking system comprise three main components - deposit liabilities, capital plus reserves, and any other net liability. These funds after deducting exogenous items, can be regarded as the loanable funds of the system. The exogenous items comprise prior claims that are determined by the non-bank private sector, PC, and the reserve requirements imposed by the financial authority, i.e.

$$\text{Exogenous item (EX)} = PC + R$$

In principle, banks' decision problems concern the determination of the relative shares of items in the choice portfolio (CP).

The sequential decision process assumed earlier implies an allocation process where the first level of the decision-making process of the banking firm indicates where a choice is made between broad categories of assets and liabilities without recourse simultaneously to determination of the whole portfolio in detail. The

Table 6.1: Consolidated Balance Sheet of the Nigerian Banking System

Vault Cash (C)	Capital plus Reserves (CRS)
Balances with Central Bank (BCB)	Deposits - Demand (DD)
Money at Call in Nigeria (MCD)	Time (TD)
Money at Call Outside Nigeria (MCA)	Savings (SD)
Balances with Call Fund (BDF)	Balance Held for Other Banks in Nigeria (BHD)
Balances with Other Banks Abroad (BWA)	Balance Held for Other Banks Outside Nigeria (BHA)
Balances with Offices and Branches in Nigeria (BWOA)	Borrowings from Banks in Nigeria (BRD)
Balances with Other Banks in Nigeria (BWD)	Borrowings from Banks Abroad (BRA)
Loans and Advances to Other Banks in Nigeria (LADB)	Certificate of Deposits (CD)
Loans and Advances to Subsd. Banks in Nigeria (LASBD)	Other Liabilities (OL)
(Loans to Government (LG))	
(Loans to and Advances to Private Sector (L))	
Total Loans and Advances to Customers (LA) = (L)+(LG)	
Holdings of Government Stocks (IG) = Ig	
Treasury Bills (TB)	
Treasury Certificates (TC)	
Bills Discounted in Nigeria (BDN)	
Bills Discounted Abroad (BDA)	
Investment Abroad (IA)	
Other Investment (OI)	
Stabilization Security (SS)	
Other Assets (OA)	

main criteria for allocation and choice of assets and liabilities at this stage are assumed to be liquidity and maturity. The banks' choices have to be consistent with the legal provisions regulating asset and liability holdings, such as primary and secondary reserve requirements.

This stage of allocation is therefore between the net portfolio of domestic liquid assets and liabilities and the less liquid portfolio of assets and liabilities.[2] Having made the overall allocations, banks are then concerned with the optimal distribution of items within each broad category.

This procedure differs from that previously adopted in the literature,[3] in which the first level of decision has been treated as the broad allocation of funds between the foreign (NFA) and net domestic items of portfolio (NDA). In this procedure the subsequent level also assumes optimal allocation to the different components of the broad category of portfolio. The main reason why we have not adopted this procedure is the institutional arrangements which prevail in Nigeria. Foreign exchange control precludes the banks from moving in and out of foreign portfolios, and (as will be argued later) it is even doubtful at present if the foreign portfolios of the banks can be treated as endogenous.[4]

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[2] Net domestic portfolio of liquid assets and liabilities is denoted as NDLP. The constituents after reserves have been satisfied are MCD, BCF, BWD, LADB, BHD, CD, TB, TC. The less liquid portfolio, LLQP consists of loans to private sector, other investments and Net foreign asset

[3] White [1975a, 1975b].

[4] Net Foreign Assets is dealt with later.

6.2 Exogenous Items of Portfolio Choice

6.2.1 Introduction

These are items that are determined independently of banks' portfolio considerations. They are usually held by banks because of the regulatory conditions imposed on the system or because they reflect demands of the private, non-banking economy. In this section, we examine these items for the Nigerian banking system and discuss them under (a) those that are determined by the monetary and financial authority, i.e. reserve requirements, and (b) those that are determined by the non-banking private sector economy, usually banks' deposit liabilities; although classifying items as exogenous may have some element of arbitrariness.

6.2.2 Reserve Requirements:

In LDC's like Nigeria legal reserve requirements have remained one of the most important means of affecting the behaviour of banks. Reserve requirements therefore offer one avenue for studying the impact of the financial authority on the banking system.

As was shown in the last chapter, legal reserve requirements came very late to the Nigerian banking scene as a legal form of control. These are organised in such a way as to enable the Central Bank to control banks' liquidity and influence their credit operations. There are three levels of reserve requirements; (i) the primary reserve requirement, which seeks to control the level of bank deposits in relation to the level of their cash balances; (ii) liquid asset reserves, which attempt to influence the asset composition of

the commercial banking system; (iii) supplementary reserves.

(i) Primary Reserve Requirement (PRR):

These are mainly cash held in bank vaults (C) and balances held with the Central Bank (BCB). From the CBN perspective PRR have been a very useful instrument, especially when automatic adjustments in bank liquidity have been desired.

CBN is empowered to instruct the banks as to the amount of desired balances to be held against their total deposit liabilities, and in applying the cash ratio, CBN is permitted to adopt a discriminatory approach - banks are differentiated according to the size of their deposit liabilities. It is believed that this avoids the problem of a uniform ratio either becoming too high for the small banks, and therefore making them illiquid, or too low to have the desired effect on the more liquid and larger banks. For instance, at the end of 1981, the requirements, for the four categories of banks were as follows:-

	Banks	Percentage Required
A	With deposits of ₦ 300 million and above	5
B	Deposits of ₦ 100 - ₦ 300 million	4
C	Deposits of ₦ 30 - ₦ 100 million	3
D	Less than ₦ 30 million	2

The financial authority has relied on changes in primary required reserves as a means of draining away excess liquidity from the banking sector.

(ii) Liquid Asset Reserves (LAR):

Provision is made for the Central Bank to require commercial banks to maintain some additional reserves over and above their legal minimum cash requirements. Apart from legal reserve requirements, commercial banks are required by law to hold a specified proportion of their portfolio of assets in liquid form. The calculation of the required liquid asset reserve of a commercial bank takes into account the sum total of short maturity and interest bearing assets in its portfolio.

The Central Bank is empowered to prescribe both the overall ratio and the composition of the liquid assets eligible for the computation of the liquidity ratio. The differences between the eligible assets are only marginal and reflect differences in yield and term to maturity. However, because they carry a different time profile, they are likely to impose different costs on the banks especially as the banks have the option of varying the composition of their holdings within the prescribed ratio. This introduces a measure of endogeneity into the choice of these variables. In the past the central bank has exercised its power over what can be included to exclude any holding of short-term foreign assets. As will be shown later, this policy has had the dual effect of making it impossible for the banks to use their foreign portfolio as a means

of adjustment and of increasing the use of domestic money market instruments for this purpose. Coupled with other policies, this has almost had the effect of separating the banks' domestic portfolio from their foreign portfolio management.

(iii) Supplementary Reserves (SRR):

The 1968 Central Bank Amendment Decree made provision for the Bank to require commercial banks to maintain, over and above the legal minimum, cash and/or liquid assets specified as supplementary reserves.

Two types of supplementary reserves are available to the commercial banking system - special deposits and stabilisation securities.

Special deposits are usually expressed as a percentage of the total deposit liabilities or of the increase in deposit liabilities. They can also be expressed as the equivalent of the absolute increase in such deposit liabilities.

In requiring special deposits, the authority employs the same discriminatory approach as in the case of primary reserve requirements. In 1976 for instance, special deposit requirements were stipulated as follows:

Class of Bank	Level of Deposit	Ratio of Cash Required
A	₦ 300 million and above	12.5
B	₦ 100 million or more, but less than ₦ 300 million	10.0
C	₦ 30 million or more, but less than ₦ 100 million	7.0
D	less than ₦ 30 million	5.0

This instrument has the advantage that the financial authority can vary its employment depending on the overall financial situation of the economy. At its own discretion, the Central Bank may pay interest on special deposits, and a rate which at its highest must be 1% below the Treasury bill rate. The object of this form of supplementary reserve is to influence the lending capacity of the banking system by freezing certain types of bank assets which normally serve as a buffer for loans and advances. It also tends to bring bank liquidity nearer to its minimum, thus preventing the banks from making good any cash loss by turning liquid assets into money.

The second type of supplementary reserve is the so-called stabilization security, which is slightly different from the special deposit. Stabilization securities consist mainly of central bank debt. They are issued at such rates of interest and under such conditions of sale, maturity, amortization, negotiability and redemption as the Central Bank deems appropriate. The bank can place any such security simply by allocation. Stabilization securities are not eligible for calculating the statutory liquidity ratio.

The Bank also possesses the power to levy fines against erring banks, and to prohibit such banks from extending new loans and advances or from undertaking new investments.

6.2.3 Deposit Liabilities:

Treating deposits as exogenous items in the portfolio of commercial banks in Nigeria is open to question. Arguments can be adduced to support the views that they should be treated either as endogenous or as exogenous, - which is appropriate can only be decided empirically. Exogeneity of deposits would imply that the volume of deposits is demand-determined. This assumes that commercial banks accept all the deposits offered to them. Examination of the Nigerian banking scene, suggests that this is probably true for some periods but may not be true for others. However, for the period covered by the analysis it is probably correct to assume exogeneity, except during some very short periods when the economy was saturated with funds as a result of monetisation of oil funds.

Despite the above points, deposits have remained a major source of funds to the banking system in Nigeria one which has grown tremendously in recent times. Also, as indicated in the previous chapter, changes in the individual components have shown considerable diversity.

The importance of deposits, particularly its different components, is in their effect on liability management of the banking system. In view of differences in the characteristics of yield of each of the components, it is necessary to examine whether aggregating them is not likely to obscure their differences and influence on portfolio of the systems. This is essential because both the explicit and implicit cost to the banks of acquiring deposits is likely to affect their portfolio behaviour. In a country where the sturcture of rates is, however, administered by the authority and where the responsiveness of the rates is questionable, it may not be surprising if the banks react to some implicit surrogate within the system as a measure of cost of holding some set of portfolio items rather than reacting to rates on deposits.

6.2.4 Other Exogenous Items

Other items that will be treated as exogenous in the analysis include other assets, i.e. other assets less other liabilities (NUB), which consist mainly of on the one hand, plant and equipment and on the other, items in transit respectively. To a large extent the latter are unclassified and are therefore best treated as exogenous. Similarly, the other asset term would not normally feature in short-term analysis as a choice variable for banks.

6.3 Portfolio Choice Items (CP)

6.3.1 Introduction

Portfolio choice items are those whose volumes and quantity are decision variables for the banks. In this section we examine choice between broad categories of variables, i.e. the first stage in the sequential fund allocation process.

As outlined earlier, in choosing either portfolios the banks are conscious both of their profit objective and their obligations. The profit objective creates the desire to hold a spectrum of assets at the longer end of the time scale with high opportunities for income, whereas the need to satisfy liquidity requirements extends portfolio configuration which must contain assets of some degree of liquidity. We therefore divide the asset portfolio into the net domestic liquid portfolio (NDLP) and the less liquid portfolio (LLQP).

6.3.2 Net Domestic Liquid Portfolio (Excess)

The excess in brackets indicates that this consists of excess over primary and liquid asset reserves (as well as supplementary reserves). We have defined primary reserves as vault cash and bank balances with the Central Bank, which consist, mainly of clearing accounts for settlement of transactions among banks that would not yield any interest. Banks will always attempt to minimise this balance. although they will be conscious of the penalty for overdrawing the account.

The different phases in the history of the Nigerian banking system have affected the banks' holdings of primary reserves, and also their holdings of excess reserve assets. These phases are the period before the creation of the Central Bank; the period when domestic money and financial instruments started to replace the holding of foreign securities, even though these foreign securities remained instruments for portfolio adjustment of the banks; and the latest period marked by the ineligibility of foreign securities coupled with a dearth of growth in domestic instruments.

The response of the banks to innovative opportunities of the market has been indicated by their holdings of primary assets. For instance, between 1950 and 1958, banks' holdings of primary assets were about 13.5% of the total assets of the banking system. In this period banks had to remain very liquid for lack of a domestic money market which could produce highly liquid instruments. Between 1958 and 1960, their holdings fell to 7.5%, and by 1962 had fallen further to 5.5%. This trend was arrested in the mid-70's when the financial authority stopped the issue of some money market instruments.

An important aspect of policy in Nigeria has been the differentiation of banks by size. It will therefore be interesting to explore the differential holding of excess reserves by the banks, since this may shed light on differences in their portfolio adjustment mechanisms. Apart from the size, policy and institutional explanations of the observed changes in holdings of excess primary reserve assets, changes in the structure of deposit holding may also

have had some influences - for instance, increases in the relative proportions of time and savings deposits. Although these can be costlier for the banks to acquire they tend to be less volatile than demand deposits.

Another important factor is the inter-bank money market, though the utilisation of this facility is constrained by communication problems in Nigeria. For the whole of the banking system, this item is supposed to drop out because balances with banks and net lending should add up to zero. However, this is not the case, for a number of reasons, including for example, float time for cheques already recorded in one bank but not received in the other. Moreover, banks do in fact use inter-bank balancecs to meet liquidity requirements. Banks which are short of funds may prefer to borrow from other banks rather than reduce their other asset holdings. The inter-bank rate therefore reflects the liquidity position of different banks within the system as well as the structure of rate regulation and industrial conditions within which banks operate. For instance, a tight liquidity position will tend to put a premium on rates.

6.3.3 Less Liquid Portfolio Items (LLQP)

Apart from the liquidity requirements, risk limitations, structure of liabilities and balance sheet conditions, the alternatives open to Nigerian banks in respect of their holdings of high income yielding and less liquid assets are further constrained by the narrowness of the market. The level of development of the market limits both the variety of portfolio instruments which are available and the

possibility of trading in those which do exist. As a result the existing securities are riskier than those in developed countries. A further restriction on the banks' choice of assets derives from the legal constraints placed upon them (as discussed in Chapter 3).

The main items in the broad allocation of the less liquid portfolio are: (i) loans and advances to the private sector of the economy; (ii) investments of the banks; and (iii) the net foreign assets held by the banking system.

(i) Loans and Advances (LA):

Loans and advances of the banking system comprise total loans and advances to the private sector of the economy and the public sector. In this analysis, however, we will treat loans and advances to the public sector as exogenous. This is mainly because institutional arrangements are such that banks will always accommodate the demands of the public sector for loans. Thus, only loans and advances to the private sector of the economy, L, (where $L = LA - LG$ and LG are loans and advances to the government) will be regarded as endogenous, and it is these which are discussed below.

Loans and advances have accounted for a significant proportion of the assets of commercial banks over the years covered by the analysis. They also constitute the single most important source of income. The major issue in Nigeria is whether the crucial influence on the banks' portfolio behaviour in respect of this item has been

the availability of funds to them, or whether it has been the interest income expected to accrue to them as a result of holding this form of asset. Other factors which impinge on the holdings of loans and advances are the reserve policies of the financial authority, and prudential requirement such as the gearing desired both by the banks themselves and by the authority.

The CBN's attempts to influence the sectoral allocation of bank loans by prescribing the proportion of banks' loan advances to each sector within the economy, which has been accompanied by a rate ceiling on loans, has also affected the overall quantity of loans and advances.

Over the periods covered loans have increased dramatically from £107.6 million in 1960 to over £3,000 million as of June 1980. Dramatic changes have also been recorded in their structure and composition. Loans and advances are, of course, not only important as the main source of income in the portfolios of the banks, but they are also important for policy makers as important sources of impulses from the financial sector to the private sector of the economy.

(ii) Investments

Banks' investments have been growing in recent times, and are becoming an important source of income. They act as a cushion between liquid assets and the less liquid assets such as loans and advances. Investments consist mainly of long-term government

securities, development stocks and some categories of debentures. Since Nigerian banking legislation prohibits banks from investing in corporate equities and real estate, bank investment is therefore predominantly government long-term fixed interest instruments. Restrictions of this sort have inhibited the growth of investments as a component of banks' portfolios.

Bank investments are useful to banks as a means of absorbing shocks especially in times of banks' excess liquidity or during the period of very low demand for loans. In recent times the growth of investments have been phenomenal, from 2.5 per cent of total banks' assets in 1960 to 11.5 per cent in 1977.

(iii) Net Foreign Assets (NFA)

The argument for this categorization is usually based on the extent of interdependence of domestic operations of commercial banks and their international operations. These arguments are further reinforced for open and small economies like Nigeria and the existence of powerful foreign banks, as argued in Chapter Three of this study.

However, our stand in this work is that the importance of this connection has been diminished by the policies of the monetary authority in recent times. Particularly important is the ability of banks to move in and out of foreign claims uninhibited by financial policy of the domain country. Various exchange regulations

of Nigerian government have precluded this. Coupled with this is the ineligibility of foreign securities for reserves, thus removing the ability to use these foreign portfolios as a source of portfolio adjustment.

However, despite these policies, the foreign portfolio of banks can still play a dominant role in terms of their external solvency. However, in very recent times the ability of the banks to directly influence or change both the volume and composition of their foreign portfolio seems to have been removed by foreign exchange regulations of the financial authority. This removes the net foreign assets of the banking system from the choice portfolio items.

It is still useful, however, to examine the influence of holding of foreign assets on the banks' portfolio behaviour, especially before the exclusion policies of the Financial Authority. The ability to hold and use foreign securities (mostly sterling denominated securities) was not only a relief in the earlier period of development, it was also an important means of making liquidity adjustments, particularly for banks with foreign connections. Its potential for giving the banks some leeway in adjusting their portfolios makes the study of the banks' foreign assets portfolios worthwhile, especially as it has implications for monetary and financial policy.

6.4 Rates and Rate Setting in Banks' Portfolio Behaviour

Finally, we examine briefly the influence of interest rates and rate setting on the portfolio behaviour of banks in Nigeria. Our model in Chapter 4 emphasised the importance of the vector of yields and interest rates on the banks' portfolios. It implicitly assumed that banks are responsive to changes in both the levels and structure of rates, the more so as these changes are often indicators of the available economic opportunities.

For a study of an LDC like Nigeria, the extent of controls and regulations over yields and interest rates poses problems concerning both the response of the banks and the measurement of the variables themselves, particularly if controls make nominal yields almost invariant, even in the face of inflation. The question then is whether these rates should cease to feature in the portfolio decisions of the banks?

In this study we shall generally assume that rates of interest will still have an important role to play, in addition to other variables in the allocation of banks' portfolios. The empirical analysis that follows should throw light on the relative roles of interest rates and other measures of the cost of funds on the allocation and adjustment process of banks within the system. However, given the extent of regulations, we will also examine the alternative possibility in our empirical analysis, i.e. that the stronger influence on the portfolio behaviour of banks in countries such as Nigeria may be the overall availability of funds in the economy.

CHAPTER SEVEN

ESTIMATION METHODOLOGY, SOME ECONOMETRIC ISSUES AND DATA COVERAGE

7.1 Estimation Procedure, Methodology and some Econometric Issues

The empirical estimation falls into two non-mutually exclusive parts, the first dealing with the static model derived in chapter four [the Tobin - Markowitz - Parkin framework] and the second, with the dynamic framework.

7.1.1 Model I - The Static Model:

Recalling equation 4.25, chapter four;

$$Z_1 = AX + BZ_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 7.1$$

where for n dimensionsl choice set and exogenous items in the balance sheet, Z_1 is an n component vector of choice set items, and Z_2 is an m component vector of exogenous items, X_t is also an n component vector of expected decision period returns on choice set items. A and B are respectively, nxn and nxm matrices of parameters. In terms of the balance sheet items discussed in chapter four, 7.1 is respecified as

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[1] Interpreting 7.1, as proportional asset holding is straightforward, where the sum of balance sheet assets can be represented as

$$\Sigma A_i$$

if this is used as the scale factor, then 7.1 becomes $Z^* = AX + BZ_2^*$, where $Z_i^* = Z_i/\Sigma A_i$

$$Z_1 = \begin{bmatrix} \text{NSR} \\ \text{TBCD} \\ \text{BD} \\ \text{OI} \\ \text{L} \end{bmatrix}^{2} \qquad X_t = \begin{bmatrix} \text{R2} \\ \text{TR} \\ \text{DR} \\ \text{B1} \\ \text{B2} \end{bmatrix}^{3}$$

$$Z_2 = \begin{bmatrix} \text{DD} \\ \text{CRS} \\ \text{NUB} \\ \text{NFA} \\ \text{SS1} \\ \text{LG} \\ \text{RR} \end{bmatrix}^{4} \qquad \ldots\ldots \quad 7.2$$

As in Parkin [1970], we can account for the influence of seasonality by incorporating seasonal dummies. An alternative procedure would have been to employ seasonally adjusted series in the estimation. However, as noted by Wallis and extensively discussed in Hendry & Mizon [1978], inappropriately applied seasonal adjustment procedures can create serial correlation and dynamic specification problems which may lead to inconsistent and inefficient estimates.

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2 This notation refers to the balance sheet items in chapter 6 NSR = Net secondary reserves, TBCD refers to excess holding of money market instruments, Treasury bills, and Certificates, bankers unit fund, and certificate of deposits.

3 R2 is deposit rate; TR, proxy for money market rates; DR, Banks' rediscount rate; B1 prime lending rate, and B2 in other advances rate.

4 SS1 = SD + TD - SS (the notations are from the balance sheet in chapter 6).

The dummy variable method of capturing the influence of seasonal factors on the financial variables was, therefore, preferred. Incorporating the dummies and writing 7.2 in its stochastic form, it becomes:

$$Z_1 = AX + BZ_2 + \gamma D + \underline{\xi}_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 7.3$$

where D is a K component vector of dummies

γ is n x k matrices of coefficients of the dummies

$\underline{\xi}_1$ is an n component vector of disturbance term assumed to possess a normal distribution with mean of zero and an unknown variance covariance matrix, $\underline{\Sigma}$.

7.3 is our estimable set of equations.

However, to estimate this system of equation, we need to take account of conditions imposed by the system and testable restriction imposed on the system. The conditions and restrictions are in terms of the parameter estimates of the structural equations, that is A, B and from 7.3. The first set of conditions are the results of balance sheet constraints on the banks. In terms of the parameters, this translates to

$$\begin{aligned} &(1) \quad i'A = 0' \\ &(2) \quad i'B = -1 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 7.4 \\ &(3) \quad i'\gamma = 0' \end{aligned}$$

where i is a vector of units.

7.4 is usually referred to as the adding up constraints.

The system is estimated such that the parameters conformed to these underlying balance sheet constraint. Further, the assumptions with respect to the utility of banks used to establish the underlying framework (the mean-variance framework) imposes a further constraint on the estimation procedure,[5] that is A is symmetric given the balance sheet condition, that is

$$i'A = O'.$$

In this study, the symmetry constraint is imposed and estimates are then compared with the general estimation without symmetry. This, we believe, is econometrically useful, because imposing symmetry is likely to increase estimation efficiency, especially in circumstances where multi-collinearity may be important.

To estimate the system, however, Zellner [1962] has suggested that if a model like system 7.3, has two or more regression equations, the disturbances from the equations are likely to be correlated. If, in addition, the model's equations share parameters, the proper procedure is the multivariate regression technique. This technique gives more efficient estimates than ordinary least squares procedure applied on separate equations. The procedure has also the advantage of allowing one to impose cross equation constraints in the estimation.

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[5] See Parkin [1970] and White [1975].

To apply this technique to our model, it is necessary to stack the equation system. We will, therefore, stack the system 7.3 in terms of data generated by the model. For the sake of convention, we let Y represent the vector of stacked left hand variables such that

$$Y = \begin{bmatrix} Y_1 \\ \vdots \\ Y_n \end{bmatrix} \quad \text{.....} \quad 7.5$$

$T_n \times 1$

X be the matrix of stacked right hand variables such that

$$X = \begin{bmatrix} X & O & \cdots & O & O \\ O & X & & \vdots & \vdots \\ \vdots & & \ddots & & \\ O & \cdots & & O & X \end{bmatrix} \quad \text{.....} 7.6$$

$T_n \times n(n + m + k)$

and ϵ be the vector of disturbance terms which can be expressed as:

$$\epsilon = \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \vdots \\ \epsilon_n \end{bmatrix} \quad \text{- - - - - - - - - - 7.7}$$

$T_n \times 1$

β, the vector of co-efficients is expressed as

$$\beta = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_n \end{bmatrix} \quad \text{. . . . . 7.8}$$

$n(n + m + K) * 1$

and the stacked equation is expressed as

$$Y = X\beta + \mathcal{E} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots 7.9$$

where Y is a $Tnx\underline{1}$ vector of dependent variables

$X = (I \otimes X)$ is a $Tn * n(n+m+k)$ matrix of explanatory variables

β is a $n(n+m+k) * \underline{1}$ vector of parameters and $\mathcal{E}$ is a $Tnx\underline{1}$ vector of disturbance terms.

In terms of data generated by the model, 7.5 - 7.8 may be stacked to produce the regression model 7.10 [where the notations of the dependent variables are the balance sheet framework notations of chapter 6].

$$\begin{bmatrix} NSR \\ \hline TBCD \\ \hline BD \\ \hline OI \\ \hline L \end{bmatrix} = \left[\begin{array}{c|c|c|c|c} (x_t' : \tilde{z}_1' : D') & 0\ 0\ 0 & 0\ 0\ 0 & 0\ 0\ 0 & 0\ 0\ 0 \\ \hline 0\ 0\ 0 & (x_t' : \tilde{z}_2' : D') & 0\ 0\ 0 & 0\ 0\ 0 & 0\ 0\ 0 \\ \hline 0\ 0\ 0 & 0\ 0\ 0 & (x_t' : \tilde{z}_3' : D') & 0\ 0\ 0 & 0\ 0\ 0 \\ \hline 0\ 0\ 0 & 0\ 0\ 0 & 0\ 0\ 0 & (x_t' : \tilde{z}_4' : D') & 0\ 0\ 0 \\ \hline 0\ 0\ 0 & 0\ 0\ 0 & 0\ 0\ 0 & 0\ 0\ 0 & (x_t' : \tilde{z}_5' : D') \end{array}\right] \begin{bmatrix} \underline{\beta}_1 \\ \underline{\beta}_2 \\ \underline{\beta}_3 \\ \underline{\beta}_4 \\ \underline{\beta}_5 \end{bmatrix} + \begin{bmatrix} \underline{\epsilon}_1 \\ \underline{\epsilon}_2 \\ \underline{\epsilon}_3 \\ \underline{\epsilon}_4 \\ \underline{\epsilon}_5 \end{bmatrix}^{6}$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 7.10$$

This multivariate system is then estimated subject to the set of conditions 7.4 and the symmetry constraints, which when collected can be expressed as

$$R\beta = r \qquad 7.11$$

Note: for 6 P.T.O.

Without this set of restrictions, the generalized least square (GLS) estimator of 7.9 is given as

$$\hat{\beta} = [X^T(\underline{\Sigma}^{-1} \otimes I)\ x\ ]^{-1} x^T(\underline{\Sigma}^{-1} \otimes I) \quad \ldots\ldots\ldots\ldots\ldots \quad 7.12$$

and the variance-coveriance matrix is given as

$$V(\hat{\beta}) = [X^T(\underline{\Sigma}^{-1} \otimes I)\ x\ ]^{-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad 7.16$$

It is straight forward to show (Theil, 1971, pp 303-310) that when the regressors are identical as in our case, that is $x_1 = x_2 = = \ldots. = X$ then 7.12 becomes

$\hat{\beta} = [\underline{\Sigma} \otimes (x^T x)^{-1}]\ \underline{\Sigma}^{-1} \otimes x^T Y$ and the variance-covariance matrix, 7.13 becomes

$$\underline{\Sigma} \otimes (x^T x)^{-1}$$

In this case therefore, OLS is the minimum variance, linear unbiased estimator. The balance sheet conditions are also satisfied applying OLS equation by equation.

However, our problem involves choosing the vector of parameter estimates subject to 7.4, such that the estimate of the sum of square of the disturbance, the sum of squares of the residual term is minimized. Doing this gives the constrained estimator[7]

$$\underline{\hat{\beta}}_R = \underline{\hat{\beta}} - \left[x^T \underline{\Omega}^{-1} x\right]^{-1} R^T \left[R(x^T \Omega^{-1} x)^{-1} R^T\right]^{-1} (R\hat{\beta} - r) \ldots\ldots\ldots 7.14$$

where $\Omega^{-1} = \underline{\Sigma}^{-1} \otimes I$

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[6] $(x^T : \hat{Z}_2^T : D^T)$ are rows of matrix of data generated by the model, where- as $\beta_1, \beta_2, \ldots \beta_5$ are column vector of parameters similarly the $\underline{\epsilon}_i$ are column vector of disturbance terms.

[7] See Goldberger (1961), Theil (1971) and Maddala 1976, appendix B for the derivation of this result.

and $\hat{\beta}$ is the unconstrained generalized least squares estimator of β in 7.12 above.

This estimator is the constrained version of the Zellner (1962) estimator. When all the equations contained the same set of regressors, ordinary least squares (OLS) applied equation by equation ensures that the adding up constraints would be satisfied. However, it can be shown that when no adding up constraint is imposed and Ω is known, then OLS is BLUE [Theil, 1971].

7.14 can be further expressed as

$$\hat{\underline{\beta}}_R = \hat{\underline{\beta}} - [\underline{\Sigma} \otimes (X^T X)^{-1}] R^T [R(\Sigma \otimes (X^T X)^{-1}) R^T] (R\hat{\beta} - r)^{8} \quad \ldots\ldots 7.15$$

thus removing the need to invert the variance-covariance matrix of disturbance terms in order to arrive at the parameter estimates. Nevertheless the elements of $\sum$ which are unknown have to be estimated. To achieve this it has been suggested [Zellner,1962],that a two stage estimation procedure should be carried out, the first in which the OLS estimate of $\underline{\Sigma}$ say $\hat{S}$ is derived, the final stage uses the OLS estimate, $\hat{S}$ as basis for deriving the final estimate of $\underline{\Sigma}$, say $\hat{\underline{\Sigma}}$.

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[8] This is straightforward derivation from 7.14

7.1.2 Model II - The Dynamic Model:

Recalling chapter four, the Tobin-Brainard model is described by the reduced form of the structural model equation 4.38, as

$$\Delta Z_{i,t} = \Psi\beta_o W_t + \Psi\beta_1 X_{it} W_t - \Psi Z_{i,t-1}$$

$$= (\Pi_o + \Pi_1 X_{it}) W_t - \Pi_2 Z_{i,t-1}^{9} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 7.15$$

We remember, however, that this model as presented in chapter four has been criticized by Friedman [1977] as being too restrictive in that it does not make allowance for the lower cost that is incurred in the allocation of new wealth compared to adjusting from existing assets. It is suggested that a more appropriate model should reflect the greater ease with which portfolio adjustments from new cash flow can take place. The empirical implementation of the resulting model [Friedman, p.676, 1977] is not free of problems associated with the Tobin-Brainard model.

A further criticism of the Tobin-Brainard model which was also touched upon by Friedman is the differentiation of anticipated short-term flows from unanticipated net flows. In both Friedman's work and Tobin-Brainard's, this distinction is not usually made. Whereas for empirical purposes Friedman lumped them together, the Tobin-Brainard were silent on the subject. In later developments, however, this issue has been taken up [Smith and Brainard, 1976].

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[9] This relation can also be expressed as

$$\Delta Z^*_{i,t} = \Pi_o + \Pi_1 X_{i,t} - \Pi_2 Z^*_{i,t-1}$$

where $Z^*_{i,t} = Z_{i,t}/W_t$

However, in this study, an attempt to incorporate some of these issues was vitiated by data limitation. The attempt to reflect the effects of unanticipated sources of net cash flow, was therefore only partial, although we believe that in principle it should be reflected when modelling the portfolio allocation of banks. The probable sources of shocks in the Nigerian situation of which we can take account are:

(i) the heavy reliance of the economy on earnings from oil and the spasmodic nature of income from the source.

(ii) the predominance of government sector activities relative to other sectors.

These factors are likely to cause divergences between the banks' planned portfolio and what is realized in practice.

An attempt is made to model these effects on the study by incorporating variables that represent the effect of government intervention on the portfolio of the banks. This type of variable includes among others the extent of public sector borrowings from the commercial banking system, measured by LG in the following analysis. Further, the effect of oil shocks is proxied by a dummy variable and attempt is also made to examine its influence on the availability of funds to the banks. When 7.15 is broadened to capture these other effects it can be expressed as:

$$\Delta Z_{i,t} = (\Pi_o + \Pi_1 \bar{X}_t) W_t - \Pi_2 Z_{i,t-1} + \gamma D_t + \beta_3 F_t + V_{it} \quad \ldots\ldots\ldots \quad 7.16$$

where γ and D are as defined earlier.

Ft represent the vector of predetermined portfolio variables (including those that impinge on the portfolio as a result of government activities).

β_3 is an nxt matrix of coefficients, and because of the balance sheet conditions

$$i'\beta_3 = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 7.17$$

Our major problem with 7.16 concerns estimation. However, before discussing these estimation problems we need to clarify certain issues. The first is the incorporation of net worth (measured by net available funds in this study) in the estimating equation. We are particularly concerned with whether all variables, including wealth, enter the estimating equation linearly, whether exogenously determined items should be aggregated and whether it is reasonable to assume that desired holdings of the various instruments are homogeneous of degree one in the exogenous items.

Generally, specification 7.15 or the alternative form in footnote 9 is the favoured formulation of the Tobin-Brainard approach. It assumes that asset demands are linearly homogeneous in wealth, the main inducements lying in convenience and tract-ability of the approach. Further, as shown in chapter 4, it is an implication of constant relative risk aversion and the asusmption of

joint normality in the assessments of asset returns. The homogeneity assumption implies that demand for an asset/liability increases proportionately to increases in the scale, that is the size of the portfolio.

The other alternative is for all the variables to enter 7.16 linearly, that is

$$\Delta Z_{i,t} = \Pi_o + \Pi_1 Z_t + \Pi_2 Z_{i,t-1} + \Pi_3 W_t + \gamma D_t + \beta_3 F_t + V_{i,t} \quad \ldots\ldots\ldots\ldots\ldots \quad 7.18$$

Empirical work is yet to cast light on which of the alternatives perform better. In most empirical studies, wealth (net wealth) is used as the scale variable in the demand for asset equation. The homogeneity assumption implicitly assumes that it is the only portfolio constraint imposed on the asset demand equations. In chapter 9 of this study, however, an attempt is made to compare the results of both formulations and to see which of the alternatives has greater explanatory power and a better fit of the data.

Since items of the balance sheet treated as prior claims during a particular stage in the decision making process may be held for different reasons and may possess different effects on demand, there may be justifications for including these items separately in the demand equation. If they have the same effect, then there exists justification for their aggregation as a single independent variable in the portfolio equation. However, the overriding justification for aggregation in this study as shown in chapter 9, is to reduce the

problem of multicollinearity, although independent influences are accommodated where they are very important.

In this part of the study, 7.16 is the final estimating equation. Each of the equations contains all the regressors, the use of OLS therefore ensures that the constraints on the model are satisfied.[10]

However, Smith and Brainard [1976][11] have suggested the use of a combination of Bayesian and classical econometric techniques for estimating the fully specified Tobin-Brainard model. The virtue of their suggestion lies in the out of sample performance of the estimates derived from their suggested procedure. The use of á priori information is believed preferable to simplification of structure or deletion of variables. To achieve their suggestion, the information set for the priors can be derived from a variety of sources such as cross-section studies, previous studies or even practical experience.

The Smith-Brainard method involves the specification of the prior means and variance-covariance matrix of parameters. This is then combined with the data by the use of the Theil-Goldberger mixed estimation technique.

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[10] See Gramlich and Kalchbrenner [1970] and Smith [1970]

[11] See further, Backusand Purvis [1980], Backus, Brainard, Smith and Tobin [1980].

Although the approach is appealing it presents two major difficulties which are insurmountable for us within a reasonable time limit. The first is the poor state of knowledge and the lack of development of the data base on the Nigerian financial system, which precludes the derivation of a very meaningful priors. The second is the availability of packages to handle efficiently the estimation problem posed by the technique.

Because of the sequential decision making process assumed in our analysis some of the estimation problems associated with the Tobin-Brainard model are reduced. For instance, the need for the entire list of relevant variables to appear in each equation is avoided, thus reducing the number of parameters to be estimated in each equation. The sequential nature also reduces the number of instruments to which funds are allocated at each stage of the decision making process, thus increasing the degrees of freedom for our empirical estimation. At the same time, the problem of multi-collinearity normally associated with the estimation of the model is reduced.

Finally here, we believe that by using the same empirical technique on Model II as on Model I, that is the stacking procedure, we shall arrive at comparable estimates of the two models. Moreover, the method has been shown to produce efficient estimates [Zellner, 1962].

7.2 Some Empirical Problems of Estimation

In this section we discuss briefly some empirical problems confronted in the process of estimating our model. These relate mainly to the treatment of some of the series. In particular, we intend to highlight the problems posed by the vector of rates and yields used in the analysis as well as the treatment of exchange rates and the price variables.

7.2.1 In general, the vector of rates should reflect the banks' expected holding period return and/or cost of instruments. Each should consist of the nominal interest rate and the expected capital gain or loss. In the case of foreign portfolio instruments, expected changes in the exchange rate must also be included. In this study, however, interest rates for most instruments are fixed by the Monetary Authority. The current rate of interest is therefore the appropriate rate to use in reflecting the returns of the banks. In order to meet the aggregation needs implied by Model II, however, it is necessary to use the weighted average of rates on the various items included within each broad category of portfolio items.

7.2.2 Foreign Yield and Exchange Rate:

The banks' external transactions are related to external rates and yields on their portfolio of assets. The interest rates on the foreign instrument holding of the banks must be adjusted for foreign exchange changes. If, over the period, the exchange rate is fixed this might not be necessary. There were, however, some fluctuations in the exchange rate over the period covered by our study. In these

circumstances, allocation of funds to their foreign portfolios by the banks would to some extent depend on their expectation of the future spot rate.

The yields from holding foreign instruments need, therefore, to be adjusted. For instance, if i_f is the yield on foreign instruments, then the adjusted yield will be (approximately)

$$i_f^* = i_f + \frac{S_t^e - S_t}{S_t} * 100 \quad \ldots\ldots\ldots \quad 7.19$$

where i_f is foreign interest rate (per cent)

S_t^e is the expected future value of the spot rate

S_t is the spot rate in terms of domestic currency.

Since expectations of the future spot rate are not observable, we need to formulate an expectation formation mechanism to capture the variable. One approach to achieving this objective is to assume that expectations of banking firms are rational. This assumes that they behave as if they have knowledge of the model that generates the actual outcomes - in other words they use all information that is available and interpret it accordingly. The rational expectation assumption is based on the assumptions that all available information is discounted and that foreign exchange markets are efficient.

Alternatively, the purchasing power parity theory of exchange rate could be used to forecast. This assumes that the expected exchange rate is dependent on the relative purchasing power of the

domestic and foreign currencies; that is

$$\left(\frac{S^{e}_{t} - S_{t}}{S_{t}}\right) = \frac{P_{dt} - P_{dt}}{P_{dt}} - \frac{P^{e}_{ft} - P_{ft}}{P_{ft}} \quad \ldots \quad 7.20$$

where P_{dt} is a measure of consumer prices prevailing in the domestic economy.

P^{e}_{dt} is the level of domestic prices expected to prevail next period.

P_{ft} is consumer prices prevailing in the foreign economy.

P^{e}_{ft} is the level of foreign prices expected to prevail in the next period.

There are a number of shortcomings of the purchasing power parity approach, particularly in terms of using it to forecast for our purpose. The most important to us is the basis of the model in a dynamic system like ours, which is very weak. Schadeler [1977] also discussed evidence which showed that movements in exchange rates generally exceed differences between the relative rates of inflation in the respective countries.

The question, therefore, is what is the conventional wisdom, or actual practice of banking firms in this respect. Evidence points to the fact that banks use a variety of forecasts which are produced by specialized firms in the field. However, whichever forecast a firm decides to use, it is invariably compared with or used in conjunction with the forward rate, that is the forward rate

is used as a forecast of the expected future spot rate. We, therefore, settle for the forward rate [f_t], because of its wider acceptability.

It is, however, not without problems but its ready availability to most banks and its known performance compared to other methods sufficiently outweighs the problems associated with forecasting with forward rates.

7.3 Nature, Source and Data Coverage

The data set required for this study is derived mainly from published reports of the Central Bank of Nigeria. They are based on legally required returns of commercial banks, and are therefore accurate to the extent that the banks comply to the rules regulating the making of their returns.

Annual reports of several of the Nigerian banks are also extensively consulted. These reports are especially relied upon where comparisons of bank characteristics are called for. The reports are therefore the sources for most illustrative graphs, tables and figures.

The econometric exercise, whose results appear in the next two chapters, are based on the quarterly series derived from CBN reports. These reports include among others, the Bank's Monthly Bulletin, Economic and Financial Review published quarterly, and

the Bank's Annual Report and Statement of Account. They are all for several years. The data set itself spans the period between 1959 fourth quarter to the last quarter of 1981. They are, therefore, strictly quarterly observations on the Nigerian banking system. Since they are mainly an aggregation of reports submitted to the Central Bank of Nigeria on specified forms conforming to the Bank's objectives, the series are likely to be influenced by why and when the reports are prepared. These may not coincide or synchronize with the planning or objectives of the individual banking firms. Needless to say, this may have implications for the results of this study.

Other sources were also consulted. The IMF International Financial Statistics, OECD Financial Trends and some Bank of England publications were consulted for U.S. interest rates. Some series are derived from various National Income Statistics published by the Nigeria Office of Statistics - these series are mainly price data and the index of industrial production. Further, rates on government stocks, especially quoted development stocks as well as treasury bills and certificates, are derived from the official list of the Nigeria Stock Exchange, the Daily Official List.

Finally, even though we settled for quarterly data, there are some reservations that need to be made here. The body of our model treats any real sector variable as essentially exogenous.

This approach is consistent with evidence that long lags occur between changes in the financial system and their effects in the real sector. However, for the model to be useful for a time horizon of more than one year, it is necessary to incorporate real sector feed-backs.

The data needs for doing this would, however, present problems for our use of quarterly data. Even though monthly or quarterly data present substantial advantages in estimation and use, especially with respect to estimation, reactions in financial markets are apt to be so rapid that the use of annual data may cause bias in estimates of dynamic structure. However, in terms of the real sector variables required for a feed-back effect it implies a greater degree of data mining. There is, therefore, a trade off between using a monthly or quarterly series, and a more aggregate series, an annual series.

7.3.1 Some Other Important Influences on Nigerian Financial Data:

It is instructive to observe some salient factors that may affect the nature and realization of the body of data used in this study. The first is the seasonal influence. This may be particularly strong for monthly and also for quarterly observations on the Nigerian banking system. The sources of seasonality on banking assets and liabilities can be various in Nigeria. Particularly important are the effects of the wage and salary payment system, the seasonal effects of religious festivals, and those emanating from the agri-cultural sector of the economy. The impulse from this sector is

particularly important (for bank deposits) due to the seasonal nature of most agricultural cash crops.

Other factors that are worth noting are the effects of political and economic factors on the realization of portfolio variables. Particularly important over the period of our study are the effects of the civil war, 1967-1969. It is questionable whether the effects of these political forces on the banks' portfolio behaviour can be eliminated.

Finally, it is worth noting the probable influences of various other governmental actions on our data. Particularly changes in the monetary and financial system, especially the decimalization of Nigeria currency and changes in exchange control regulations, and the various development plan periods are likely to influence the realization of bank data.

We hope as we shall investigate the following chapter that influence of these factors on the stability of our estimates is not drastic.

CHAPTER EIGHT

EMPIRICAL RESULTS I: THE STATIC ESTIMATION

8.1 Introduction

In this chapter we present the results of the static estimations. The first part presents an overview of the results. It presents the results of estimating the final equation discussed in the previous chapter without the imposition of the symmetry restrictions. Major findings of the study within this general framework are highlighted and discussed. Unlike the next chapter, the attempt to take account of the effect of the civil war on banks' allocations of funds to their choice portfolio proved relatively insignificant and the effects were therefore not separately discussed for the static model. In presenting the result of the section [the general framework where however, the balance sheet condition, particularly the additivity conditions, is satisfied], we undertook a differentiating test between the specification with or without the intercept term.

The second part presents the results of the model given that all the required restrictions are imposed, particularly the symmetry restriction as discussed in chapter four. In the light of the results of the test, the consequent results from the imposition were examined and compared with the results of the general framework, especially to see whether there have been significant improvements from the imposition of the restrictions. Further, in the two sections

the results discussed are the result of treating allocation to choice portfolio items as a proportional allocation [i.e. $\hat{Z} = Zi/\underline{\sum}Ai$, where $\underline{\sum}Ai$ is the sum of total assets]. The results of straight level estimation which are reported in the appendix [8B] are not discussed, since the proportional allocations did not suffer from the same heteroscedacity problems as the straight levels estimations.

8.2 Results of the General Framework

8.2.1 A Brief Overview:

The estimation involves a set of five choice portfolio items; NSR measures excess reserves holdings of banks; BD, bills discounted; OI, other investments; TBCD, net holdings of short term money market instruments; L, loans and advances to private sector economy. For the proportional representation, these terms are differentiated by a hat [in other words, $\hat{NSR} = NSR/\underline{\sum}A$ etc].

The results are based on estimates of specified equations for quarterly data for the period 1959 IV to 1981 IV.

8.2.2 A Brief Descriptive Insight into Variables of the Analysis:

Before presenting the main results it is useful to examine some descriptive statistics that should help in casting more light on the results that follow. Tables 8.1 and 8.2 indicate the mean, standard deviation and the relative measure of dispersion for all the variables and interest rates used in the static analysis. The relative measure of dispersion would help in indicating the extent of

Table 8.1 Some Descriptive Statistics of Important Portfolio and Balance Sheet Items.

Variables Variables	Means $(\bar{x})^a$	Standard Deviation (SD)[b]	Relative Dispersion $(SD/\bar{x})$
$\hat{NSR}$	0.029	0.014	0.48
$\hat{TBCD}$	0.172	0.136	0.79
$\hat{BD}$	0.022	0.033	1.50
$\hat{OI}$	0.017	0.016	0.94
$\hat{L}$	0.383	0.068	0.18
$\hat{ND}$	0.289	0.053	0.18
$\hat{SSI}$	0.301	0.038	0.13
$\hat{CRS}$	0.056	0.023	0.41
$\hat{NUB}$	-0.068	0.074	-1.09
$\hat{LG}$	0.007	0.004	0.57
$\hat{RR}$	0.071	0.054	0.76
$\hat{NFA}$	0.015	0.041	2.73

[a] The means are balance sheet average over the period of our analysis.

[b] Whereas the standard deviation is independent of the dimension of the items, the relative measure of dispersion is not.

Table 8.2 Some Descriptive Statistics of Important Interest Rates Variables.

Variables	Means (% Averages) [a]	Standard Deviation (SD)[b]	Relative Dispersion $(SD/\bar{x})$
R2	3.68	0.931	0.25
TR	4.07	0.611	0.15
DR	4.64	0.672	0.14
B1	7.07	0.652	0.09
B2	8.46	1.078	0.13

[a] As in Table 8.1
[b] As in Table 8.1

volatility of some of our portfolio variables. For instance, out of all the choice portfolio items it is indicated that the most volatile were $\widehat{BD}$ and $\widehat{OI}$, whereas loans and advances to the private sector economy was relatively less volatile over the period which may be indicative of the cautious nature of banks' attitude towards this portfolio. Furthermore, the average size of this portfolio item relative to other portfolio items may partly explain its stability over the period.

Similarly, on the explanatory variables the most active item appears to be $\widehat{NFA}$ which was changing over at an incredible rate of 173 per cent, which may be explained by the average size of the balance sheet item which was very low (0.015). The $\widehat{NFA}$ was followed by $\widehat{NUB}$ with 109 per cent and the required reserves with only 76 per cent. Comparing the volatility of the interest earning deposit source of funds, SS¶ and non-interest earning source, $\widehat{ND}$ seems to confirm the popular belief in LDCs that there exist little or no difference in terms of volatility, 13 per cent compared to 18 per cent for $\widehat{ND}$. Finally, the interest rate variables were relatively non-active, the highest, R2 being 25 per cent. The picture conveyed by these statistics are also confirmed by figures 8.1 to 8.2C which compare the important portfolio variables over the period of our analysis, in addition to figure 8.3 which also illustrates the movements in the interest variables over the same period of time.

Figure 8.1: Portfolio Choice Items.

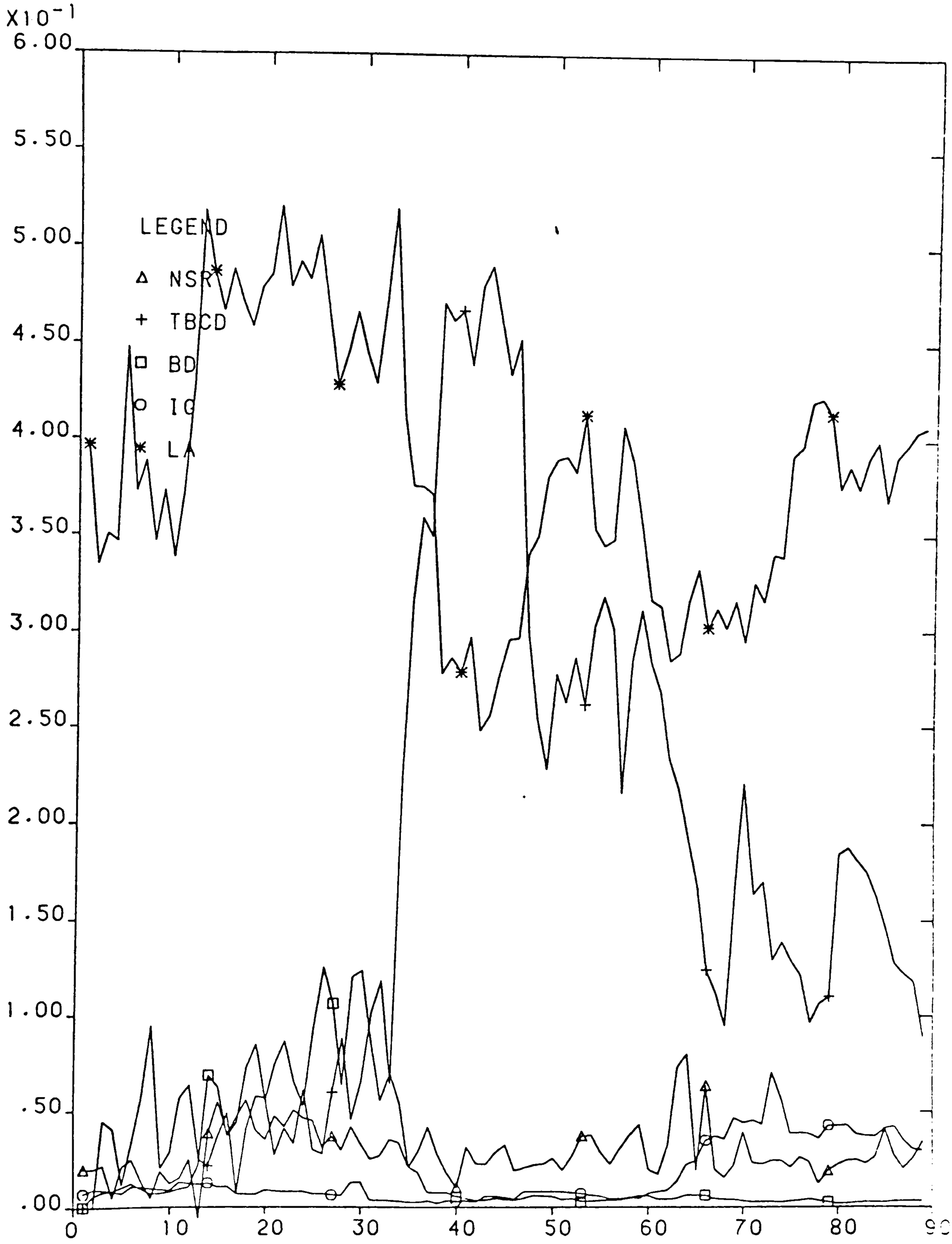


Figure 8.2A: Non-Choice Portfolio Items

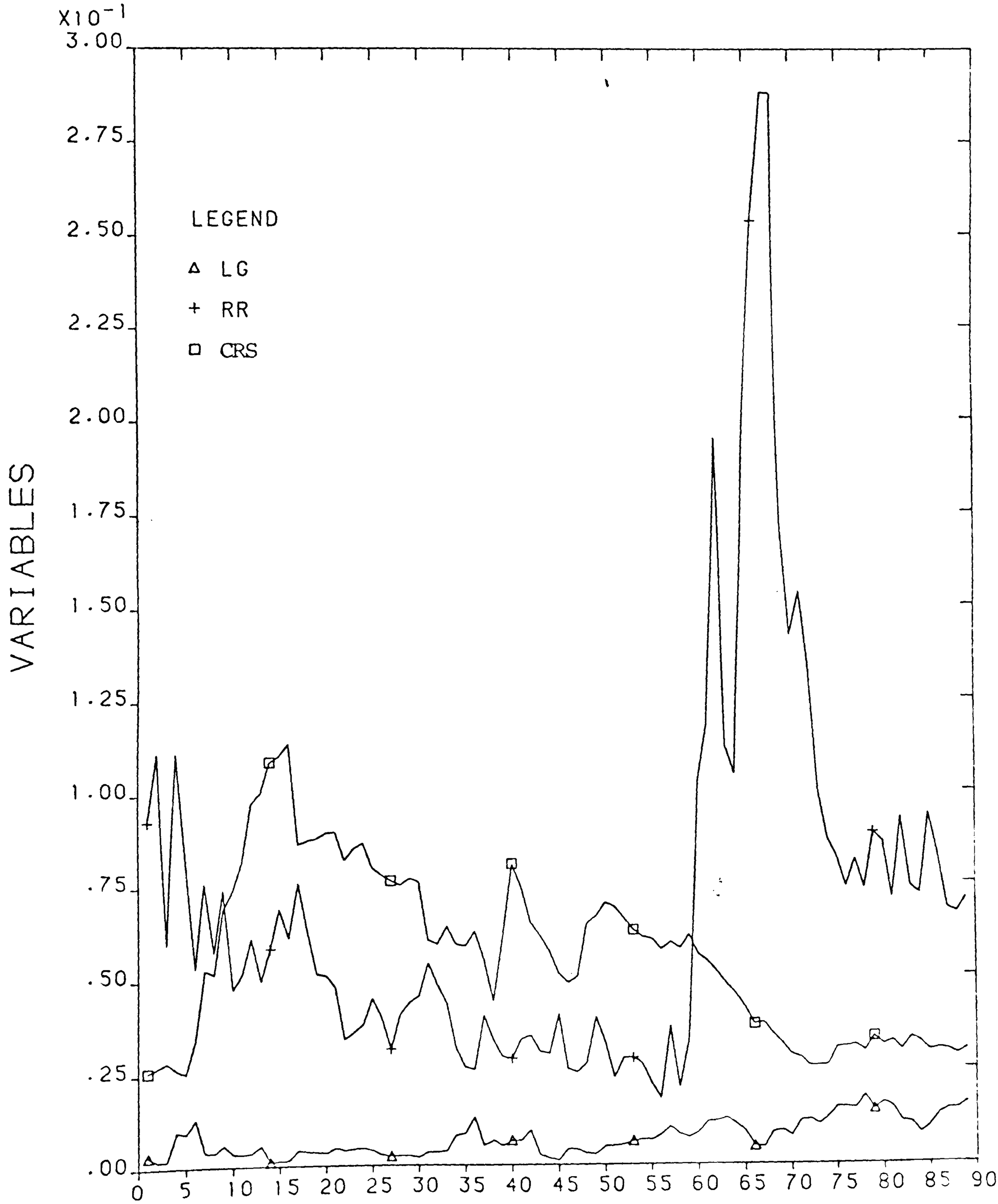


Figure 8.2B: Non-Choice Portfolio Items.

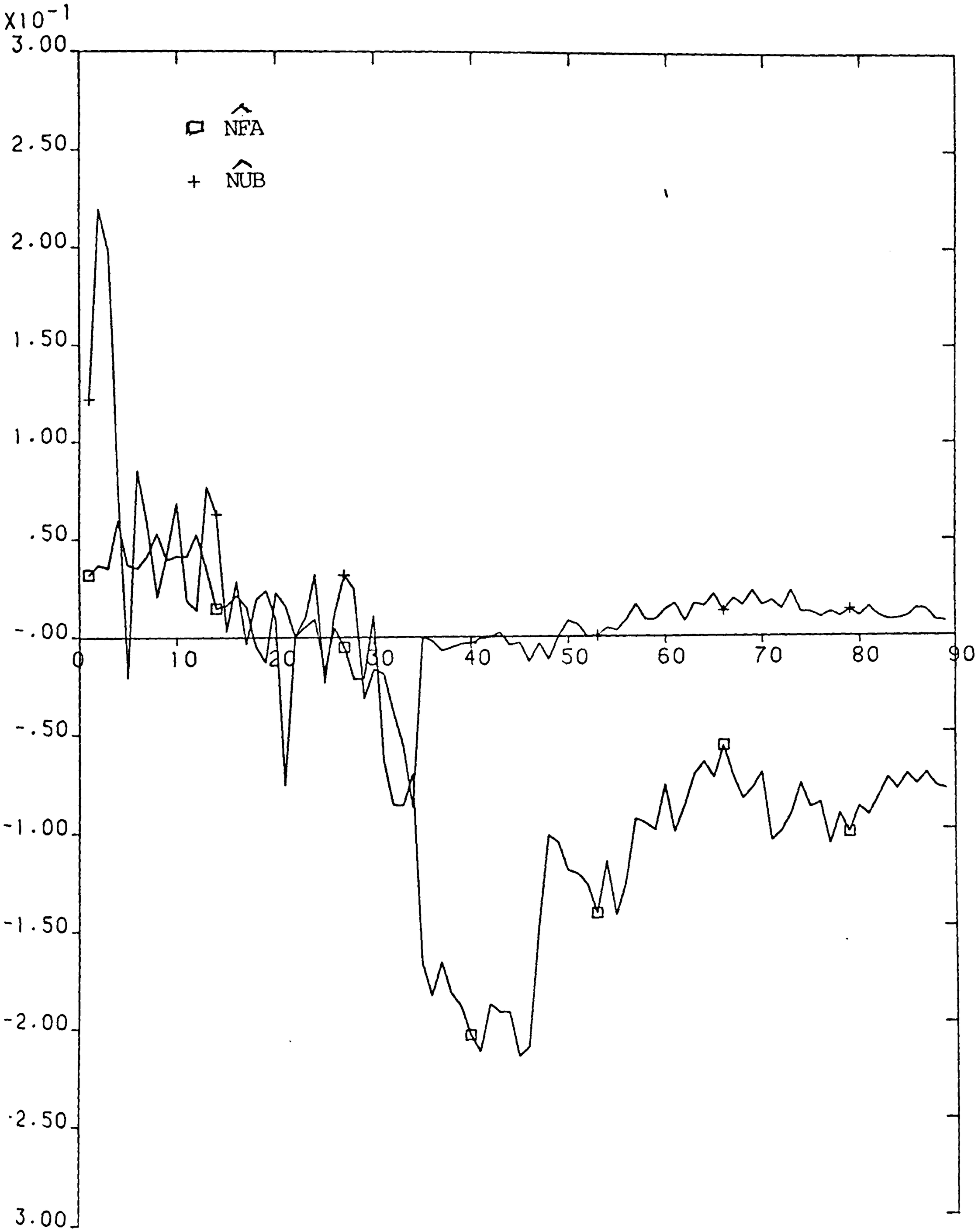


Figure 8.2C: Non-Choice Portfolio Items.

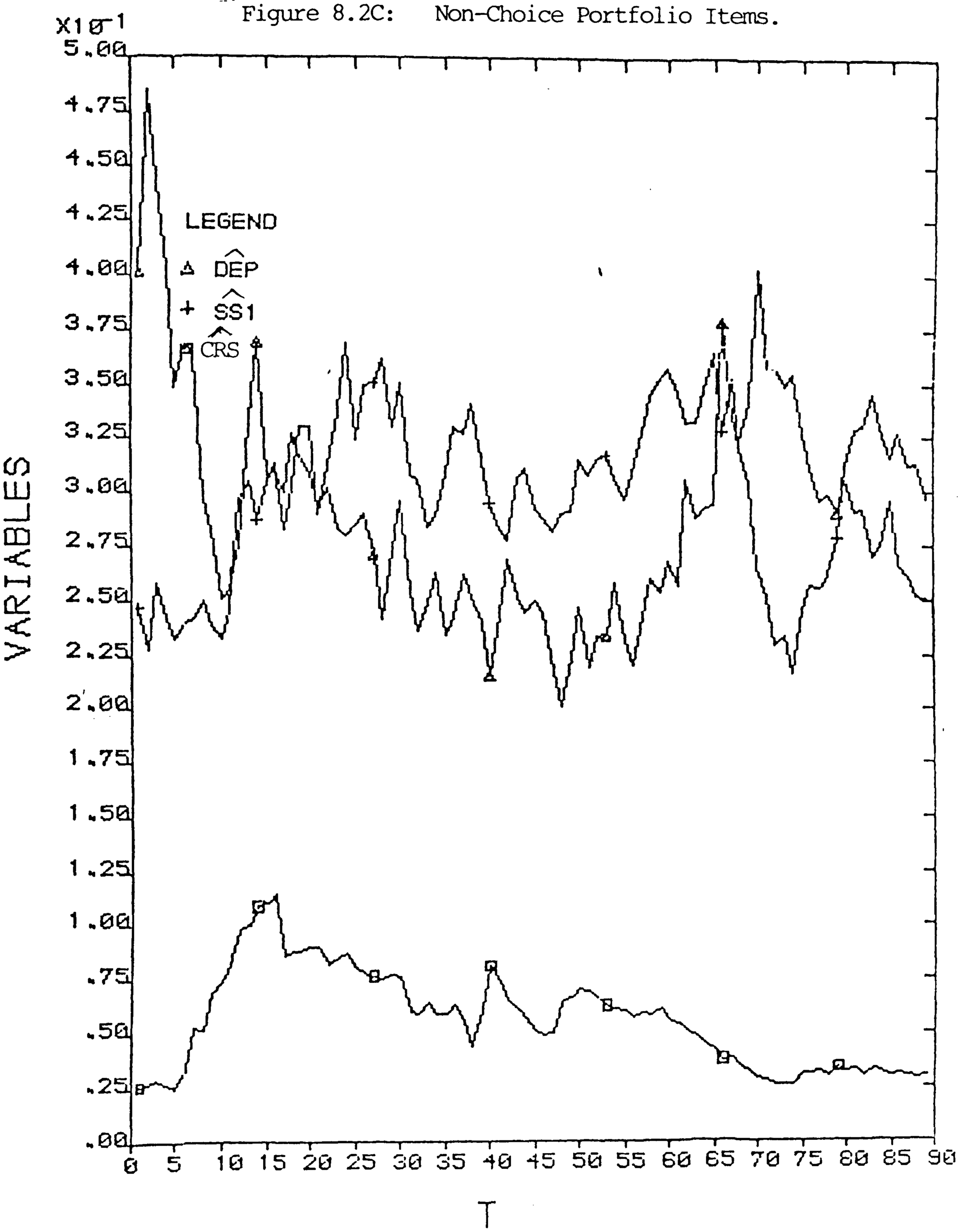
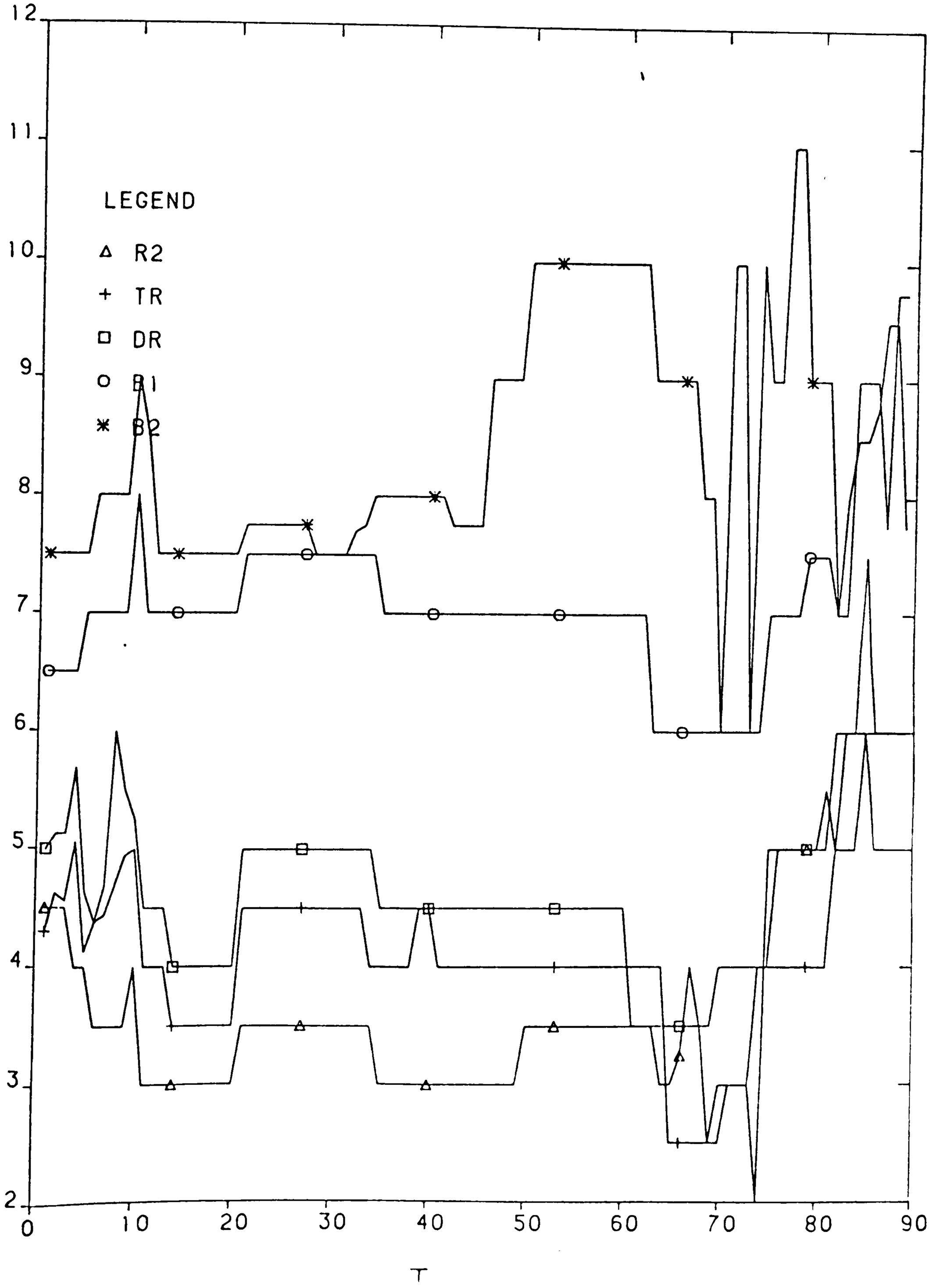


Figure 8.3: Interest Variables



8.2.3 Choice of Specification:

In order to choose whether to include the constant term in our estimation or to work with a model without constant term, we performed a discriminating test between the two specifications. In other words, we tested whether the two specifications are significantly different from one another.

A formal test was therefore set up for the inclusion or exclusion of the constant term. The estimation without an intercept term was treated as a restricted estimation in which case the restriction for the five equation model would be:

$$C_1 = C_2 = C_3 = C_4 = C_5 = 0$$

Where the Ci, i = 1, 2, 3, 4, 5 refers to the intercept in the i^{th} equation.

The test adopted utilizes the log of likelihood function from both the unrestricted and the restricted estimation. If, for instance, the two specifications are not significantly different from each other, then the maximum likelihood estimate (MLE) of the restricted specification should tend to the MLE of the unrestricted. The test is basically a Chi square test, it states that:

$$2\ \text{Log}\underline{\lambda}^{1} \overset{a}{\sim} \underline{\chi}^{2}(\tau)^{2}$$

where $\underline{\lambda}$ = the ratio of maximum likelihood estimates of both the restricted and the unrestricted estimation.

τ = is the degrees of freedom which in this case is the same as the number of restrictions (which is four)

The null hypothesis is therefore

H_o : $Ci = 0\ \forall i \quad i = 1, 2, \ldots, 5$ [3]

versus the alternative hypothesis

H_a : $Ci \neq 0$ for some i = 1, 2, 3, 4, 5

We will reject H_o if and only if, 2 times the difference of the log of likelihood function is greater than the Chi square with 4 degress of freedom: that is

$$2\ \text{Log}\underline{\lambda} > \underline{\chi}^{2}(4)\ 0.95.$$

where 4 is the effective number of restriction because of the balance sheet condition on the C_i in the unrestricted regression.

---

[1] $2\ \text{Log}\underline{\lambda} = -2\{\log[\ell(\underline{\hat{\omega}})] - \log[\ell(\underline{\hat{\Omega}})]\}$

= the difference between the log of likelihood function of the restricted estimates ($\hat{\omega}$) and the unrestricted estimate ($\hat{\Omega}$). It is important to note that 2 Log λ is asymptotically distributed as Chi square.

[2] For a complete discussion of the derivation of this test, see Silvey 1975, pp. 198-122.

[3] The actual restriction imposed however is four, since the balance sheet conditions on the constant terms implies that

$\sum_{i=1}^{5} C_i = 0$; suppose that $\sum_{i=1}^{4} C_i = 0$,

then C_5 must also be zero.

And computing 2 log $\underline{\lambda}$ [4] gives 2.012.

This result implies that the specification without the intercept term cannot be significantly differentiated from the one with the intercept term. However, for other reasons in the analysis that follows our discussion will be based on the specification with the intercept term. We did this because (i) the results of the model without the intercept terms was almost the same [both in terms of signs and significance of individual co-efficients] as the results with the intercept term, presenting either of the results would therefore not change the direction of the analysis; (ii) the fit of the results of the specifications with intercept terms as measured by their R squares are marginally higher than the other specification; (iii) it is also useful to differentiate between the influence of the intercept term (however little this influence may be) and the influence of the dummy variables used in the analysis to capture the effect of seasonality on banks' portfolio behaviour.

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[4] Log$\left[\ell(\underline{\hat{\omega}})\right]$ = 1672.850 and Log$\left[\ell(\underline{\hat{\Omega}})\right]$ = 1673.862, and $X^2(4)$ from the table is 9.49 at the 95 per cent level and

$2 \log \underline{\lambda} = 2\ (1673.862 - 1672.85)$

$= 2.012$

8.2.4 Interest Rates:

Six sets of interest variables were employed in the static estimation; R2, the deposit rate, refers to the rate on short and medium term deposits. TR refers to the average rate on the holdings of short term government fixed interest bonds, particularly treasury bills and certificates. DR is the Central Bank rediscount rate and B1 and B2 are prime lending rate and rate on other advances respectively. The other rate, denoted EXR, is the expected rate on banks' holding of foreign assets as explained in chapter six.

The results as presented in tables 8.3, 8.4 and 8.5 appear consistent with the general notion that economic agents in LDCs are not in general responsive to movements in interest rates.[5] The evidence here, however, contains new indications about the response of banks to rates and yields. For instance, the results indicate that this general view should be held with caution; to conclude that interest rates generally may have no role to play in explaining the portfolio holdings of commercial banks as indicated by our results may be an exaggeration.[6]

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[5] Adekunle [1968]; Wong [2977] among others.

[6] In fact, tests conducted on the joint significance of the inclusion of the interest rates variables for both the static and dynamic analysis (next chapter) indicates that their joint contribution to the explanation of the portfolio items is very significant.

Table 8.3: Summary of Results on Interest Rates.[7, 8]

	R1	TR	DR	B1	B2
$\widehat{NSR}$	+ SIG**	+ SIG**	- SIG***	-NSIG	+NSIG
$\widehat{TBCD}$	NSIG*	NSIG*	-NSIG	-NSIG	-NSIG
$\widehat{BD}$	-NSIG	+NSIG	+NSIG	+NSIG	-NSIG
$\widehat{OI}$	+NSIG	- SIG***	+ SIG**	-NSIG	-NSIG
$\widehat{L}$	+ SIG**	- SIG***	+NSIG	+NSIG	+NSIG

Table 8.4: Summary of Results on Interest Rates. [9]

	R2	TR	DR	B1	B2	EXR
$\widehat{NSR}$	+NSIG	+NSIG	- SIG**	-NSIG	-NSIG	+ SIG**
$\widehat{TBCD}$	-NSIG	+ SIG**	-NSIG	-NSIG	-NSIG	-NSIG
$\widehat{BD}$	-NSIG	-NSIG	+NSIG	+ SIG	-NSIG	-NSIG
$\widehat{OI}$	-NSIG	- SIG***	+NSIG	-NSIG	- SIG**	+ SIG***
$\widehat{L}$	+NSIG	- SIG**	+NSIG	+ SIG**	+NSIG	-NSIG
$\widehat{NFA}$	NSIG*	- SIG**	-NSIG	-NSIG	+NSIG*	-NSIG

---

[7] The summaries here are derived from table 8A.1 and 8A.2 respectively from the appendix.

[8] (i) NSIG implies not significant.
(ii) SIG implies significant, two stars at 95 per cent, and three stars at 99 per cent.
(iii) + means positive sign and - negative sign.
(iv) NSIG with one star implies that if we reduce our level of acceptance say to 90 per cent, then these co-efficients might have been significant.

[9] Derived from table 8A.2.

The results, however, indicate that movements in interest rates were not the most important in explaining the allocation of funds by banks to their choice portfolio during the period covered by the analysis. The majority of the coefficient of the interest rate variables had the expected sign but they turned out to be insignificant. For example, in table 8.3, if we consider the effect of the rates by choice items only three of the rates have any significant effect on the portfolio items; R2 in $\hat{NSR}$, and $\hat{L}$, TR in NSR, $\hat{OI}$ and $\hat{L}$, and DR in $\hat{NSR}$ and $\hat{OI}$. However, let us consider their effect on portfolio item by portfolio item.

On the excess reserve holdings ($\hat{NSR}$), three rates had significant effects, R2 and TR coefficients significant at 95 and DR at 99 per cent. The signs of the significant co-efficients were not unexpected; since this portfolio is a highly liquid portfolio, one expects more funds to be held in this form as a hedge as the cost of acquiring funds rises, hence the positive sign of R2, the deposit rate. On the other hand, we expect the co-efficient of TR, the treasury bill rate to be negative, it turned out to be positive. Again, the sign may be a reflection of complementarity of the excess reserve holdings of the banks and net holdings of money market instruments. The co-efficient of DR was negative thus implying that as DR increases (or the cost of borrowing from the Central Bank rises) the banks try to economise on their holding of reserves. However, what we would have expected was the sign to be positive. In other words, as DR rises holdings of banks excess reserves increase given that this source of liquidity is usually the cheapest available to the banks.

The other two rates, B1 and B2 were not significant in explaining $\hat{NSR}$, but still, B1 had the expected sign. Again, the negative sign of B1 indicates that as the opportunity for more income in prime lending arises, banks would correspondingly reduce their holding of excess reserves. However, we would have expected B2 to have a similar sign, but it turned out to be positive. The only plausible explanation of this sign may be the relation between the prime lending rate and the other advances rates, because they almost invariably move together, and this might be responsible for the perverse sign.

In contrast, in the holding of net money market instruments, $\hat{TBCD}$, the interest rates were surprisingly not significant in determining allocation of funds to the portfolio. The single starred R2 and TR in table 8.3. however, indicates a high t ratio for the variables. If the level of acceptance is reduced to 90 per cent, they can then be considered as significant. In terms of the signs, the rates possessed the correct signs with respect to this portfolio. The positive sign of the co-efficient of TR implies that as this rate increases more net money market instruments will be held by the banks. This is only proper since the bulk of the money market instruments is made up of treasury bills and certificates. The negative sign of R2 is, however, not surprising since an increase in R2 will cut the spread between deposit rate and the rate accruing on the holding of money market instruments and thus reducing the willingness of banks to use the same level of deposit fund to finance the holding of this

type of instrument. Again, the co-efficient of DR and B1 are negative thus implying, as in $\hat{NSR}$ above, that as these rates rise banks are more likely to reduce their allocation of funds to this category of assets. Unlike $\hat{NSR}$, however, B2 has the correct sign, although not significant.

The next choice item, $\hat{BD}$ performed poorly in terms of significance of rates and yields. None of the rates were significant with respect to this portfolio. The signs of TR and DR even though not significant were dubious. R2 had the expected sign, so also had B1.

The next portfolio item, $\hat{OI}$ performed better, two interest rates, TR and DR were significantly different from zero in explaining the portfolio item. The negative sign of the co-efficient of TR in this portfolio implies that as treasury bill rates rise more funds are allocated away from this portfolio. This is, however, not surprising since banks' investments in Nigeria consist mainly of long term government fixed interest instruments; if the yield on short term money market instruments should rise the inducement to hold $\hat{OI}$ would definitely fall. In other words, holding of these instruments and net money market instruments are substitutes. Furthermore, the nature of $\hat{OI}$ and the balance sheet condition imply that DR, the bank rediscount rate, should be negatively related to banks' investment. However, the fact that the co-efficient of DR was positive is not surprising, since banks' investments consist in the main assets whose yields are not responsive to market forces.

In addition, because their maturity is invariably longer than the average instruments in the portfolio of the banks, there is the possibility that the penal nature of DR may have no effect on the $\hat{OI}$ choice portfolio item.

The last portfolio item, loans and advances, $(\hat{L})$, to the private sector economy also had two significant interest rate variables, R2 and TR. The positive sign of R2 in this equation is an indication that the cost of acquiring deposit is probably not important in the Nigerian banking system. If this were important, one would expect this rate to act as opportunity cost for creating credit by the banks. Similarly, one would expect the banks' rediscount rate to penalize the commercial banks' holding of loans for reserve deficiency. Therefore, it is expected as the bank's rate goes up, banks would economise in their use of funds by pruning loans to marginal customers. In other words, they are more likely to reduce their loan portfolio as DR rise in which case the sign of the co-efficient of DR should have been negative rather than positive. The other rates had the proper sign; it is, however, disappointing that none of the lending rates were signfiicant. TR was, however, significant and had the correct (negative) sign; thus indicating that as TR increases funds will be allocated away by the banks from the loan portfolio, thus implying that the loan portfolio, $\tilde{L}$, is a substitute to $\hat{TBCD}$ portfolio item.

It is also necessary at this stage to talk about the summary in table 8.4; these results are derived from table 8A.2 in the appendix. They are the result of treating $\widehat{NFA}$ as a choice variable. As emphasised in chapter six, the evidence from institutional arrangements, organisation and regulation of the financial sector in Nigeria, points to treating this portfolio item as a non-choice item. However, in the table, external rate, EXR was shown to be significantly related to both the holding of net excess reserves and banks' investments. The holding of net foreign asset itself was not significantly related to the external rate, but related positively at the 95 per cent confidence level, to the short term money market rates (TR). It is also almost significantly (as indicated earlier) related to deposit and other advance rates. There are, however, a number of observations about this equation. The first is the non-significance of the EXR and its perverse sign. If $\widehat{NFA}$ holdings of the Nigerian banks was responsive to market influences one would expect EXR to have a positively significant co-efficient. However, the non-significance of EXR with respect to $\widehat{NFA}$, may not be the result of insulation of the holdings of the portfolio item from international influences. It may be that the source of that influence to the portfolio of commercial banks is not captured by our model. It may also be the result of the attempt of the financial authority to keep the domestic financial sector fairly separated from the external sector. In which case any shock or effect of the external sector is mopped off before getting to the commercial banks. [In the case of Nigeria this role is probably played by the CBN].

However, the results seem to justify our exclusion of $\widehat{NFA}$ from from the choice portfolio item. Besides, the inclusion of $\widehat{NFA}$ did not contribute to the overall explanation of other equations.

Overall, the signs of the different yields indicate that the holding of excess reserves and short-term money market instruments are to some extent complements. The clear substitutes that emerge from table 8.3 is loans ($\widehat{L}$) and money market instruments ($\widehat{TBCD}$). The others are not clear substitutes or complements within the whole portfolio.

Several reasons may be adduced to account for the inability of the interest rate to explain the holdings of domestic assets by commercial banks. The first is that other factors such as availability of funds may be more important in the explanation of portfolio assets of the banks. This is dealt with below. The second may be traced to the nature of control of the structure of interest rates in LDCs and in particular, Nigeria. It is known in Nigeria that for a fairly long length of time rates are usually held constant and not allowed to vary freely with impulses of the market. The non-free variability of the interest variables may be such that they do not actually indicate or reflect the real market opportunity that the market offers. In fact, this is more likely to be so where market rates are artifically held below the real value of returns they represent in the market, as is the case in Nigeria. Furthermore, other causes of non-responsiveness may be due to self-imposed restrictions by the banks on holding some category of instruments.

For instance, as a result of risk and uncertainty associated with the holding of some category of portfolio items, the banks may not be induced to assume the high risk associated with the transactions with the expectation of higher returns. A good exmaple is holding of loans portfolio and sometimes the foreign portfolio. In such cases the allocation of funds by the banks may be more defensive rather than speculative and thus their portfolio behaviour can be explained by their aversion to risk rather than the expected return on the assets.

8.2.5 Other Non-Interest Variables:

As was argued earlier, the results discussed here were based on the estimation of the specification with a constant term. The results of estimation without the intercept term is presented in table 8A.4 in the appendix. There is, of course, no significant difference between the specification as shown earlier.

Table 8.5: Summary of Results on Non-Interest Exogenous Variables.[10]

	$\hat{NFA}$	$\hat{ND}$	$\hat{CRS}$	$\hat{NUB}$	$\hat{SS1}$	$\hat{LG}$	$\hat{RR}$
$\hat{NSR}$	- SIG***	+ SIG***	+NSIG	+NSIG	+ SIG***	-NSIG	- SIG**
$\hat{TBCD}$	+NSIG*	-NSIG	-NSIG	-SIG***	+NSIG	-NSIG	-NSIG
$\hat{BD}$	- SIG***	+ SIG***	+NSIG	+ SIG**	+ SIG***	-NSIG*	-NSIG*
$\hat{OI}$	-NSIG	+NSIG	-NSIG	+NSIG	-NSIG	+ SIG***	+NSIG
$\hat{L}$	- SIG***	+ SIG***	+ SIG***	+ SIG***	+ SIG***	+NSIG	- SIG**

[10]The summary is also derived from table 8A.1 in the appendix.

Table 8.6: Elasticities[11]

	R2	TR	DR	B1	B2	$\widehat{NFA}$	$\widehat{ND}$	$\widehat{CRS}$	$\widehat{NUB}$	$\widehat{SS1}$	$\widehat{LG}$	$\widehat{RR}$
$\widehat{NSR}$	0.89**	1.27**	-2.41***	-1.47	0.09	-0.10***	1.65***	0.07	-0.04	1.78***	-0.14	-0.24**
$\widehat{TBCD}$	-0.60*	0.88*	0.22	-0.74	-0.20	0.03*	-0.40	-0.12	0.64**	0.47	-0.04	-0.07
$\widehat{BD}$	-0.99	0.91	0.42	2.86	-0.38	-0.28***	5.21***	0.73	-0.36**	4.31***	-0.43*	-0.43*
$\widehat{OI}$	0.89	3.68***	2.51**	-1.70	-1.02	-0.04	0.50	-0.21	-0.02	-0.83	0.62***	0.23
$\widehat{L}$	0.22**	-0.38***	0.15	0.27	0.13	-0.03***	0.49***	0.16***	-0.09***	0.22**	0.77	-0.12***

Elasticity is defined as $Ez_i x_i = \hat{\beta}\bar{x}/\bar{z}$, where $\hat{\beta}$ is the estimated coefficient; $\bar{x}$ is the mean of the relevant independent variable; $\bar{z}$ is the mean of the relevant dependent variable.
[See Pindyck and Rubinfeld, 1981, pp. 90-91].

Table 8.5 indicates (as argued earlier on) that other factors apart from interest rates are likely to be more important in explaining portfolio allocation of the banking system in Nigeria. The summary in table 8.5 also indicates the signs as well as the significance and non-sugnificance of the different explanatory variables. Very important among these variables are those that measure the effects of the inflow of funds to the banking system; $\hat{ND}$ which measures, non-interest earning deposit net of reserves and $\hat{SS1}$ which measures interest earning deposits net of secondary and supplementary reserves. Other significant influences are the net foreign asset ($\hat{NFA}$), net other asset ($\hat{NUB}$) and the policy variables public sector borrowing from banks ($\hat{LG}$), and required reserves ($\hat{RR}$).

Various measures of the availability of funds, in particular the deposits source of funds appeared more important than the interest rates across the portfolio choice items in explaining banks' allocation of funds. This was, however, not true of non-deposit source of funds, in particular, sources from capital account denoted as $\hat{CRS}$ in the study. Even though the two deposits source of funds, $\hat{ND}$ and $\hat{SS1}$, were each significant in explaining allocation of funds to three of the choice portfolio items, it is however of interest to compare the summary in table 8.5 with elasticities in table 8.6. From table 8.5, both $\hat{ND}$ and $\hat{SS1}$ were significant in allocating funds into $\hat{NSR}$, $\hat{BD}$ and $\hat{L}$. They all have the expected sign, but the interesting thing to note about them is their elasticity from table 8.4. The response of the loans' portfolio was less than unity, whereas for $\hat{BD}$ and $\hat{NSR}$ it was greater than unity

implying that the last two portfolios possess elastic response to changes in these sources of funds. In fact, compared to the non-significant co-efficients, these two were the only portfolio items with elastic response to changes in the flow of funds to the banking system. However, the interesting aspect of the result emerges when one looks at the result as an historical data on what the banks have been doing in terms of fund allocation. It emerges from the results that the banks have been more willing to allocate funds within their disposal to more liquid portfolios than the loans' portfolio. In this case to $\widehat{BD}$ which are a fairly guaranteed form of portfolio holdings of the bank and to $\widehat{NSR}$ which is relatively safe and imposes a lesser cost than other portfolios in terms of deficiency and adjustment cost as well as liquidity cost incurred through the allocation of deposit funds to income earning operations of the banks.

Furthermore, comparing the elasticity coefficient of the deposit variables across choice portfolio items (table 8.6), it emerges that the responsiveness or the willingness of the banks to utilize the non-interest bearing deposit ($\widehat{ND}$) for choice portfolio operations is greater in $\widehat{BD}$ and $\widehat{L}$ and lower in $\widehat{NSR}$, $\widehat{TBCD}$ and $\widehat{OI}$ compared to $\widehat{SS1}$. Looking at the nature of $\widehat{BD}$ and $\widehat{L}$ and comparing them to $\widehat{NSR}$, $\widehat{TBCD}$ and $\widehat{OI}$, it appears that the former group of portfolio items ($\widehat{BD}$ and $\widehat{L}$) are in general riskier forms of portfolio than the latter categories ($\widehat{NSR}$, $\widehat{TBCD}$ and $\widehat{OI}$). $\widehat{BD}$ and $\widehat{L}$ also tend to have a higher income generating prospects for the banks. The greater willingness of the banks to apply more of their non-interest bearing funds to this two portfolios may be a reflection of a higher preference for

cost of funds minimization in their liability management with respect to the two choice items. It can also be argued that the greater willingness to apply $\widehat{SS1}$ to the more liquid portfolio may be a reflection of liquidity cost minimization policy of the banks.

The attempt to balance out the source of funds application of the banks is, however, hardly surprising since it is known that these two important sources of funds to banks impose costs of varying degrees on the liability management process of the banks.

For instance, in general it is expected that the non-interest bearing deposits would be more volatile and thus imposing more liquidity cost, whereas the other source, apart from liquidity cost (which is usually to a lesser degree) imposes interest cost on the banks. In the case of this study, however, the differences in the volatility of the two deposit sources of funds have been very small as measured by their co-efficient of variation (table 8.1); 0.13 for the interest bearing deposits and 0.18 for the non-interest bearing deposit. This difference may not be sufficient enough.as to compensate for the liquidity cost in addition to the interest cost, thus making the banks less willing to apply this source of funds. Secondly, the extent of liquidity in the whole economy in the recent times may have on the other hand relegated liquidity minimization to a secondary position in the liability management of the banks.

Almost invariably, $\widehat{NFA}$ had a contractionary effect on the proportion of funds that is allocated to the different portfolio as expected, except the holding of net money market instruments ($\widehat{TBCD}$).

This is, however, surprising since we would also expect NFA to money market have a negative effect on/portfolio of the banks. Table 8.6, however, indicates that the elasticity of the asset with respect to the choice portfolio items is (generally less than unity), this is despite the fact that it is one of the most variable components of balance sheet items of banks in Nigeria. The most responsive choice portfolio to changes in $\widehat{NFA}$ is again bill discounted $\widehat{BD}$. Given the overall elasticity of $\widehat{BD}$ with respect to the explanatory variables, the plausible deduction that one can derive is that the greater willingness to apply funds to this portfolio item may be indicative of a buffer role.

$\widehat{NUB}$, net other assets was also significant in affecting the proportion of funds that is allocated to three of the choice portfolio items, $\widehat{TBCD}$, $\widehat{BD}$ and $\widehat{L}$. The influence captured in $\widehat{NUB}$ is twofold; it consists of the effect of other assets of balance sheet items which are mainly the influence emanating from banks holding of plant and equipment, the other is the effect of banks' other liabilities. Therefore, the influence of $\widehat{NUB}$ in the choice portfolio items depends on the more dominant of the two influences. In fact, $\widehat{NUB}$ over the period covered by our analysis has an average proportion of total asset of -0.068 which implies that the other liability component was greater. This is also indicated in figure 8.2B, where the average proportional allocation to $\widehat{NUB}$ was shown to be in the negative quadrant of the diagram for about four-fifths (4/5) of the period covered. Theoretically, however, we would expect

$$\frac{\partial Z_{it}}{\partial(OA-OL)} = \frac{\partial Z_{it}}{\partial NUB} \gtrless 0 \quad [\text{where } Z_{it} \text{ is the relevant portfolio item}]$$

depending on which of the component that is dominant. However, in our results table 8.5 and table 8A.1 from the appendix, the coefficient of $\widehat{NUB}$ was positive for four of the portfolio items $\widehat{NSR}$, $\widehat{BD}$, $\widehat{OI}$ and $\widehat{L}$ and only negative for $\widehat{TBCD}$. The implication of the result therefore is that if the dominant increase has taken place in the other liability components of $\widehat{NUB}$, then this change over time would lead to significant increases in the proportion of fund allocated to $\widehat{BD}$ and the loans portfolio but not significant in $\widehat{NSR}$ and $\widehat{OI}$. It will, however, lead to a fall in proportion of funds allocated to $\widehat{TBCD}$. Again, like the $\widehat{NFA}$, all the choice portfolio items are relatively inelastic with respect to $\widehat{NUB}$ (from table 8.6). $\widehat{NUB}$, however, impinges on $\widehat{TBCD}$ and $\widehat{BD}$ more than other choice items.

Public sector borrowing from the banking system and reserve requirements represented by $\widehat{LG}$ and $\widehat{RR}$ respectively in this study were also significant in affecting the allocations of funds to some of the portfolio but their influence was not as important as that of the sources of funds discussed earlier. Public sector borrowing had positive effects on the investments portfolio and the loans portfolio but had negative effects on the other choice portfolio items. However, the only significant effect of $\widehat{LG}$ was on banks' other investment. Similarly, reserve requirements was only significant

in allocation of funds to $\widehat{NSR}$ and $\widehat{L}$. The response to shocks from these two policy instruments of the portfolio items was relatively inelastic. The largest response to $\widehat{LG}$ being from $\widehat{L}$ although not significant, the response from $\widehat{OI}$ was, however, relatively high. Although not significant, the sign of LG in the loans equation seems perverse. The only possible explanation would be the extent of government involvement in private sector activities in the country, for instance, an increse in public sector borrowing rather than crowding out private sector borrowing may generate secondary effects in which case it causes the banks to use their other disposable assets to finance increased borrowing.

The seasonal dummies were only significant in two portfolios, $\widehat{TBCD}$ and loans ($\widehat{L}$).

	D2	D3	D4
$\widehat{NSR}$	-NSIG	-NSIG	-NSIG
$\widehat{TBCD}$	-NSIG	-NSIG	- SIG**
$\widehat{BD}$	-NSIG	-NSIG	-NSIG
$\widehat{OI}$	+NSIG	-NSIG	-NSIG
$\widehat{I}$	+NSIG	+NSIG	+ SIG***

Finally, in terms of overall performance, in this static estimation, the fit appeared fairly good given that our variables are in proportion, R^2s ranging between 0.47 and 0.90. The $\widehat{NSR}$ fit appears poorer than the other equations. Our estimates are, however, suspicious because of the value of DW statistics recorded for the

equations. The estimates are therefore clouded with positive serial correlation.[11] In this situation, however, our estimates are still unbiased but serious doubt is cast on our test of significance because of the possibility of underestimation of the variance of the coefficients.

8.3 Results: With Symmetry Restrictions[12]

Our discussion so far has been within the general framework imposed by the balance sheet condition of the model. We, therefore, present here the result of requiring the model to satisfy the symmetry restrictions. Since this is a testable restriction, we therefore call on the test used earlier [in the case of the inclusion of the intercept term], the likelihood ratio test. The procedure is the same as described earlier. Again, we should however be reminded that this test is a large sample test. Our hypothesis in this case is that the population from which the sample data comes from

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[11] The DW statistics for the equation are as follows: equation 1 - 1.67, equation 2 - 1.03, equation 3 - 0.86, equation 4 - 0.85, equation 5 - 1.21. If one uses the approximation $\hat{\rho} = 1 - 1/2d$ where $\hat{\rho}$ is the estimate of serial correlation and d is Durbin-Watson statistic, the estimate of serial corrleation in the individual equations are 0.17, 0.49, 0.57, 0.58 and 0.40.

[12] The symmetry assumption is not crucially necessary for the estimation carried out in the analysis so far. In fact, as argued by White [1975, pp.461-463] the symmetry is derived from the assumptions used to establish the mean-variance framework. And in as much as the framework can be derived from other types of utility function [as for instance in Royama and Hamadd (1967)], there is therefore no strong grounds for imposing symmetry.

is consistent with the theory that the behavioural response of the banks in Nigeria to asset price variations is symmetric across their choice portfolio items. This is tested against the alternative that the symmetry imposed estimation is significantly different from the unrestricted estimation.

If the null hypothesis is true, then the restricted maximum likelihood estimate of the parameter (or Log [L ($\hat{\omega}$)]) will tend to be very near the unrestricted MLE; (or Log [L ($\hat{\Omega}$)]) for large samples.

Again, comparing the ratio of the likelihood function for both the restricted and unrestricted multiplying by 2 gives

$$X^2 = 145.39 \quad [13]$$

Comparing this value with $X^2(6)_{0.95}$ from the Chi square table indicates that the restricted model is significantly different from the general model. In other words, imposing symmetry is not supported by the data upon which our study is based.

Given the nature of this result, it is therefore legitimate to compare the estimated results of the restricted model with that of the general estimation.

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[13] The unrestricted log likelihood function is 1673.868 and the restricted is 1601.170.

The non-interest variables (table 8A.4) apart from their reduced standard errors, their direction in terms of signs and significance remained the same as before. However, there were some changes in the significance and signs of the interest rate variables. For instance, in the $\widehat{NSR}$ portfolio, R2 while still retaining the same sign was no more significant. On $\widehat{TBCD}$, B1 was now significant and correctly signed and in $\widehat{BD}$, R2 and B1 became significant. In other investments, while TR and DR were significant with the same signs, as before, B1 also became significant.
In the last portfolio item, $\widehat{L}$, while before no interest variable was significant and unlike the general case DR was now correctly signed.

In terms of overall direction of results, the relative insignificance of the interest variables at explaining portfolio allocation of funds in Nigeria was still maintained. Overall, the symmetry estimation further reinforces our major conclusion from the previous section that even though interest rates and yields appeared relatively insignificant when compared to other variables such as availability of funds, they cannot be discounted in policies relating to portfolio of banks in a country like Nigeria.

CHAPTER NINE

EMPIRICAL RESULTS II: THE DYNAMIC ESTIMATION

9.1 Introduction

In this chapter, we present the results of estimating the dynamic model. This model is essentially in the spirit of Tobin-Brannard model (Chapter 4) except that in this case, banks' allocation to the choice portfolio are assumed to have been made sequentially rather than simultaneously as assumed in the original Tobin-Brannard model. As a further development on this main assumption and consequent to results of the static model in chapter eight, a further attempt is made to examine the behaviour of the banks dynamically given that the level of disaggregation is more than that assumed in our main model.

The chapter is broadly categorized into four sections, the first discusses the main variables employed in the exercises and presents the analysis of diagnostic checks and tests which the main model have been subjected to. Section three presents the results of the second stage allocation to the choice portfolio, the results are examined and discussed. Section three further presents the results of the third stage allocation given that overall allocations to choice portfolio have been made and the final section examines the implication for our results of a greater level of disaggregation of the choice portfolio than that assumed by our main model.

9.2 Presentation of Variables, Econometric Problems, Diagnostic Checks and Tests

9.2.1 Before the presentation of the results, we present here a brief discussion on the variables employed in the analysis; they are mainly for clarity of the discussion that follows. Later on the various tests that the model is also subjected to are presented and discussed.

In the estimation of the first part of the dynamic analysis, three interest rate variables were employed: A1 and A2 are the quarterly averages of the deposit rates and lending rates respectively for the given quarter, and DR is the Bank's rediscount rate as used in the static analysis. $\widehat{NCP1}$ is net funds after allocation to reserves have been met. In this analysis in order to limit the possible effect of multicollinearity, we did not differentiate funds by source as in the static analysis, $\widehat{NPC1}$ therefore includes influences from both non-deposit and deposit sources of funds. $\widehat{NUB}$ is net other assets, that is other assets less other liabilities as explained earlier [Chapter Six]. $\widehat{LG}$ and $\widehat{RR}$ are public sector borrowing from the banking system and required reserves respectively. Zi, t-1 are the first lag of the dependent variables. Di,t are dummies introduced to capture various influences on the portrolio items 0 D1, to D4 for seasonal effects, D5 for oil price shocks and D7 for the effects of the Nigerian civil war. Finally, MFP and IID are introduced as surrogates for any feedback from the real sector of the economy where (MFP stands for the index

of manufacturing production and IID the index of industrial production).

9.2.2 Econometric Problems:

A number of problems were encountered in estimating the dynamic specifications, the first being the dynamic structure of the model. This is important since we have lagged variables on the right hand side of the equations, in which case the conventional dw statistic becomes inappropriate. Furthermore, the h statistic, which is designed to handle such a situation, has also been shown to perform poorly when the analysis is based on quarterly series and may be suspect to fourth order serial correlation.[1] In this situation a number of suggestions have been made for testing for the adequacy of the dynamic structure implied in the specific equations.[2]

In order to provide a simple but encompassing test of the dynamic structure, we have chosen to adopt the so-called LM test. This method was chosen because of its generality and flexibility in implementation, since it only requires combining the residuals from previous estimations in an OLS estimation of an augmented equation. The LM test possesses properties that are asymptotically equivalent to the likelihood ratio tests [Godfrey, 1978; Silvey, 1975].

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[1]The weakness of these statistics is documented for our case - see for instance Sims [1974, pp.320-321] amd Wallis [1972].

[2]See Buse [1 81], Breusch and Pagan]1980] and Godfrey [1978].

In addition to the LM test, an F test was performed for regression co-efficient constancy over adjacent periods of the study: the civil war providing the break point. As a complement to the dynamic test, a simulation of the specification was undertaken, mainly in order to test the forecasting ability of the model as well as its ability to capture essential turning points in the data.

The other problem encountered in the study is that of multi-collinearity. In order to overcome this problem we have tried to restrict our included variables to those that are most important in terms of what we want to explain. In doing so, however, we took account of the fact that it is better to err on the side of over inclusion rather than exclusion.

In the literature there are a number of alternative suggestions for overcoming the problem of multicollinearity. These solutions were not attempted because they may lead to further insurmountable problems of their own. Two of these solutions that are of interest are mentioned briefly here. The first is the so-called principal components approach, which leads to the generation of pseudo variables which attempt to combine the influences of the phenomena understudy. The major obstacle to our using the approach was the interpretation of the new variables thus generated. The other interesting solution would have been the so-called ridge regression analysis, which is similar to the method suggested by Smith and Brainard [1976] and discussed in chapter seven. However, apart

from the reasons adduced earlier, it has been argued [Draper and Smith, 1981] that in comparison with the least square estimates, the technique changes the non-significant estimated regression co-efficients (i.e. those whose values are statistically doubtful, anyway) to a far greater extent than the significant estimated co-efficients. We therefore believed that not much real improvement could have been achieved by adopting such procedure.

9.2.3 Diagnostic Checks and Tests

(a) Serial Correlation: To cater for the existence of serial correlation an efficient procedure was adopted, the Beach and Mackinnon procedure. This has the advantage over the Cochrane-Orcutt [1949] or the Hildreth Lu [1960] procedure of being a maximum likelihood procedure without losing the first observation [Beach and Mackinnon (1978)]. Before applying the Beach and Mackinnon procedure, however, despite our reservations about the h statistics, an attempt was made to use this procedure to test whether the $\hat{\rho}$ indicated by the DW statistics was significant. However, we ran into the familiar situation where the h statistic breaks down.[3] In fact, the estimated $\hat{\rho}$ for all the equations was very small in such a way that the estimates from the autoregressive least squares were not significantly different from our direct estimations.

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[3]The asymptotic test h can be expressed as $h = \frac{T}{1-TV(\beta_i)}$ and $\hat{\rho} = 1 - \frac{1}{2}d$ h breaks down when $TV(\beta_i) > 1$, where $V(\beta_i)$ is the variance of the co-efficient attached to the lagged dependent variable.

As a result we find no justifications for presenting the results of the procedure.

As discussed earlier, the LM procedure was then used as a check on the adequacy of our dynamic structure. Basically we tested for serial independence of the error process, the need for this test is further reinforced because of the quarterly nature of our data set. The test enables us to test for higher order autoregressive process and especially the existence of fourth order autoregressive process which quarterly series are often susceptible to. A further advantage of this test is that of its joint nature in testing for both an autoregressive and a moving average error process.[4]

Now, suppose we specify our estimating equation simply as

$$Z_i = \sum_{i=1} X_t \beta_t + \mu_t \quad t = 1, 2....., n... \qquad 9.1 \quad .$$

X_t includes lagged values of Zt and we are interested in testing the assumption that the μ_t are independent against the alternative of t^{th} autocorrelation. However, if the assumption of independent errors is correct, then the LM statistic is asymptotically distributed as X^2 (t). The comparison of its values, therefore, with critical

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[4]For a detailed description of the implementation of LM, see Breusch and Godfrey [1981], pp.70-73 and pp.76-79, and also for theoretical properties of the test, Silvey [1975].

value of the distribution would imply the rejection of large values of the statistic, that is the rejection of the null hypothesis.

To implement the test, we set up an augmented regression

$$\mu_t = \sum_{i=1} X_{ti}\beta_i + \sum_{i=1}^{t} \mu_{t-1}\alpha_i + \quad _t \ldots\ldots \qquad 9.2$$

However, since OLS resudial μ_t is orthogonal to each of the regressors X_t, the null hypothesis of

Ho : $\alpha_1 = \alpha_2 = \ldots\ldots\ldots\alpha_t = 0$ implies testing equation 9.1 against the alternative of the augmented regression equation 9.2, that is

$\alpha_1 \neq \alpha_2 \neq \ldots\ldots\ldots\neq\alpha_t \neq 0$ at least for some α_i.

In terms of our model, we decided to test for AR(5), the hypothesis was therefore set forth as

Ho : $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$

(where the α_i are the co-efficients attached to the estimated residual $\mu_{t-1}, \mu_{t-2}\ldots, \mu_{t-5}$ in the LM equations) versus (the alternative hypotheses) Ha; $\alpha_i \neq 0$, in other words the null hypothesis of independent errors is tested against the alternative of i^{th} order autoregressive or moving average process.

The null hypothesis (Ho) is rejected if and only if

$$N*R^2_{LM} > X^2_{(5)}$$

where N is the number of observations of the least square estimation

R^2_{LM} is the measure of goodness of fit from the augmented equation and $N*R^2_{LM}$ is asymptotically distributed as Chi square with 5 degrees of freedom [Godfrey and Breusch, 1981].

When $N*R^2_{LM}$ was calculated for our main model, the values for each of the equations were given, as in table 9.1 below.

Table 9.1: Chi square Computed for LM Test.

Equations	$N*R^2_{LM}$
$\Delta \widehat{NDLP}$	9.84
$\Delta \widehat{LLQP}$	9.83

But the X^2 at 95 per cent confidence level and 5 degrees of freedom was given as 11.07, thus implying that the null hypothesis of serial independence is accepted. It should, however, be noted that one of the likely causes of higher order serial correlation is the quarterly nature of the data and this has been modelled in by the use of quarterly dummies. Also, as will be seen later in the results section, some of these dummies are significant.

(b) Stability of Estimates and Homogeneity of Data Base:

As emphasized in chapter seven of this study, during the period covered by this study, Nigeria experienced a civil war, including the events that led to the war. It covered the period 1967 to 1970. As expected, the event had a perceivable effect on our data

base. In a pre-run exercise the data produces outlier observations at the beginning of 1968 and 1971 respectively. Moreover, from a historical point of view, we know that the data on the banking system excludes that of the war-affected areas for the period of the war. We were, however, forced to confront this problem. The steps taken in order to take account of this problem was to examine whether the war had only a once and for all effect on the portfolio of the banks in which case it is only the intercept terms of our estimation that would change. Secondly, if it has more than a once and for all change then both the intercept terms and the slope co-efficients were expected to be significantly different.

The other step tried was to drop the outlier observation and test whether this significantly affected our estimates. Furthermore, in order to gain more insight into the portfolio of the banks the war periods were dropped out and separate estimations were undertaken for periods before and after the war. The period itself was not long enough for a separate estimation. The results of these exercises are presented and discussed in the results section.

Finally, however, because of the observed problems there was the need to test our model for parameter constancy over the adjacent periods, the war providing the natural break for the adjacent periods. In order to do this, we set up the null hypothesis

of no structural change over the adjacent periods against the alternative of no parameter constancy across adjacent periods that is:

$$Ho: \Delta\beta = 0 \text{ versus } Ha: \Delta\beta \neq 0$$

where β is the parameter vector.

We will reject Ho: if and only if

$$F_{1c} = \left[\frac{URSS - RSS_1}{RSS_1}\right]\left[\frac{N1-K}{N_2}\right] \quad [5]$$

$$> F^{\alpha}(N_2, N_1-K)$$

where URSS is the unrestricted residual sum of squares

RSS_1 is the residual sum of squares for the first period

RSS_2 is the residual sum of squares for the second period

α is the level of confidence

N_1 N_2 is the number of observations for respective periods

K is the number of explanatory variables including the intercept term.

Apart from the parameter constancy test, we also performed a homoscedasticity test, that is we test for the constancy of the variance of the regressions over the period. In this case our hypothesis is

$$Ho; (\sigma_i^2)_1 = (\sigma_i^2)_2 \text{ versus } Ha; (\sigma_i^2)_1 \neq (\sigma_i^2)_2, \text{ for } i = 1,2$$

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[5]The first test is the so-called Chow test [Chow, 1960], sometimes it is also regarded as a prediction test [See Anderson and Mizon, 1983].

We will reject Ho if

$$F_{2C} = \left[\frac{RSS_2}{RSS_1}\right]\left[\frac{N_2 - K}{N_2 - K}\right] > F^{\alpha}_{(N_2-K,N_1-K)}$$

The results of these tests are reported below in table 9.2.

Table 9.2: Results of F tests for Parameter Constancy.

	F_{1C}	F_{2C}
$\Delta\widehat{NDLP}$	1.31	0.53
$\Delta\widehat{LLQP}$	1.30	0.53
$F_{0.95(26,49)} = 1.75$		$F_{0.95(26,36)} = 1.80$

The null hypothesis were not rejected despite our fears. This is an indication that the basic structure of banking operations did not significantly change despite the civil war. In that case it must be that once the war was over, the structure of banking operations gradually returned to normal and stability of operations was maintained.

(c) Dynamic Simulation:

Finally, as a check on the reliability of our model especially on its ability to simulate the path of the data over time, we undertook a dynamic simulation with the model. The advantage of this lies in the fact that sometimes, as experience has shown, a good fit model may be a poor predictor. If, therefore, in addition to passing the basic diagnostic checks, the simulated series is able to match the historical data very well, the better for our model.

Simulation was done for the model, first taking into account the effects of the civil war, that is allowing the intercepts and the significant slope terms to vary as a result of the civil war and, secondly, without incorporating the effect of the civil war.

The statistics of the simulation are presented in table 9.3. Our main criteria for judging the performance of the simulation is the Theil's statistic of inequality also called the U statistic. For the perfect situation, the U should tend to zero, otherwise it lies between zero and unity. The advantage of the U statistic over the others is that it is a normalized measure of performance, unlike the others which are absolute measurement. In terms of the U statistic, our model did not perform too well, the model with war effect was also only marginally better from 0.63 to 0.46 for the NDLP portfolio and 0.67 to 0.51 for the LLQP portfolio. However, bearing in mind that what we are simulating is the changes

Table 9.3: The Descriptive Statistics of the Dynamic Simulation

	NDLP		LLQP	
	A^6	B^6	A	B
γ^7	0.71	0.82	0.64	0.77
RMSE	0.08	0.04	0.08	0.04
MAE	0.07	0.04	0.08	0.04
MEAN ERROR	-0.08	-0.04	0.08	0.04
U	0.63	0.46	0.67	0.51

[6]The A stands for results of simulation without incorporating the effect of the war, whereas B stands for results of simulation with the war effect incorporated.

[7](d) γ is the correlation co-efficient between the simulated series and actual series.

(b) RMSE = root mean square error

$$= \frac{1}{N} \sum_{t=1}^{N} (Z_{it}^{s} - Z_{it})^{2}$$

where Z_{it}^{s} is the simulated value of Z_{it}

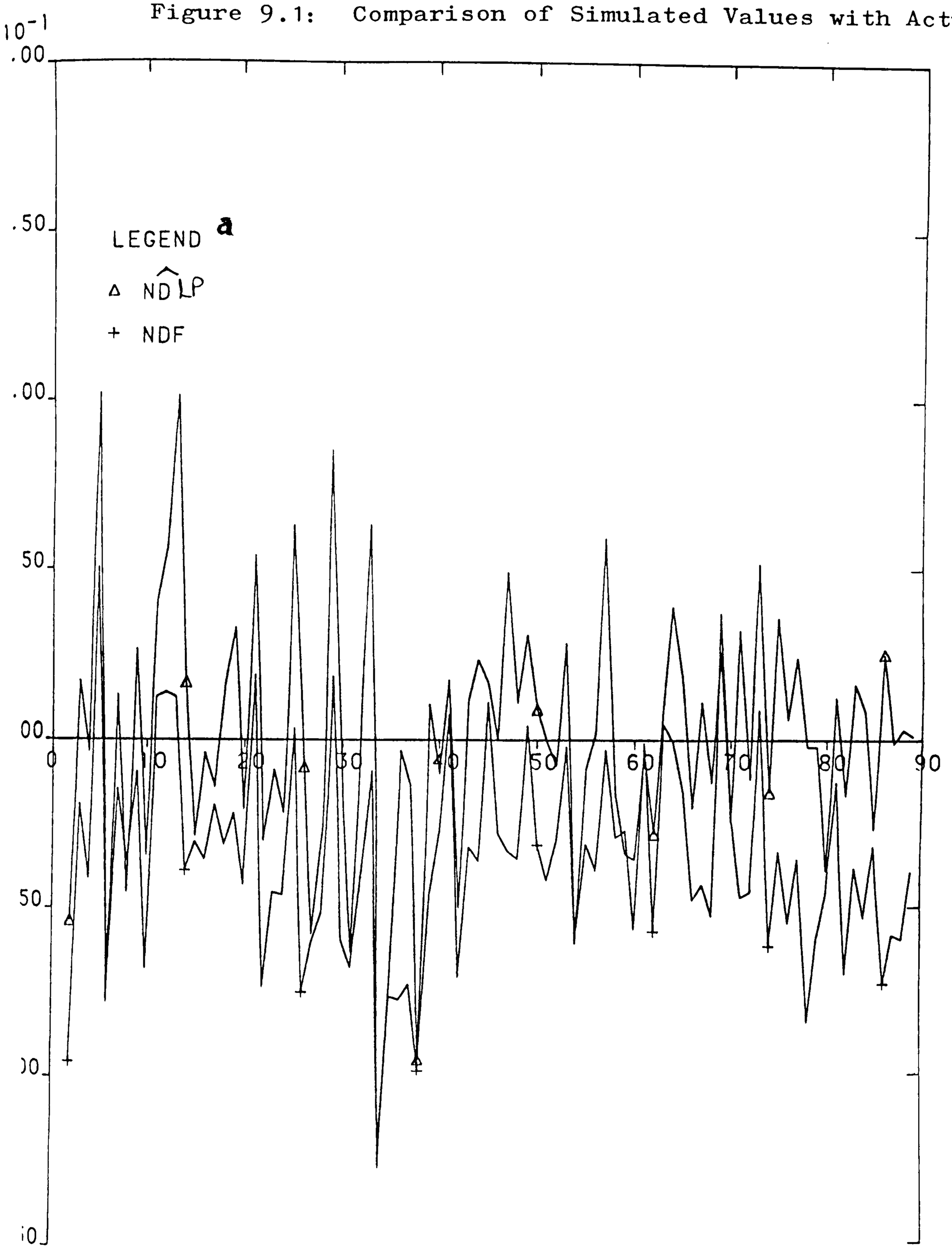
(c) MAE = mean absolute error

$$= \frac{1}{N} \sum_{t=1}^{N} \frac{Z_t^s - Z_t}{Z_t} \quad \text{and,}$$

(d) U = the Theil's inequality co-efficient.

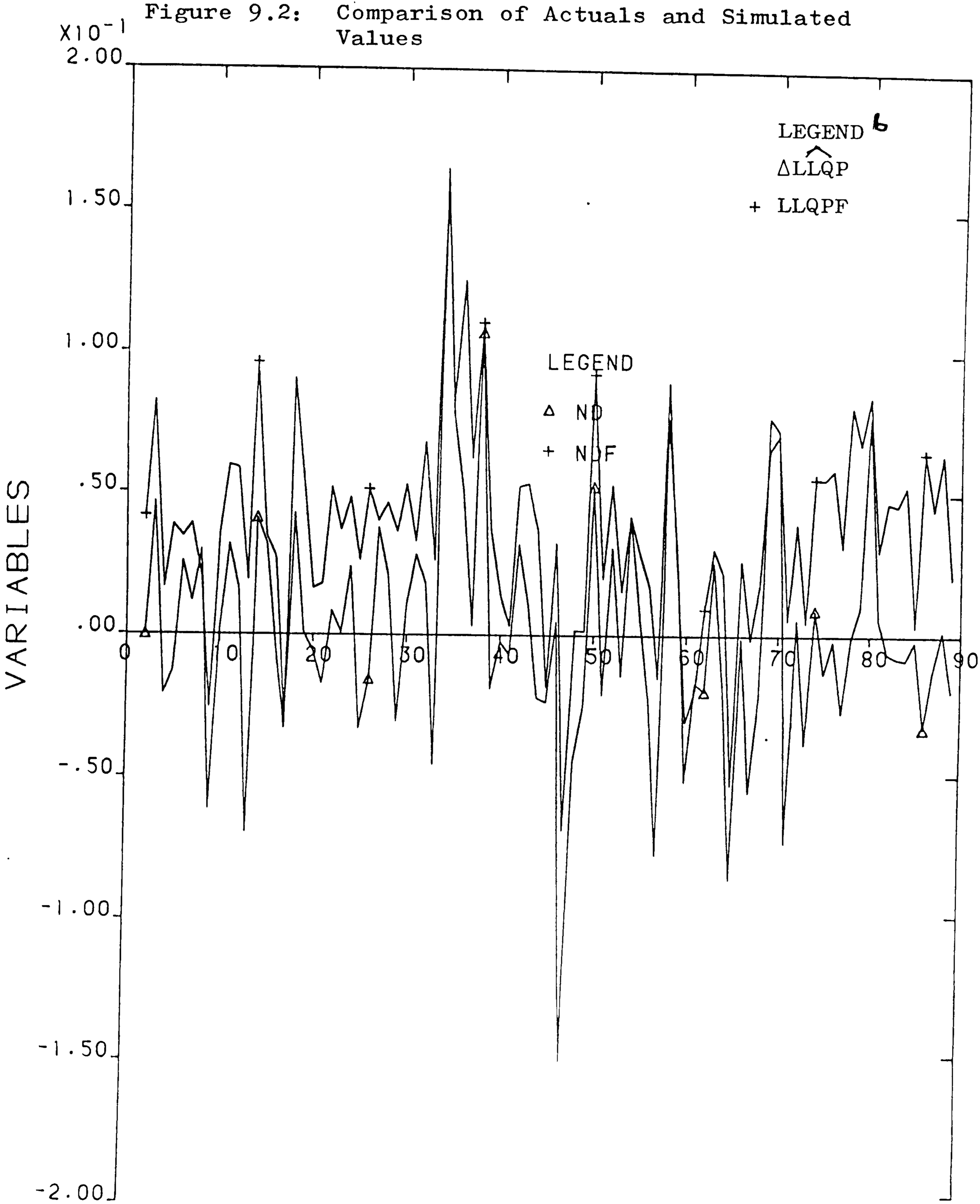
$$\frac{\frac{1}{N} \sum_{t=1}^{N} (Z_{it}^{s} - Z_{it})^{2}}{\left[\frac{1}{N} \sum_{t=1}^{N} (Z_{it}^{s})^{2}\right]^{\frac{1}{2}} + \left[\frac{1}{N} \sum_{t=1}^{N} (Z_{it})^{2}\right]^{\frac{1}{2}}}$$

Figure 9.1: Comparison of Simulated Values with Actuals



(a) $\widehat{\text{NDLP}}$ are actuals and NDF are simulated values

Figure 9.2: Comparison of Actuals and Simulated Values



(b) $\widehat{LLQP}$ are actuals and LLQPF are simulated values

that took place in each of the portfolios, our simulation can therefore be regarded as fairly good. In fact, this view is confirmed if one looks at figures 9.1 and 9.2 which plot the simulated value against the actual change in the portfolio. Looking at the figures, it appears that there is some measure of closeness of fit for the two cases. Although, whereas the $\Delta\hat{NDLP}$ tend to overhsoot, the $\Delta\hat{LLQP}$ tends to under-predict. Most of the turning points are, however, fairly matched by the simulation.

9.3 The Results

0.3.1 Descriptive Statistics of Variables:

Just like the last chapter, we present birefly some descriptive statistics of the variables used in this analysis to enhance the insight into the results that follow.

Table 9.4: Descriptive Statistics of Portfolio and Balance Sheet Items (including Variables).

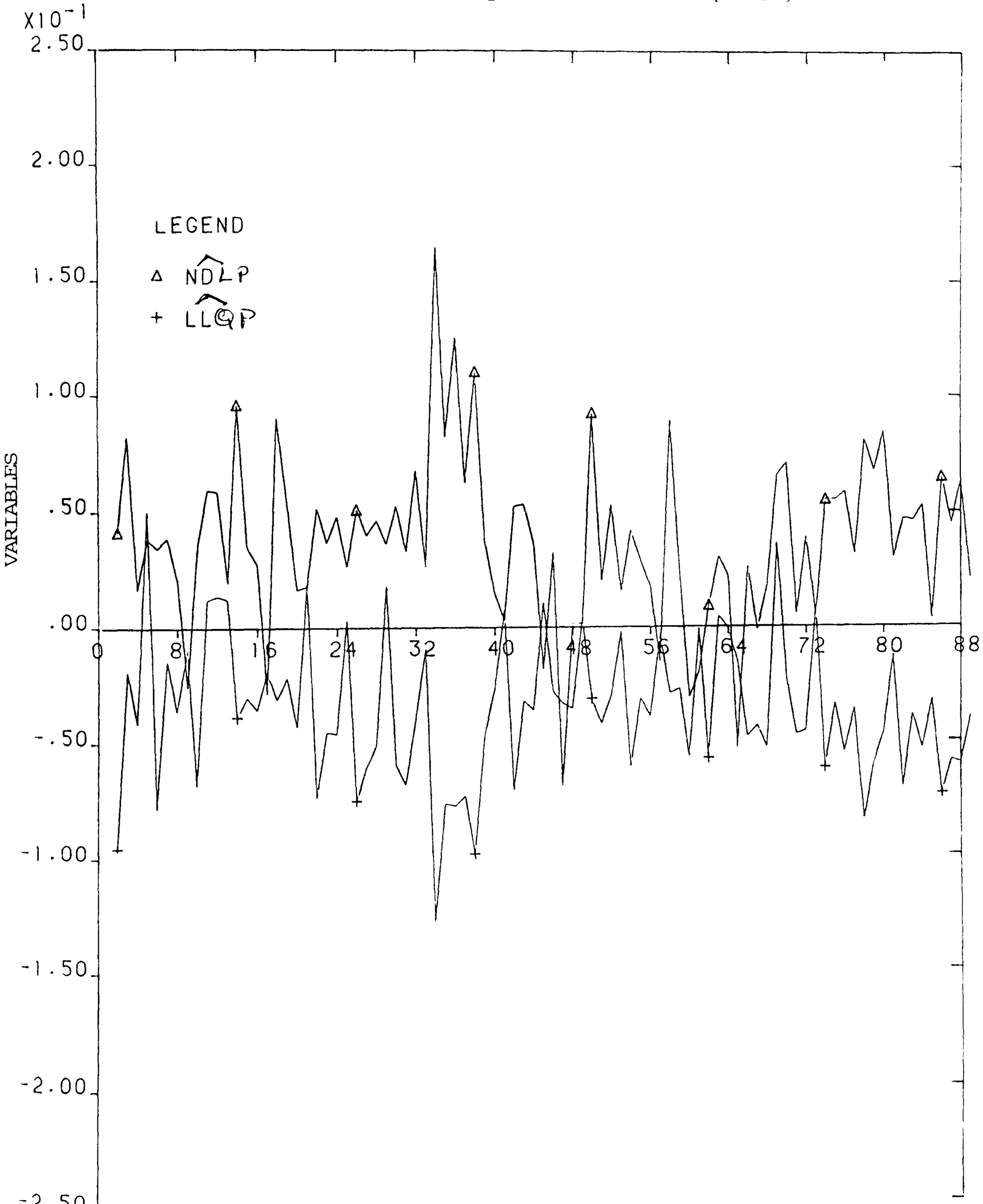
Variables	Mean of Variable	Standard Deviation of Variable	Relative Measure of Dispersion
	$\bar{X}$	S.D.	S.D./$\bar{X}$
$\widehat{NDLP}$	0.203	0.135	0.67
$\widehat{LLQP}$	0.422	0.092	0.22
$\widehat{NPC1}$	-0.646	0.053	-0.08
$\widehat{AGV}$	-0.624	0.098	-0.16
A1[a]	3.909	0.752	0.19
A2[a]	8.237	0.662	0.08

(a) These are average per cent rate of interest.

The averages and standard deviations are calculated over the entire period of our analysis, that is 1959.IV to 1981.IV.

Again, the information in table 9.4 is mainly to indicate the extent of activeness or the extent of volatility of the individual variables over the period of the analysis. Particularly the co-efficient of variations in table 9.3 indicates that out of our two broad category of choice portfolio, the portfolio of the more liquid assets $\widehat{NDLP}$ was more active than the less liquid portfolio, $\widehat{LLQP}$; in fact, it was more than three times as active. A similar picture also comes through from figure 9.3 which compares the variables over time. Again, the interest rate variables remain relatively stable around the means with little variation over time,

Figure 9.3: Comparison of Liquid Portfolio (NDLP) and the less liquid Portfolio (LLQP)



so also is net available funds at least when compared with the two deposit sources of funds from chapter eight.[7]

9.3.2 The Main Model:

In this subsection, we present the result of our main model, which deals with allocation of bank funds between broad categories of portfolio, specifically between the net domestic liquid portfolio, $\widehat{NDLP}$ and less liquid portfolio, $\widehat{LLQP}$. As was discussed in chapter six our starting point was to test whether the individual explanatory variables possess significant explanation different from its aggregate. In other words we asked whether it is necessary to include the individual variables separately or just their joint influences. We did this and performed a chi square specification test. The indication from the test was that the joint influence cannot explain the individual effects of the separate explanatory variables. (Table 9.8)..

Our main results are reported in tables 9.5 to 9.8. Table 9.5 indicates estimation of our main model without taking account of the civil war. Table 9.6 indicates the same result but allowing for the civil war to affect only the intercept term; and table 9.7 allows the civil war to affect both the intercept and some of the slope co-efficients. Our discussion is based on

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[7]The relative measure of dispersion for the non-interest earning deposit is 0.18, whereas for the interest earning deposit it is 0.13 and net available funds, it is 0.08.

Table 9.5A: Full Model Without War Effect

	A0	A1	A2	DR	$\widehat{NFA}$	$\widehat{NPC1}$	$\widehat{NUB}$	$\widehat{LG}$	$\widehat{RR}$	$Z_{1,-1t}$	$Z_{2,t-1}$	D2	D3	D4	MFP	IID	R^2	DW
$\Delta\widehat{NDLP}$	-0.003	-0.018	-0.005	0.010	-0.333***	-0.422***	-0.750***	1.582	-0.441***	-0.524***	-0.249***	-0.019*	-0.016*	-0.051***			0.58	1.69
	(-0.03)	(-1.44)	(-0.78)	(0.81)	(-2.73)	(-3.67)	(-6.13)	(1.24)	(-4.60)	(-7.16)	(-3.82)	(-1.98)	(-1.73)	(-5.27)				
$\Delta\widehat{LLQP}$	0.003	0.018	0.005	-0.010	-0.666***	-0.578***	-0.250**	-0.581**	-0.559***	-0.476***	-0.751***	0.019*	-0.016*	0.051***			0.71	1.69
	(0.03)	(1.44)	(0.78)	(-0.81)	(-5.45)	(-5.03)	(-2.04)	(-2.02)	(-5.83)	(-6.51)	(-11.51)	(1.97)	(1.73)	(5.23)				

Table 9.5B: Full Model with Real Sector Effect.

$\Delta\widehat{NDLP}$	-0.059	-0.017	0.002	0.008	-0.321***	-0.419***	-0.971***	1.711	-0.395***	-0.525***	-0.259***	-0.020**	-0.017*	-0.051***	-0.0001	-0.0002		
	(-0.53)	(-1.34)	(0.28)	(0.64)	(2.62)	(-3.64)	(-6.22)	(1.20)	(-3.82)	(-7.19)	(-3.95)	(-2.04)	(-1.74)	(-5.25)	(0.73)	(-1.46)	0.58	1.73
$\Delta\widehat{LLQP}$	0.059	0.017	-0.002	-0.008	-0.679***	-0.581***	-0.228*	-2.709*	-0.604***	-0.475***	-0.741***	0.020**	0.017*	-.051	-0.0001	0.0002		
	(0.50)	(1.34)	(-0.28)	(-0.64)	(-5.55)	(-5.06)	(-1.84)	(-1.90)	(-5.83)	(-6.51)	(-11.30)	(2.03)	(1.74)	(-0.73)	(0.73)	(1.46)	0.76	1.73

Table 9.6: Estimation of Dynamic Model with War Effect Incorporated in Intercept Term

	A0	A1	A2	DR	$\widehat{NFA}$	$\widehat{NPC1}$	$\widehat{NUB}$	$\widehat{LG}$	$\widehat{RR}$	$Z_{1,t-1}$	$Z_{2,6-1}$	D2	D3	D4	D7		R^2	DW
$\Delta\widehat{NDLP}$	-0.103	-0.018*	0.005	0.014	-0.522***	-0.677***	-0.878***	0.972	-0.590***	-0.762***	-0.521***	-0.019**	-0.015*	-0.047***	0.032**	871.283	0.66	1.78
	0.097	0.010	0.006	0.011	0.115	(0.115)	0.119	1.081	0.093	0.084	0.090	0.008	0.008	0.008	0.014			
	(-1.06)	(-1.69)	(0.76)	(1.29)	(-4.54)	(-5.87)	(-7.35)	(0.90)	(-6.31)	(-9.02)	(-5.76)	(-2.26)	(1.86)	(-5.69)	(2.36)			
$\Delta\widehat{LLQP}$	0.103	0.018*	-0.005	-0.014	-0.478***	-0.323***	0.122	-1.971*	-0.410***	-0.237***	-0.479***	0.019**	0.015*	0.047***	-0.032***		0.58	1.78
	0.097	0.010	0.006	0.011	0.115	0.115	0.119	1.081	0.093	0.084	0.050	0.008	0.008	0.008	0.014			
	(1.06)	(1.69)	(-0.76)	(-1.29)	(-4.16)	(-2.80)	(-1.02)	(-1.82)	(-4.38)	(-2.81)	(-5.30)	(2.26)	(1.86)	(5.69)	(-2.36)			

Table 9.7: Estimation Allowing for Shift in Intercept and Slope Terms

	A0	A1	A2	DR	$\widehat{NFA}$	$\widehat{DNFC1}$	$\widehat{NFC1}$	$\widehat{DNUB}$	$\widehat{NUB}$	$\widehat{LG}$	$\widehat{RR}$	$Z_{1,t-1}$	$Z_{2,t-1}$	D2	D3	D4	D7		R^2	D
$\Delta\widehat{NDLP}$	-0.044	-0.009	0.004	0.006	-0.439***	-1.011***	-0.575***	0.416*	-0.817***	-0.197	-0.566***	-0.693***	-0.491***	-0.019**	-0.015**	-0.047***	-0.514***	878.877	0.70	1.9
	-0.090	0.010	0.006	0.010	0.108	0.297	9.111	0.215	0.115	1.038	0.088	0;080	0.085	0.008	0.007	0.008	0.185			
	(-0.48)	(-0.94)	(0.67)	(0.62)	(-4.07)	(-3.40)	(-5.15)	(1.93)	(-7.08)	(-0.19)	(-6.42)	(-8.68)	(-5.78)	(2.55)	(-2.05)	(-6.12)	(2.78)			
$\Delta\widehat{LLQP}$	0.044	0.009	-0.004	-0.006	-0.560***	1.012***	-0.425***	-0.415*	-0.182	-0.802	-0.434***	-0.307***	-0.509***	0.019**	0.015**	0.047***	0.515***		0.62	1.94
	0.090	0.010	0.006	0.010	0.108	0.297	0.111	0.215	0.115	1.038	0.088	0.080	0.085	0.008	0.007	0.008	0.185			
	(0.48)	(0.94)	(-0.67)	(-0.62)	(-5.19)	(3.41)	(-3.81)	(-1.93)	(-1.58)	(-0.77)	(-4.92)	(-3.84)	(-6.00)	(2.54)	(2.05)	(6.12)	(2.78)			

Table 9.8: Estimation with Aggregated Independent Variables

	AO	A1	A2	DR	$\widehat{AGV}$	$Z_{1,t-1}$	$Z_{2,t-1}$	D2	D3	D4	R^2	DW
$\widehat{NDLP}$	-0.030	-0.001	-0.002	0.003	-0.701***	-0.650***	-0.581***	-0.025***	-0.022***	-0.056***	0.70	1.70
	(-0.59)	(-0.16)	(-0.29)	(0.35)	(-7.98)	(-7.56)	(-6.06)	(-2.89)	(-2.54)	(-6.36)		
$\widehat{LLQP}$	0.030	0.001	0,002	-0.003	-0.299***	-0.350***	-0.419***	0.025***	0.022**	0.056***	0.76	1.70
	(0.59)	(0.16)	(0.29)	(-0.35)	(-3.41)	(-4.07)	(-4.37)	(2.88)	(2.54)	(6.36)		

Log L(10) = 861.393

table 9.7. This is because of the significance of the movement from 9.5 to 9.7. However, presenting results of table 9.5 and 9.6 allows us to perceive the extent and direction of the war on our estimates.

Unlike the static results (chapter eight) table 9.7 indicates that there is complete lack of responsiveness of the broad portfolio allocation of banks to the interest rate variables. In other words, all the interest rate co-efficients were not significantly different from zero in the allocation of the banking system funds to their broad portfolios.[9] In addition the intercept terms were also not significantly different from zero. Although this is not strictly required by theory, the result is desirable since if all pre-determined balance sheet variables were zero, then the sum of the funds available for investment in choice set items would be zero. Under this situation, the holdings of individual choice set items might be expected to be zero.

Similarly, the variables included to reflect the existences of any feedback of the real sector economy proved insignificant. An

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[9]We wish to state the nature of care that needs to be taken in interpreting our results, especially because of balance sheet conditions imposed on the estimates. For instance, where $\alpha 11 + \alpha 21$ has to sum to zero the hypothesis necessarily implies that if $\alpha 11$, the estimate of $\alpha 11$ is not significantly different from zero, $\alpha 21$ also cannot be significantly different from zero. This condition was met throughout our estimation. The same was true of the other explanatory variables where the sum of parameter has to be unity. Therefore the test of no significant difference from zero on one parameter implies that the other has to be unity.

important reason may be adduced for this, our set of variables, that is the index of industrial production (IID) and the index of manufacturing production may not have been representative of the nature of the true influence of the real sector such that this model can capture. Furthermore, availability of quarterly index on gross domestic production should have been a better proxy.

The lagged dependent variables, $Z_{1,t-1}$ and $Z_{2,t-1}$ featured prominently in the explanation of the choice portfolio. In fact, they all possess the proper magnitude. Apart from the lapped value of each portfolio item being significant in explaining each item, the results also indicate a significant cross effect of portfolio items. Taken together as a block the parameter estimates of the lagged coefficients form the estimates of π_2 in equation 7.15. They therefore indicate the adjustment behaviour of the banking system. In the more liquid portfolio for instance, $\widehat{NDLP}$, with a co-efficient of -0.693, it seems that about 70 per cent of any discrepancy between actual and desired levels of $\widehat{NDLP}$ is made up within a quarter. At the same time adjustment of discrepancies is slightly slower within the less liquid portfolio. Over the same length of time only about 51 per cent of such discrepancy is made up. The difference in the adjustment process of the two broad categories of portfolio is, however, not surprising since one would expect the liquid portfolio to adjust more rapidly than the non-liquid portfolio. Furthermore, all the off diagonal elements of π_2, were significant which imply that there is significant cross effects from one portfolio

market affecting the purchase of the other. Again, the non-liquid portfolio tends to affect the holding of the liquid portfolio more than the lagged value of $\widehat{NDLP}$ does to $\widehat{LLQP}$.

On the other variables, as has been indicated earlier, the civil war was significant in affecting some of the slope coefficients as well as the intercept terms unlike the static model. Overall, as compared to the interest rates variables, available funds were most significant in explaining the allocation of funds to banks portfolio. Net foreign asset had the expected sign; it indicated that 44 per cent of an increase in banks' foreign portfolio holding is borne by the liquid portfolio, the remaining 56 per cent is borne by the less liquid portfolio.

As for net funds after allocation for reserves has been made ($\widehat{NPC1}$), the result indicates that its parameter estimates was significantly influenced by the civil war. The interactive effect of the civil war on this variable was proxied by $\widehat{DNPC1}$, $\widehat{NPC1}$ being a negative variable was itself significantly different from zero in its influence on the allocation of funds to the bank portfolio. Without taking the shift $\widehat{DNPC1}$ into consideration, the result indicates that 57.5 per cent of increase in $\widehat{NPC1}$ goes to increasing allocation of $\widehat{NDLP}$ the remaining 42.5 per cent goes to increasing the less liquid portfolio. However, if the shift due to the civil war is included the picture appears different. In this case, increase in net funds available leads to about 158.6 per cent increase in the holding of

liquid portfolio. In order to sustain this holding the banks are forced to draw down their holding of non-liquid assets by about 58.7 per cent. This is, however, not surprising since during the war investments fell and the demand for bank loans fell. This, coupled with the desire of the Monetary Authorities to direct the financial ability of the economy towards the financing of the civil war thus leaves no other avenue for the banks except that of moving into more liquid assets.[10]

However, contrary to the effect of $\widehat{NPC1}$, the net other assets $\widehat{NUB}$ was only significant in affecting the more liquid portfolio and its interactive term was barely insignificant. Although the co-efficient is correctly signed but without the interactive terms, the magnitute of the co-efficient seems perverse. Normally one would expect an increase in other assets to be much more depressing on the less liquid portfolio because of the nature and characteristics of the assets. However, since the other liabilities component of $\widehat{NUB}$ comprises mainly of sundry items and in our case this aspect seems to dominate the other asset aspect, it may therefore help in explaining its greater influence on the liquid portfolio. However, with the interactive effect of the war, the indication is more consistent with expectation, for instance, it indicates that 40 per

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[10]The banks were even induced and persuaded to hold various government bonds that were created then, particularly treasury certificates.

cent of an increase in $\widehat{NUB}$ would go to reduce the liquid portfolio, whereas 60 per cent would go into reducing the less liquid portfolio.

Public sector borrowing was not significant in banks' allocation of funds but required reserves were significant in reducing allocation of funds to the broad categories of portfolio. Finally, dummies were used to capture the effect of seasonality on the portfolio (D1 - D4). They were all significant. And as argued earlier, D7 was used to reflect shift in the intercept term as a result of the civil war, even though the intercept itself was not significantly different from zero, the indication from the result was that there was no significant shift of the intercept as a result of the civil war.

Even though we have discussed the results in terms of the individual regressors having any influence on the dependent variables, the peculiar nature of the balance sheet condition might make it more interesting if the significance of the regressors is exmained in terms of its average overall allocation to particular portfolios over the period. For instance, we know from table 9.4 that over the period, out of the total funds available for allocations to choice portfolio, 32.5 per cent was allocated on average to the more liquid portfolio and 67.5 per cent was allocated to the less liquid portfolio. From the same table, we also know that given the higher volatility the more liquid portfolio ($\widehat{NDLP}$) was more likely to contain extreme values than the $\widehat{LLQP}$. It would, therefore, be of interest to see how the measure of the marginal values over the regressors differs from the

average values. Using the same standard error the hypothesis is set up in such a way that the t values would be given as

$$t_c = \frac{\beta - \beta}{SE(\beta)} \quad [11]$$

where β are the parameter estimates in table A3 and

$SE(\beta)$ are their standard errors.

The t values for table 9.7 excluding the dummies and interest rate variables are reported in table 9.9.

Table 9.9: Indicating t values for the New Hypothesis.

$\widehat{NFA}$	$\widehat{NCP1}$	$\widehat{NUB}$	$\widehat{LG}$	$\widehat{RR}$	
-1.71	-3.06	-4.64	1.20	-2.85	$\triangle$NDLP
-1.71	3.06	4.64	1.20	2.85	$\triangle$LLQP

In fact, as can be seen from the table, apart from $\widehat{NFA}$ and $\widehat{LG}$ which were not significantly different from their average values, all others were. In such a case the results as disccused earlier stand.

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[11] where t_c is the computed student t statistic.

Furthermore, even though the Chow test did not reject our parameter constancy test, but because of the significance of the war dummy and the interactive effect of the war on the net available funds, we considered it insightful to drop out the war period and run separate regressions on the periods before and after the war. The results of the exercise are reported in tables 9.10A and 9.10B. The observable changes compared to the overall results was that the latter period seems more dominant on the overall results. In the earlier period, at least one interest rate, the average lending rate, was significantly different from zero. More of net available funds ($\widehat{NPC1}$) was significantly allocated to the less liquid portfolio. In the latter period, however, no interest variable had any significant effect on the allocation of funds, net foreign asset becomes volatile, the magnitude of the coefficient were inexplicablly high, whereas the holding of this asset should lead to a decrease in both choice items, the result indicates it led to over 300 per cent decrease in the holding of the more liquid choice set while this decrease is used partly to finance increase holdings of less liquid portfolio. Although our attempt to proxy the effect of the oil shocks on the portfolio behaviour of the banks proved insignificant, the only probable explanation of the magnitude and sign of the variable lies in the source of the $\widehat{NFA}$ which in recent times may have been more from the oil revenue from abroad. Another significant difference between the two periods is the relatively less significance of the effect of required reserves in the latter periods, particularly

Table 9.10A: Estimation of the Before the War Period

	AO	A1	A2	DR	$\widehat{NFA}$	$\widehat{NPC1}$	$\widehat{NUB}$	$\widehat{IG}$	$\widehat{RR}$	$Z_{1,t-1}$	$Z_{2,t-1}$	D2	D3	D4	R^2	DW
$\Delta NDLP$	0.578***	0.009	−0.047***	−0.003	−0.210***	0.140	−0.316***	−2.502**	−0.576***	−0.945***	−.004	0.008	−.019***	−0.028***		2.04
	0.193	0.012	0.017	0.007	0.058	0.095	0.096	1.015	0.175	0.123	0.052	0.005	0.007	0.008		
	(2.99)	(0.70)	(−2.75)	(−0.40)	(−3.61)	(1.48)	(−3.31)	(−2.46)	(−3.30)	(−7.62)	(−0.08)	(1.50)	(2.62)	(−3.60)		
$\Delta LLQP$	−0.576***	−0.009	0.047***	0.003	−0.781***	−1.138***	−0.684***	1.509	−0.427***	−0.054	−0.995***	−0.008	−0.019***	0.028***		2.05
	0.193	0.012	0.017	0.007	0.058	0.095	0.096	1.020	0.195	0.124	0.052	0.006	0.007	0.008		
	(−2.97)	(−0.70)	(2.73)	(0.41)	(−13.47)	(−11.99)	(−7.12)	(1.48)	(−2.44)	(−0.43)	(−19.01)	(−1.50)	(−2.61)	(3.60)		

Table 9.10B: Estimation of After the War Period

	AO	A1	A2	DR	$\widehat{NFA}$	$\widehat{NPC1}$	$\widehat{NUB}$	$\widehat{LG}$	$\widehat{RR}$	$Z_{1,t-1}$	$Z_{2,t-1}$	D2	D3	D4	R^2	DW
$\Delta\widehat{NDLP}$	-0.343***	-0.020*	0.001	0.010	-3.063***	-1.261***	-0.818***	1.657	-0.845	-0.858***	-0.554***	-0.000	0.002	-0.013		2.06
	0.108	0.011	0.005	0.012	0.864	0.146	0.248	1.447	0.083	0.089	0.167	0.009	0.008	0.009		
	(-3.18)	(-1.79)	(0.23)	(0.74)	(-3.55)	(-8.66)	(-3.30)	(1.14)	(-10.12)	(9.61)	(-3.31)	(-0.05)	(0.28)	(-1.48)		
$\Delta\widehat{LLQP}$	0.343***	0.020*	-0.001	-0.010	2.063**	0.261*	-0.182	-2.657*	-0.155*	-0.142	-0.446***	0.000	-0.002	0.013		2.06
	0.108	0.011	0.005	0.013	0.864	0.146	0.247	1.446	0.083	0.089	0.167	0.009	0.008	0.009		
	(3.18)	(1.79)	(-0.23)	(-0.74)	(2.39)	(1.80)	(-0.73)	(-1.84)	(-1.86)	(-1.59)	(-2.67)	(0.05)	(-0.28)	(1.48)		

on the less liquid assets. A number of reasons may account for this, the most important is in the increased reliance on direct tools of intervention as a means of influencing banks allocation of funds. This is particularly true of loans to the private sector economy which is the most important component of the less liquid portfolio. The second reason may be due to improved liquid position of the economy which may imply that reserve requirement becomes a non-binding constraint at least as far as the non-liquid portfolio is concerned.

It is also worth noting that the adjustment behaviour of banks differs over the period. Whereas before the war, about 95 per cent of the discrepancy between the desired NDLP and actual NDLP is made up within a quarter only about 85.8 per cent is made up over the same period of time for the same portfolio item after the war. It is even more glaring when one considers the less liquid portfolio. It was almost unity before the war, it dropped to about 45 per cent after.

Finally, seasonal effect was also less dominant over the banks portfolio behaviour in the latter period. Whereas, in the first period the co-efficients of D3 and D4 were significantly different from zero, in the latter period none was significant.

9.3.3 Sequential, Decomposition of Banks' Assets Demand.

In this sub-section we present the result of the next stage in our sequential process. In the last section, the indication from the results is that commercial banks in Nigeria tend to adjust to a greater extent their net domestic portfolio of liquid assets in response to changes in demand for a certain type of disposable assets and in response to changes in net available funds. In this section an attempt is made to examine factors explaining the components of the net domestic portfolio of liquid assets and the less liquid portfolio.

$\widehat{NDLP}$ portfolio consists of two main components, first excess reserve holdings, which consists of net balance on interbank trading as well as excess of cash and cash items due from transaction with the financial authority. As argued earlier, because these items yield little explicit income banks will attempt always to minimize their holdings of the items.

The other component of $\widehat{NDLP}$ consists mainly of banks' excess holding of money market instruments. They are characteristically interest earning instruments and because of their high liquidity content they count towards the reserve policy of banks. In fact, the instruments are all reserve elibible. Whereas the former provides the banks with funds to be used for transaction purposes and act as a means of synchronizing between their inflow and outflow

of funds without incurring substantial cost, the latter provides steady income and act as an insurance to minimizing the cost of reserve deficiency in times of scarcity of funds. It also counts as a measure of banks liquidity. Finally, in a less developed country like Nigeria, because the bulk of money market instruments consists of government short-term debt, the holding of this type of portfolio by the banks can serve to indicate the extent of inter-dependency of the banking system and Financial Authorities (deficit) budgetary policy.

However, the estimation of banks demand for these instruments was similarly constrained by the balance sheet condition as in the previous section. Thus, the independent variables include the relevant portfolio constraints, interest rates as well as lagged dependent variables and other exogeneous variables. Similarly, the portfolio of less liquid asset was also explained in terms of its constituent parts, inter and loans. Inter consist of Bills discounted and bank investment, the special characteristic of this type of instrument being the existence of a market in them. However, until very recently such opportunities die not exist. As argued in chapter six, they act mainly as buffers between the liquid portfolio of the banks and non-liquid portfolio, particularly loans and advances to the private sector, the second component of the portfolio.

Table 9.11: Estimation of Banks' Holding of Excess Reserves and Net Money Market Instruments.

	CONST	TR	DR	RRD	DSL-1	DTBL-1	DND	NDL	D7	T	R^2	DW
DSL	0.043***	0.009*	-0.012***	-0.029	-0.698***	-0.072**	-0.015	-0.057	0.003	0.000	0.42	2.09
	0.016	0.005	0.004	(0.025)	0.099	0.032	0.048	0.037	0.019	0.000		
	2.63	(1.83)	(-2.83)	(-1.15)	(-0.703)	-2.27	-0.31	(1.54)	(0.16)	(1.29)		
DTB	-0.043***	-0.009*	0.012***	-0.029	-0.302***	-0.928***	0.015	0.943***	-0.003	-0.000	0.93	2.09
	0.016	0.005	0.004	0.026	0.099	0.032	01048	0.037	0.019	0.000		
	(-2.63)	(-1.83)	(2.83)	(1.15)	(-3.05)	(-20.24)	(0.31)	25.60	-0.16	(-1.29)		

Table 9.12: Estimation of Banks Holding of Tertiary Assets and Loans Portfolio.

	CONST	B1	B2	DINTL-1	DLL-1	DQL	LQL	D7	T	R^2	DW
DINT	0.009	-0.007***	-0.004**	-0.504***	-0.006	0.127**	0.193***	0.044***	0.0002***	0.46	1.78
	0.020	0.002	0.002	0.068	0.046	0.062	0.038	0.022	0.00007		
	(0.45)	-2.75	(-2.19)	(-7.41)	(0.13)	-2.05	(5.13)	(2.03)	2.65		
DL	-0.009	0.007***	0.004***	-0.496***	-0.994***	-0.127**	0.807***	-0.044**	-0.0002***	0.97	1.78
	0.020	0.002	0.002	0.068	0.046	0.062	0.038	0.022	0.00007		
	(0.45)	(2.75)	(2.19)	-7.28	(-21.51)	(2.05)	(21.44)	(-2.03)	-2.65		

In setting up the regressions model for this stage, different interest rate variables were employed as the averaged rates used in the earlier stage performed poorly. In the components of the liquid portfolio, the treasury bill rate and bank's rediscount rate were used and in the analysis of the components of less liquid asset two rates were also used, B1, for prime lending rate and B2 for other advances. Furthermore, a trend term was included to capture the effects of development particularly in growth of domestic money market and the expansion of the banking system itself. As in the last section an attempt is made to capture the effect of the war on both the parameter estimates and the intercept terms. The results of the estimations are presented in tables 9.11 and 9.12.

As in the overall allocation the interest rates were relatively insignificant. The Bank's rediscount rate, however, was significant in the disbursement of funds between net money market instruments and excess reserve holding. Treasury bill rate was also barely insignificant. Reserves to deposits ratio (RRD) was not significant but the signs indicate that the higher the ratio, more of the banks liquid funds will be held in form of short term money market instruments rather than in excess reserves. The adjustment variables DSL-1 and DTB-1 indicate that the rate at which banks adjust within the liquid funds is higher than that obtained in the overall portfolio allocation. About 70 per cent of the net excess reserves is made up within the quarter, at the same

time about 93 per cent of discrepancy between the actual and the desired money market instruments holding is made up within a quarter, given that the overall allocation of funds has been made. The result also indicates there exist significant cross effects of excess reserve holding on the money market instruments and vice versa. Unlike the overall allocation, however, available funds was not significant in allocating funds between this two liquid portfolio given that the overall allocation has been made. The war effect was also insignigicant both in the intercept term (which was itself significant) and on the slope terms.

However, on the less liquid portfolio the war effects were significant on both the intercept terms and the co-efficient of funds available, LQL[12]. The trend term was also significant, although economically, its effect is likely to be very marginal. The pattern of adjustment within the portfolio also differs from the liquid portfolio. Given that overall allocation has been made, the loans portfolio adjusts faster than the portfolio of intermediate assets. This may be due to the nature of these assets, especially the fact that their maturity tends to be long and their yield controlled even though they can be considered safer than the loans portfolio in terms of risk.

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12 The effect of the civil war or its interactive term is represented by DQL.

9.4 A More Disaggregated Application.

Finally, to highlight the results from the study we estimated a form of the Tobin-Brainard model in which we assumed that funds are simultaneously allocated to four choice portfolio. These choice portfolios consist of excess reserve holding of banks, $\widehat{NSR}$; net money market instruments, $\widehat{TBCD}$; intermediate instruments consisting mainly of banks' investments and bills discounted, $(\widehat{INTER})$; and loans and advances to the private sector economy, L. The results of this estimation is presented in table 9.13.

Again, compared to the results presented earlier, the constant terms were insignificant; interest rate terms were also relatively insignificant except in the first portfolio, NSR. Availability of funds ($\widehat{NPC1}$) were significant over all the portfolio items. The civil war was also significant in altering the slope estimate of this term for $\widehat{TBCD}$ and loans and advances only. Compared to our other results, the war effect was also significant when the allocation funds has to be made into more than two broad category of assets. The sign and magnitudes of the adjustments were also proper. Seasonal dummies were not significant in affecting the excess reserve portfolio but they were significant in affecting others. Although public sector borrowing had the proper sign, it was not significant in any of the portfolios; whereas, required reserves was only not significant in the third portfolio term (Inter).

Table 9.13: An Estimation Using the Simultaneous Allocation

	CONST	AVDR	AVLNR	DR	$\widehat{NFA}$	$\widehat{DNPC1}$	$\widehat{NPC1}$	$\widehat{DUB}$	$\widehat{NUB}$	$\widehat{LG}$	$\widehat{RR}$	$Z_{3,t-1}$	$Z_{4,t-1}$	$Z_{5,t-1}$	$Z_{6,t-1}$	D2	D3	D4	D7	R^2	DW
ΔNSR	0.031	0.012**	-0.006*	-0.013***	-0.139***	-0.012	-0.113**	0.059	-0.029	-0.532	-0.098**	-0.846***	-0.002	-0.058	0.004	-0.004	-0.004	-0.003	-0.008	0.55	2.03
	0.044	0.005	0.003	0.005	0.052	0.145	0.054	0.106	0.058	0.497	0.045	0.106	0.042	0.073	0.053	0.004	0.004	0.004	0.089		
	(0.70)	(2.49)	(-1.92)	(-2.68)	(-2.67)	(-0.09)	(-2.09)	(0.55)	(-0.502)	(-1.07)	(2.16)	(-7.98)	(-0.36)	(-0.80)	(0.08)	(-0.95)	(-1.15)	(-0.72)	(-0.09)		
ΔTBCD	-0.077	-0.021	0.009	0.019	-0.301***	-0.997***	-0.459***	-0.351	-0.781***	0.340	-0.454***	0.081	-0.679***	-0.449***	-0.466***	-0.015*	-0.011	-0.044***	-0.507***	0.68	1.94
	0.103	0.011	0.007	0.012	0.124	0.343	0.128	0.251	0.137	1.179	0.107	0.251	0.100	0.172	0.125	0.009	0.009	0.009	0.212		
	(-0.75)	(-1.84)	(1.29)	(1.62)	(-2.43)	(-2.91)	(-3.596)	(1.40)	(-5.70)	(0.29)	(-4.24)	(0.32)	(-6.81)	(-2.60)	(-3.72)	(-1.66)	(-1.26)	(-5.09)	(-2.39)		
ΔINTER	-0.036	0.001	-0.005	0.001	-0.173***	0.303*	-0.164**	-0.111	-0.079	-0.193	-0.051	0.082	-0.072	-0.384***	-0.013	-0.006	-0.010**	0.001	0.155	0.44	1.00
	0.052	0.006	0.004	0.006	0.062	0.171	0.064	0.125	0.068	0.589	0.054	0.126	0.050	0.086	0.063	0.004	0.004	0.004	0.106		
	(-0.69)	(0.24)	(-1.30)	(0.19)	(-2.79)	(1.76)	(-2.57)	(-0.88)	(-1.16)	(-0.33)	(-0.95)	(-0.65)	(-1.44)	(-4.46)	(-0.21)	(-1.43)	(-2.36)	(0.24)	(1.46)		
ΔL	0.083	0.007	0.001	-0.007	-0.387***	0.708**	-0.264**	-0.299	-0.110	-0.165	-0.397***	-0.153	-0.247***	-0.108	-0.524***	0.025***	0.025***	0.046***	0.361*	0.62	1.99
	0.092	0.010	0.006	0.010	0.110	0.306	0.114	0.224	0.122	1.052	0.096	0.224	0.089	0.153	0.112	0.008	0.008	0.008	0.189		
	(0.90)	(0.74)	(0.19)	(-0.65)	(-3.50)	(2.31)	(-2.32)	(-1.33)	(-0.90)	(-0.58)	(-4.15)	(-0.68)	(-2.78)	(-0.70)	(-4.69)	(3.10)	(3.28)	(5.92)	(1.91)		

Overall, the direction of the results seem to be consistent with our earlier results. Although the R^2 was somewhat lower, some part of the low level of explanation can be explained by the first difference of the dependent variable. LIke our main model, the DW also indicate low values of in the equations.

CHAPTER TEN

CONCLUSIONS, SUMMARIES AND IMPLICATIONS

10.1 Introduction

This final chapter presents the conclusions and brief summaries on results and policy implications. The chapter is divided into five sections for this purpose; section 10.2 gives conclusions and implications derivable from the results on the interest rates variables; section 10.3 discusses the conclusions on the non-interest variables - the section is subdivided into three, sub-section (a) examines the conclusions on availability of funds, (b) the policy variables and (c) other balance sheet variables treated as explanatory variables; section 10.4 discusses other findings in terms of real sector variables, seasonality, banks' adjustments behaviour and other institutional factors; section 10.5 summarizes and examines other policy implications derivable from the study, and section 10.6 gives brief concluding comments.

10.2 Interest Rates: Conclusions and Implications

Overall, the study indicates that interest rates were less important than other variables in the portfolio behaviour of the banks. As argued earlier (Chapter Eight) this may be an indication of the predominance of risk averse behaviour over speculative behaviour by the banks. Furthermore, the relative insignificance of the rates of interest may be a reflection of possible divergence of regulated rates and the actual cost of funds to the banks. This may arise when there is a profitable opportunity for 'under the counter trading' in funds - a consequence of financial repression. However, the results of the two models used for this study for the effects of interest rates were consistent with one another. Although the static model indicates that some rates, particularly the deposit rate (R2), the money market rate (TR), and to some extent the bank's rediscount rate (DR) were significant in the banks' allocation of funds to some of the portfolios, within the dynamic model, the average deposit rates, the average lending rates and the bank's rediscount were insignificant in the overall allocation of funds to the broad portfolio categories. However, within the dynamic analysis, once the overall allocation to the choice portfolio has been made interest rates (deposit rates, money market rates and lending rates) become significant in allocating funds to the components of the broad category of portfolio, net domestic liquid portfolio (NDLP) and the less liquid portfolio (LLQP).

However, in spite of the lesser importance of the rates, the overall indications from both analyses seem to suggest that the influence of rates and yields on banking portfolio behaviour, particularly in the allocation of funds to their choice portfolio, cannot be discounted. This is so despite the fact that the current

policies in the country with respect to interest rates seek to control both the structure and movements of the rates. This conclusion follows from the joint significance of the rates in both of the models employed. Interest rates were shown to be jointly significant in the banks' allocation of funds.[1]

Individually, the results did not give us much to rely upon with regard to the interest rates implication for policy. For instance, while the deposit rate was shown to be significant in banks' holdings of excess reserves and net money market instruments, the sign of the rates over both analyses was disappointing for the loans portfolio. As argued earlier, while we would have expected high deposit rates to penalize the holding of loans, the results showed the reverse. However, we must be sceptical of this result and question whether in a normal situation holdings of loans portfolio would increase in these circumstances. However, in the Nigerian situation the perverse nature of the results is not totally surprising since the rates sometimes hardly vary over a substantial length of time and the spread between the rates and lending rate hardly reflect the opportunity cost of transforming deposit funds into income earning assets of the banks (particularly bank loans).

However, deposit rates and the money market rates were important in indicating the role of the short maturing assets in the portfolio

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[1] In fact the hypothesis that interest rates can be excluded from both types of estimation was strongly rejected, using the same likelihood ratio test as in chapters eight and nine.

behaviour of the banks. For instance, among the very short maturity portfolio, these rates indicate that net money market instruments are substitutes.

In both the static and dynamic analyses, the money market rate was just insignificant in affecting the allocation of funds to money market instruments. But this rate was shown to be important in banks' holding of other investments portfolio (a substitute of banks' holding of money market instruments). In fact, it was also significantly important in allocation of funds to the banks' loan portfolio and the excess reserve holdings of the banks. For a better appreciation of the direction of influence of this rate table 10.1 indicates that a 1% change in the rate would lead to a change in the same direction of 0.9 per cent in the proportion of funds allocated to excess reserves, while the change in net money market would be 3.7 per cent. But the increase in the short-term instrument is almost completely financed by drawing down the holdings of the loans portfolio to the tune of 3.6 per cent, the rest coming from 1.5 per cent drawing down of the proportion of funds allocated to other investments ($\hat{OI}$). The important conclusion derivable from this result is that any financial authority's policy which tries to increase banks' holding of money market instruments by increasing the yields of the instruments can only succeed at the expense of corresponding decrease in banks lending to the private sector. In other words, an increase in money market rates is likely to lead to increase banks' holdings of short-

Table 10.1: Proximate Effects of Policy Instruments on Banks' Portfolios[2]

Ceteris Paribus Change		$\hat{NSR}$	$\hat{TBCD}$	$\hat{BD}$	$\hat{OI}$	$\hat{L}$
A. Non-Interest variables		(proportional change induced in portfolio item)				
Non-Interest Deposits ($\hat{ND}$)	N1 million	0.165	-0.24	0.401	0.029	0.645
Interest Bearing Deposits ($\hat{SS1}$)	"	0.171	0.267	0.319	-0.046	0.289
Required Reserves ($\hat{RR}$)	"	-0.099	-0.174	-0.136	0.054	-0.644
Public Sector Borrowing ($\hat{LG}$)	"	-0.555	-0.958	-1.364	1.461	0.415
Capital plus Reserve A/C ($\hat{CRS}$)	"	0.037	-0.366	0.288	-0.062	1.101
Net Foreign Assets ($\hat{NFA}$)	"	-0.204	0.373	-0.432	-0.042	-0.695
B. Interest Rate variables		(Percentage Change)				
Deposit Rate (R2)	1%	0.7	-2.8	-0.6	0.4	2.3
Money Market Rate (TR)	1%	0.9	3.7	0.5	-1.5	-3.6
Bank Discount Rate (DR)	1%	-1.5	-0.8	0.2	0.9	1.2
Prime Lending Rate	1%	-0.5	-1.8	0.9	-0.4	1.8

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[2]This table is derived from table 8.1A and the notations are defined as follows:

$\hat{NSR}$ stands for net excess reserve holdings of banks

$\hat{TBCD}$ stands for net money market instruments

$\hat{BD}$ stands for Bills discounted

$\hat{OI}$ stands for Other investments

$\hat{L}$ stands for loans and advances to private sector economy.

term instruments and the reduction of banks creation of credits other things being equal.

Furthermore, the prime lending rate and other advances rate were unfortunately not as significant as expected across the two models. The only exception for these rates was on the components of the non-liquid portfolio in the dynamic analysis. However, the signs and magnitude of the rates provide some insights for the concluding comments on them. Even though the magnitude of response is low, the rates do have positive effects on the loans portfolio (table 10.1). In fact, if the banks' procedures are sequential, as hypothesized in this study, then once the overall allocation has been made to the broad categories of portfolio, the lending rates become importantly significant in the allocation of funds to the components of the non-liquid portfolio. Thus, the banks are likely to increase their proportion of funds that goes into the non-liquid portfolio and particularly the loans portfolio as the lending rate and other advances rates rises. It is, however, interesting to note that the effects of the prime lending rates and other advances rates are not complementary over all the portfolio as in the loans portfolio. In fact, if the rates move together, the study indicates that the effect of the movements would be compensatory on banks' holdings of excess reserves and bills discounted, whereas they will be complementary on other portfolios [tables 8.A1, 9.6].

Finally, the Bank's discount rate which can be regarded as an important instrument of policy for the financial authority, although significant at least in the net money market instruments and loans portfolios,the signs were however perverse. Thus, we are unable to derive solid conclusions from its results because of inconsistency in terms of signs. This is, however, not surprising since the rate is heavily regulated. This emanates from the belief of the authority that the rate is related to the rate at which government borrows from the financial system.

In concluding on the rates of interest and the yields, it is useful to note generally that even when they are significant banks' response to changes in rates in Nigeria tend to be relatively inelastic, except for the relatively short term and secured portfolios of excess reserves ($\widehat{NSR}$) and other investments ($\widehat{OI}$). In fact, the low elasticity indicates that even if rates like the discount rate had turned up a consistent result, it should still have been regarded as a weak policy instrument because of the expected response to the rates as a result of changes in the rates. The inelasticity of the rates was irrespective of whether the study is conducted in terms of static or dynamic models and whether the study is conducted in terms of proportional allocation of banks' funds or otherwise.

In terms of responsiveness of choice portfolio items, the greater responsiveness of the net excess reserves ($\widehat{NSR}$) and the other

investments ($\widehat{OI}$), portfolio indicates that these choice items act probably as buffers in the portfolio of the banks. This would not be surprising since the other investment portfolio could be a natural buffer between the loans portfolio (a non-liquid but more income generating) and the short-term portfolios (less income generating but liquid). $\widehat{OI}$ is mainly an intermediate item between loans' portfolio and net money market instruments. Moreover, it is relatively safe and a steady market is already developing for the components of the portfolio, particularly since the establishment of the Stock Exchange in Nigeria. On the other hand, the greater responsiveness of the net excess reserve holding of the banks can be explained by the structure of the Nigerian economy itself, particularly the shallowness of the money market makes it less responsive to meeting sudden demands on the banks and the unavailability of instruments to absorb shocks. These and the fact that government-induced instruments such as treasury bills and treasury certificates can be irregular make excess reserve holdings a more dependable form of buffer for the banks.

Finally, banks' response to changes in rates also seem to depend to some extent on liquidity . For instance, the least responsive portfolio of the banks seems to be the loans portfolio. Although it should be noted that this portfolio is not only distinguished by its liquidity characteristics it is also distinguished by its risk characteristics; the latter can be very important for the Nigerian situation. Compared to other works, particularly Parkin [1970],

White [1975] and Clinton [1976], the Nigerian banks' portfolio behaviour were less responsive to changes in interest rates. They also showed a greater liquidity preference than the banks from these developed countries.

10.3 Non-Interest Variables: Conclusions

The direction of influence of the non-interest variables is examined here under three main headings: those that (a) measured the influence of availability of funds, (b) those that measured the influence of policy variables and (c) those that are regarded as disposable assets.

(a) Availability of funds was shown by the results to be relatively more important than the interest rates factors in explaining the allocation of banks' funds to the choice portfolio. This general conclusion is irrespective of whether one is concerned with the static model or the dynamic model. In fact, the results of both models are complementary in that in addition to the aggregative results of the dynamic model, the static model enabled us to disaggregate the influence of the explanatory variable according to its respective constituents and over choice portfolio items.

Apart from the overall effect of available funds on banks' portfolio behaviour, the influence can also be examined according to the source of the fund. Generally, the effect of availability

of funds was shown to be significantly affected by the civil war. The liquidity preference of the banks was shown to have been increased by the civil war. For instance, it was shown that 160 per cent of an increase in available fund went to financing the liquid portfolio while the deficit came from drawing down banks' non-liquid assets, particularly the loans' portfolio. Even without the war effects, it was still shown that overall 57.5 per cent of an increase in available funds was applied by the banks to the financing of the liquid portfolio.

The high liquidity preference of the banks during the civil war was not much of a surprise, since government policy coupled with the greater level of uncertainty that existed then might have encouraged the banks' posture. In fact, a substantial proportion of the war effort was financed through the issue of short-term government debts which were often placed through the banks. These conditions may have made lending to the private sector unattractive to the banks.

However, apart from the civil war effect, the higher liquidity preference displayed by the banks over this period seems a bit disturbing. For instance, a scrutiny of the constituent components of available funds to the banks over the period of the analysis indicates that 44.6 per cent of available funds was due to non-interest bearing deposit and about 47 per cent was due to interest bearing deposits. The others came from capital plus reserves account and banks medium to long-term borrowings. If, for simplicity we regard savings and time deposits as medium to long-term funds, then it is

clear that well above 50 per cent of banks' available funds was made up of medium to long-term funds. Although simplified, a more positive term transformation than the one observed in this study should indicate a greater application of funds to the less liquid portfolio than what the study has shown. It is our belief that the nature of the underlying sources of funds can make possible this type of term transformation of funds by the banks. Again, as argued earlier, it appears that the banks emphasized liquidity over a more income generating approach in their portfolio allocation of funds over the period.

Furthermore, a consideration of pre- and post-Nigeria civil war indicates that banks' behaviour has changed over time. For instance, before the civil war a greater proportion of available funds was used to finance the non-liquid portfolio [Table 9.10A], whereas after the civil war the situation was completely reversed [Table 9.10B]. A number of reasons may explain the post civil war application of funds by the banks. The first is the extent of saturation of the economy by the inflow of funds as a result of the monetization of oil funds. This may have led to a situation where the opportunity for private sector lendings of the banks fizzled out and the banks were therefore forced to hold funds in the liquid portfolio. Secondly, as will be discussed later, during this period the financial authority relied mainly on direct controls as a means of influencing the portfolio behaviour of the banks. It is not unlikely that the response of banks to these sets of policies was negative, especially with regard to term transformation.

As to the banks' preference between different sources of funds, especially in application to particular types of portfolio, no clear conclusion emerges from the study. It seems, however, [Table 8.6 and Table 8.A1] that banks are more responsive in applying funds to the excess reserve portfolio than to the less liquid portfolio (their responsiveness in applying the interest earning deposits ($\hat{SS1}$) was, in fact, greater than for the non-interest bearing deposits). One reason for the marginal difference observed on the two sources is likely to be the similarity of the sources in terms of their volatility [table 8.1]. The result also confirms the importance of banks' capital [Pringle, 1975] in terms of banks' lending to the private sector economy.

(b) Policy variables: The study enabled us to draw some conclusions on two important tools of monetary management in the country; although in recent times the authority has relied on tools of direct control. Of the two examined, required reserves appeared more important in terms of the significance than public sector borrowing from the banks. Required reserves was consistent in affecting the behaviour of the banks in the same direction whether one is considering the pre or post-Nigerian civil war. However, public sector borrowing tends to have the greater incidence on banks' lending to the private sector economy. In other words, public sector borrowing tends to crowd out banks' lending to the private sector rather than affecting banks' holding of short-term instruments. The study also shows that in a country like Nigeria,

where there is no open market operations' facility and where the bank rate is as inelastic as shown earlier, then bank reserve requirements can be an effective way of influencing the portfolio behaviour of the banks.

(c) Other Balance Sheet Items:

Two other important balance sheet items were separately considered in this study, because of their importance for the portfolio behaviour of the banks. The more important of the two was the net foreign asset item of the banks ($\widehat{NFA}$). This item was significant and important in constraining banks' allocation of funds to choice portfolio over the period whereas the second item, net other asset ($\widehat{NUB}$) was more important in affecting significantly the banks' allocation of funds to liquid assets. Institutionally NFA is similar in the Nigerian context to prior claims; they are largely trading balances held as a result of the private sector economy's demand for foreign transactions. It is, therefore, important to observe that the greater influence of the variable is on banks' lending to private sector. This result is irrespective of which model one adopts, thus the greater the net foreign asset of banks, the lesser the amount of funds that the bank would make available to private sector lending compared to other short-term bank activities. This conclusion points to an important implication, and that is that despite government policy which seeks to insulate the economy from the external economy, banks' allocation of funds to choice portfolio items are still not independent of

their external trade balance. Similarly, the predominant influence of net other assets on short-term items of portfolio must be due to the fact that out of the two main components of this item (other assets and other liabilities), other liabilities was more pre-dominant, and this item was made up of banks short-term liabilities (like sundry items, managers involvements, etc.). Net other asset has also an important effect on banks' loans. In recent years banks in Nigeria have expanded their branches, they have correspondingly expanded their other assets, except during the civil war; this has not led to reduction in the proportion of funds allocated to the less liquid portfolio. This may be construed as a success for the authority's policy which makes it mandatory for the banks to increase their branch offices according to some desired target of the financial authority.

10.4 Real Sector Variables, Seasonality, Adjustment Behaviour and Other Institutional Factors.

In terms of real sector influence, our approach was not justified by the study. Basically, we took real sector variables to be exogenous. Given the fact that long lags occur between changes in the financial system and their effect in the real sector, we believed that this procedure would be tenable for short run analysis; although we realised that for long term study our models should incorporate real sector feedbacks. This should have involved more detailed and complex models of the whole financial sector than those used in the study.

The adjustment behaviour implied by our study was also interesting in that the lags were shorter than normally held notions about the response of economic agents in LDCs (although studies that have considered the response of economic agents in this way have been restricted to demand for money studies, for instance, Adekunle, 1968; Khan, 1977; Wong, 1977 among others). Again, in considering the lag response of the banks, it was shown that there is considerable difference between post-war adjustment patterns and those before the civil war. Whereas the pre-war adjustment pattern was almost instantaneous,[3] in the post-war period adjustment was slower and more of a reflection of average pattern of adjustment captured by our overall analysis. [It is possible that the shorter lag of the pre-war years is a result of the minimal controls in force during the period, in which case the results could be interpreted as indicating that a more flexible policy (less controls) is likely to make financial policy more effective].

Overall, the study shows that the liquid portfolio of the banks tends to adjust faster from dis-equilibrium situation than the less liquid portfolio. The pace of banks' adjustments from a dis-equilibrium position in one market is not unaffacted by disequilibrium on another market. In other words, if the sequential procedure

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[3] This might be due to the quarterly nature of our data in which case this result is an indication of a lag response shorter than the 3 months implied by the quarterly data.

accurately reflects the procedure actually adopted by banks then adjusting from disequilibrium from one market is not independent of the extent of disequilibrium in the other asset market. This viewpoint was also confirmed by the more disaggregated approach adopted at the end of Chapter Nine, at least for some portfolios, particularly between net money market, the portfolio of intermediate instruments and the loans portfolio.

Finally, other factors that need brief comments here include the role of seasonality on banks' allocation of funds in Nigeria. Nigeria is a country of festivities, because of its multiplicity of religions, and this is shown in the strong significance of the seasonal dummies. The dummies were, however, more significant in the loans portfolio than the other portfolios; the consistent positive sign of the coefficients indicates that the seasons tend to increase the proportion of funds allocated by the banks to the portfolio. Although not significant, the consistent negative sign of the co-efficients of the dummies for the short-term assets, particularly the net money market instruments, indicate that the seasons increase the chance of the banks drawing down their short-term assets to meet increased demands for credit by the private sector economy. This situation is particularly shown to be more evident during the fourth quarter of the year by our study; of course, this period includes the Christmas and New Year festivities.

We also seem to have been justified in classifying loans and advance to the private sector as a choice item, as the study showed. This justification is based on the evidence produced by the study, with respect to the response of banks' loans portfolio to the various policy instruments and interest rates, as well as by the term transformation implied by the spectrum of assets within the banks' portfolio. Furthermore, in situations where credit control is the order, it is doubtful whether banks would be as 'accommodating' as implied in treating banks' loans as completely exogenous.

10.5 Summary and Other Implications of the Study.

The purpose of the study has been to examine empirically some aspects of commercial banks' portfolio behaviour in Nigeria. In doing this, however, we were constrained by lack of data on individual banks. Nevertheless, the study has achieved one of its main objectives, that is to provide a basis for further understanding of the process of portfolio and debt selection by commercial banks in a country like Nigeria. Furthermore, we have shown that analytical tools used to study advanced systems can be modified and applied to studying an LDC in such a say as to provide some of the information on the relation of financial policy and the banking system which is needed.

The two models used in the study are largely complementary. While the dynamic model was aggregative, it provided insights on the adjustment behaviour of the commercial banks, and provided a handy

tool for the analysis of banks' behaviour, given the extent of data availability. The results of the sequential analysis were not only consistent with the simultaneous approach to portfolio allocation of banks, but were at the same time complementary with the static analysis.

Overall, the results indicate that it is preferable in this type of study to enter the various prior claims separately rather than aggregatively. Each item possessed a particular influence on banks' behaviour, that could not be captured by aggregation.

Uncertainty seems to have played a major role in the portfolio choice of the banks, particularly since the civil war. For instance, as argued earlier, the banks' was more in tune with risk averse than speculative behaviour. There are, however, slight differences between the periods, pre and post-Nigerian civil war. For instance, the interest rate was more important in banks lending in the pre-war than post-war period, possibly because of the relatively flexible control system in the former period. This may be an indication that, rather than administratively stipulated rates as obtained now, a less restrictive control system can increase the predictability of banks' portfolio behaviour and can also increase the opportunity for monetary and financial control.

This brings us to the stance of the Authority on interest rate policy, which has concentrated mainly on economizing the interest cost of government debts. It is possible, according to this study,

that such a policy has reduced the scope of monetary and financial management, especially as policies so far have failed to induce the banks to reflect the cost of acquiring funds in their allocation of funds to the choice portfolio. Unfortunately the level of aggregation did not permit us to evaluate directly the performance of the main tool of government policy in the past few years, credit control and credit ceilings. However, this study does show some of the indirect implications of these policies for the portfolio behaviour of the commercial banks. While it can be argued that where the cost of funds is less important than availability of funds, as the study has shown, control types of policy are called for. Nevertheless, they need to be tempered with policies which take account of cost and efficiency in the application of banks' resources. The pre-dominant reliance of the authority on credit control and credit guide-lines at the aggregative level have failed to change the preference of the banks for liquidity.

In fact, since this type of policy was more prevalent since the civil war, our study indicates that the policy might have contributed to the lower responsiveness of the banks to lend to the private sector.[4] However, another contributory factor which may explain the underlying preference of the banks since the civil war, is structural deficiency in terms of the absorptive capacity of the economy [Cochrane and Struthers, 1983]. If this explanation is true

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[4] This is not to say that credit controls and guidelines to the banks have failed to change the composition of loans of the banks; in fact, studies like those of Adewunmi [1981] and Nwankwo [1980] did show that policy has succeeded in changing banks' composition of loans.

then the observed preference of the banks may be due to lack of viable opportunity.

From the analysis in chapter five we have seen the position of the banks both as active participants and promoters of the money market, and the empirical study is also consistent with this position. It showed that in addition to the banks being important in the market, the market was important in the portfolio adjustment of the banks. The greater willingness of the banks to hold money market instruments, as shown by the study, is an indication of the role of the instruments in banks' portfolio adjustments and financial policy. Since the response of this type of portfolio items [$\widehat{NSR}$, $\widehat{TBCD}$, $\widehat{OI}$ and to some extent $\widehat{BD}$] to changes in policy instruments is higher than other portfolio items, they provide a more certain transmission mechanism for policy. The financial authority should therefore continue its present role of helping to promote the growth of the market and to extend the range of instruments traded.

Our study also holds important indirect implications for the process of the money supply. For instance, as this study has shown, the commercial banks' demand function for money market instruments (which consist to a large extent government debt) and to some extent private debts are very important because of the extent of their holdings of these key assets; knowledge of the behaviour of these banks are essential for the precise control of the money stock. The knowledge of adjustment patterns, of lags

in response to policies and of the elasticities of portfolio response to important policy variables are important to policy-makers in order to be able to determine the type and dosage of policy. Information in respect of these issues has been provided by this study, most of which is suppressed in the simple multiplier approach to money supply determination.

Finally, another implication which seems to emerge from this study is the fact that the Nigerian banking system as it operates presently seems geared more towards the financing of the government deficit than the private sector, and the creation of money market instruments by the authorities has, to a large extent, altered and enlarged the portfolio structure of the banks and their liquidity behaviour over the period.

10.6 Concluding Comments

In carrying out this study, we were handicapped, not so much by the lack of a theory upon which to base our study, but by the lack of the requisite data upon which a more qualitative study can be based. For instance, we have not touched upon many qualitative and interesting issues such as:

(i) the problem of size of institutions in relation to policy,

(ii) the relation between the so-called foreign owned and indigenous owned banks,

(iii) indigenization and banks' operations in relation to their portfolio behaviour,

(iv) bank customer relations.

In this respect, the study is certainly deficient.

In conclusion, while we hope this study has contributed towards increased understanding of the issues of banks' portfolio behaviour in LDCs in general, we hope also that it has contributed to knowledge about the operations of the banking system in Nigeria and its relation to public policy, with a view to improving the basis for formulating a more effective monetary and financial policy.

However, to develop this kind of work further, more disaggregated research, using disaggregated data is called for. In as much as further research would benefit the system eventually, without jeopardizing the commercial ability of the banks and their private operations, the authorities need to make provision for greater availability of data on the financial sector, especially at the firm level. In Nigeria in particular, further research needs to be directed towards evaluating the effectiveness of the credit allocation policy of the financial authority. Similarly, to provide an appropriate picture of the effect of the real sector on the banking system, there is a need to direct further research to the study of the portfolio behaviour of the household sector of the economy. Without studies of this type, it will be difficult to provide a complete evaluation of monetary and financial policy for Nigeria.

Appendix 2.A: Bank's Deposit Liabilities and Insolvency.

Let us consider a bank with a given (beginning of period) level and structure of assets Yo. Its income, Y from these assets for the decision period is known a priori in probabilistic form only with estimated density function. $\Phi(Y)$, partly due to default risk and partly due to (end of period) interest rates and asset prices. $\Phi(Y)$ is assumed dependent on volume and structure of the asset portfolio. The bank issues an amount of deposits D (= debt), and promises to pay interest i_d on the deposits. The bank's end of period indebtedness can be expressed as

$$D\ (1 + i_d) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 1.A.1$$

At the end-of-period, if its assets A + Y are less than its end-of-period debts, 2.A.1, the bank finds itself with a negative end-of-period net worth, that is in a state of insolvency. The condition for this to occur can be expressed as

$$A + Y - D\ (1 + i_d) = (Y - i_d D) + (A - D) < 0$$

which is the same as

$$Y < D\ (1 + i_d) - A \equiv \hat{Y} \quad \ldots\ldots\ldots\ldots\ldots \quad 2.A.2$$

The probability of this event occurring is positively related to the size of D and negatively related to net worth. For simplicity if we define Ω as cost per unit of deficiency and Y as defined above,

$\hat{Y} - Y$ as the size of the capital deficiency, the expected cost of insolvency, INS then can be expressed as

$$INS = \int (\hat{Y} - Y) \, dY$$

The bank's optimal decision with regard to its liability structure involves balancing INS against the cost of using equity capital rather than deposit funds.

Appendix 4A

$$Z_1 = {}^1/c\ G\ \hat{X}_1 - G\sigma_{12}^{\mu} Z_{12} - Hi_2' Z_{12} \quad \text{.....} \quad 4.A.1$$

$$\text{where } G = \sigma_{\mu}^{11} - \frac{\sigma_{\mu}^{11} i_1 i_1' \sigma_{\mu}^{11}}{i_1' \sigma_{\mu}^{11} i_1} \quad \text{.....} \quad 4.A.2$$

$$\text{and } H = \frac{\sigma_{\mu}^{11} i_1}{i_1' \sigma_{\mu}^{11} i_1} \quad \text{.....} \quad 4.A.3$$

Since σ_{11}^{μ} is a covariance matrix, it can be deduced that G is symmetric and H has a column sum of -1.

Rewriting and expanding the second term in 4.A.2 it can then be expressed as

$$G\sigma_{12}^{\mu} Z_2 = G[S_{1\cdot H} : S_{1\cdot C} : 0:0:0:0.S_{1\cdot D}] \quad \begin{bmatrix} \text{NUB} \\ -\text{CRS} \\ -\text{DD} \\ \text{R} \\ \text{LG} \\ -\text{SD} \end{bmatrix} \quad {}^{10} \quad 4.A.4$$

The third item of 4.A.1 can also be expressed as

$$Hi_2' Z_2 = HZ_{21} + HZ_{22} + \text{.....} + HZ_{2K}^{11} \quad \text{....4.A.5}$$

---

10 Si_j is the vector of covariances between the forecasting errors of the interest rates in $\hat{X}_1$ and the interest rate in $\hat{X}_2$ j = N,C,D denotes a representative letter for the predetermined variables in 4.A.4

11 Z_{2i}, i = 1,2 ---K is the vector of predetermined variables

Rewriting 4.A.4 in 4.A.5 notations and combining, they can then be expressed as

$$-G\sigma^{\mu}_{12}\ Z_2 - Hi'_2 Z_2 = -(S_{1:N} + H)\ Z_{21}\ (GS_{1:C} + H)\ Z_{22} + \text{----+ HDD} - \text{HR} + (GS_{1:D} + H)\ Z_{2K} \ \ldots\ldots\ 4.A.6$$

Defining $B \equiv [(GS_{1:N} + H) : (G\ S_{1:C} + H) : \text{---} : H]$

4A1 may be rewritten as

$$Z_1 = {}^{1}/_{c}\ G\hat{X}_1 + B\hat{Z}_2$$

$$= A\hat{X}_1 + B\hat{Z}_2 \quad \ldots\ldots\ 4.A.7$$

where $A = {}^{1}/_{c}$

APPENDIX 5.A

Table 5.A.1: Banking and Financial Legislations.

Banking Ordinance, 1952.

Banking Ordinance, 1958.

Central Bank of Nigeria Act, 1958.

Exchange Control Act, 1962.

Banking Act, 1969.

Nigeria Bank for Commerce and Industry Act, 1973.

Federal Savings Bank Act, 1974.

Federal Mortgage Bank Act, 1977.

Securities and Exchange Commission Act, 1979.

Bankruptcy Act, 1979.

Insurance Act, 1976.

The National Provident Act, 1958.

Companies Act, 1968.

Nigerian Enterprises Promotion Act, 1977.

APPENDIX 5.B

Table 5.B.1: Nigerian Commercial Banking System Portfolio of Assets 1960 - 1981 (₦ Million)

Year	Cash & Cash Items	BWD	BWA	TBS	Other Advances	Loans & Advances	Other Assets	Total Assets
1960	18.8	6.4	42.5	3.7	2.0	114.0	48.4	238.5
1961	22.0	2.5	72.9	5.9	2.7	120.0	68.6	194.6
1962	24.7	5.7	43.0	6.7	3.3	154.1	47.8	285.3
1963	23.3	9.7	53.2	2.4	2.3	178.9	55.3	325.1
1964	28.3	7.6	33.8	10.7	3.2	244.8	66.9	395.8
1965	25.7	9.8	41.1	12.9	3.0	270.0	71.7	434.2
1966	29.3	8.4	48.4	22.5	6.4	298.1	79.7	492.8
1967	25.1	7.9	29.5	28.5	1.4	275.0	81.5	449.0
1968	31.1	9.4	2.1	195.7	1.9	225.7	94.1	560.1
1969	37.4	10.7	4.0	335.4	2.3	242.7	129.6	761.8
1970	74.6	16.1	4.5	500.2	5.8	351.3	199.5	1152.0
1971	62.1	25.2	12.9	290.7	10.3	502.0	372.5	1275.0
1972	75.9	22.9	8.3	376.3	10.0	619.5	324.4	1437.5
1973	100.9	25.6	34.2	382.0	7.4	753.4	468.3	1772.0
1974	331.4	48.4	61.4	755.4	22.9	938.1	653.5	2811.2
1975	404.3	265.6	81.3	792.8	48.1	1121.5	905.2	4308.0
1976	1094.0	133.1	159.2	1054.7	336.3	2122.9	1471.1	6371.4
1977	851.8	219.8	224.9	1153.8	862.8	3074.6	2143.3	8530.9
1978	741.4	216.8	177.3	953.1	620.4	4109.7	2287.0	9105.7
1979	797.3	269.0	235.4	2144.0	484.4	4618.7	2689.8	11238.6
1980	1532.1	612.5	247.7	2434.8	680.0	6379.2	4454.1	16340.5
1981	1376.1	614.4	254.7	1773.9	576.3	8604.8	6277.3	19477.5

*

BWD is balances with Nigerian banks,

BWA is balances held with banks abroad, and

TBS is Treasury bills plus Treasury certificates.

APPENDIX 8A: Proportional Estimations.

Table 8A1: Full Estimation

	Const	R2	TR	DR	B1	B2	NFA	ND	CRS	NUB	SS1	LG	RR	D2	D3	D4		R2	DW
NSR	-0.014	0.007**	-0.009**	-0.015**	-0.006	0.000	-0.204***	0.165***	0.037	0.017	0.171***	-0.555	-0.099**	-0.002	-0.003	0.001		0.47	1.67
	(-0.28)	(2.16)	(2.00)	(-3.00)	(-1.38)	(0.18)	(-4.42)	(2.80)	(0.33)	(0.57)	(4.11)	(-1.19)	(-2.37)	(-0.56)	(-0.67)	(-0.28)			
TBCD	0.256	-0.028*	0.037*	-0.008	-0.018	-0.004	0.373*	-0.240	-0.366	-1.620***	0.267	-0.958	-0.174	-0.015	-0.002	-0.033**		0.90	1.03
	(1.19)	(-1.93)	(1,93)	(-0.38)	(-1.06)	(-0.64)	(1.87)	(-0.95)	(-0.75)	(-12.77)	(1.48)	(-0.47)	(-0.97)	(0.92)	(-0.14)	(-2.10)			
BD	-0.240***	-0.006	0.005	0.002	0.009	-0.001	-0.432***	0.401***	0.288	0.119	0.319***	-1.364*	-0.136*	0.002	-0.007	-0.001		0.71	0.86
	(-2.73)	(-0.98)	(0.68)	(0.22)	(1.32)	(-0.26)	(-5.31)	(3.88)	(1.45)	(2.30)	(4.32)	(-1.65)	(-1.86)	(0.36)	(-1.08)	(-0.12)			
OI	0.034	0.004	-0.015***	0.009**	-0.004	-0.002	-0.042	0.029	-0.062	0.004	-0.046	1.461***	0.054	0.001	-0.001	-0.001		0.69	0.85
	(0.79)	(1.33)	(-3.86)	(2.10)	(-0.13)	(1.24)	(-1.05)	(0.57)	(-0.64)	(0.17)	(-1.27)	(3.58)	(1.49)	(0.24)	(-0.16)	(-0.37)			
L	-0.036	0.023**	-0.036***	0.012	0.015	0.006	-0.695***	0.645***	1.101***	0.480***	0.289***	0.415	-0.644***	0.013	-0.012	0.036***		0.81	1.21
	(-0.24)	(2.23)	(-2.71)	(0.80)	(1.23)	(1.37)	(-4.97)	(3.62)	(3.23)	(5.41)	(2.27)	(0.29)	(-5.11)	(1.22)	(1.11)	(3.27)			

Table 8A.2: Full Estimation, with NFA as a Choice Item

	Const	R2	TR	DR	B1	B2	EXR	ND	CRS	NUB	SS1	LG	RR	D2	D3	D4		R2	DW
NSR	0.144	0.001	0.006	-0.014**	-0.005	-0.001	0.003**	0.036	0.070	0.052	0.162***	-0.388	-0.087*	-0.004	-0.005	-0.001		0.37	1.75
	(0.81)	(0.33)	(1.31)	(-2.61)	(-1.11)	(-0.79)	(2.57(	(0.66)	(0.57)	(1.53)	(3.59)	(-0.75)	(-1.94)	(-1.0)	(-1.19)	(-0.23)			
TBCD	0.171	-0.020	0.045**	-0.012	-0.022	-0.001	-0.002	-0.006	-0.408	-1.652***	0.280	-1.792	-0.217	-0.011	0.002	-0.033*		0.89	0.81
	(0.77)	(-1.32)	(2.32)	(-0.57)	(-1.24)	(-0.22)	(-0.49)	(-0.03)	(-0.82)	(-11.91)	(1.51)	(-.85)	(-1.18)	(-0.49)	(0.11)	(-2.05)			
BD	-0.175*	-0.011	-0.008	0.011	0.018**	-0.004	-0.002	0.130	0.309	0.105	0.314***	0.430	-0.053	-0.002	-0.012	-0.001		0.60	0.61
	(-1.70)	(-1.58)	(-0.88)	(1.11)	(2.11)	(-1.26)	(-0.98)	(1.24)	(1.33)	(1.62)	(3.63)	(0.44)	(-0.61)	(-0.24)	(-0.17)	(-0.17)			
OI	0.077**	-0.001	-0.011***	0.005	-0.004	-0.002**	0.005***	0.002	-0.030	0.059***	-0.057**	0.721**	0.025	0.001	-0.001	-0.001		0.82	0.99
	(2.31)	(-0.60)	(-3.89)	(1.52)	(-1.46)	(-2.04)	(7.17)	(0.07)	(-0.40)	(2.80)	(-2.02)	(2.24)	(0.88)	(0.22)	(-0.27)	(-0.33)			
L	0.069	0.014	-0.057***	0.027	0.028**	0.001	-0.003	0.209	1.136***	0.457***	0.281*	3.310**	-0.510***	0.007	0.004	0.035***		0.73	0.89
	(0.40)	(1.20)	(-3.79)	(1.57)	(2.01)	(0.25)	(-0.95)	(1.17)	(2.89)	(4.18)	(1.92)	(1.99)	(-3.51)	(0.53)	(0.33)	(2.79)			
NFA	-0.187	0.017*	0.026**	-0.017	-0.015	0.007*	-0.000	0.628***	-0.079	-0.020	0.206	-3.282***	-0.157	0.010	0.011	0.001		0.61	1.42
	(-1.48)	(1.95)	(2.36)	(1.37)	(-1.46)	(1.95)	(-0.03)	(4.85)	(-0.28)	(-0.26)	(0.19)	(-2.70)	(-1.49)	(1.03)	(1.23)	(0.07)			

Table 8A.3: Estimation without the Intercept Term

	R2	TR	DR	B1	B2	NFA	ND	CRS	NUB	SS1	LG	RR	D2	D3	D4	R2	DW
NSR	0.008***	0.009**	-0.015	-0.006*	-0.060	-0.201***	0.151***	0.027	0.022	0.168***	-0.565	-0.102**	-0.002	-0.003	-0.001	0.40	1.66
	(2.68)	(2.00)	(-.329)	(-1.72)	(-0.01)	(-4.46)	(4.47)	(0.25)	(0.89)	(4.29)	(-1.22)	(-2.57)	(-0.73)	(-0.82)	(-0.41)		
TBCD	-0.037***	0.041**	-0.000	-0.009	0.001	0.332*	0.005	-0.180	-1.704***	0.341**	-0.769	-0.116	-0.007	0.003	-1.026*	0.90	1.07
	(-2.92)	(2.20)	(-0.011)	(-0.56)	(0.18)	(1.68)	(0.03)	(-0.39)	(-16.136)	(1.99)	(-0.38)	(-0.67)	(-0.51)	(0.22)	(-1.78)		
ED	0.002	0.001	-0.006	0.000	-0.006*	0.393**	0.171***	0.113	0.197**	0.250***	-1.540***	-0.191*	-0.004	-0.012*	-0.007	0.68	0.81
	(0.43)	(0.14)	(-0.66)	(0.03)	(-2.52)	(-4.71)	(2.74)	(0.58)	(4.42)	(3.46)	(-2.80)	(-2.59)	(-0.69)	(1.91)	(1.19)		
OI	0.028	-0.014***	0.010**	0.001	-0.001	-0.048	0.062**	-0.037	-0.007	-0.037	1.486***	0.062*	0.002	0.000	0.000	0.69	0.83
	(1.09)	(-3.78)	(2.49)	(0.28)	(-0.96)	(-1.21)	(2.11)	(0.40)	(-0.33)	(1.07)	(3.67)	(1.77)	(0.58)	(0.08)	(-0.08)		
L	0.024***	-0.037***	0.011	0.014	0.006	-0.689***	0.610***	1.075***	0.492***	0.278**	0.388	-0.653***	0.013	0.011	0.035***	0.80	1.23
	(2.72)	(-2.83)	(0.77)	(1.28)	(1.62)	(-5.036)	(5.96)	(3.35)	(6.72)	(2.35)	(0.28)	(-5.41)	(1.22)	(1.09)	(3.46)		

Table 8A.4: Estimation with Symmetry Restrictions

	Const	R2	TR	DR	B1	B2	NFA	ND	CRS	NUB	SS1	LG	RR	D2	D3	D4	R2	DW
NSR	-0.072***	0.004*	0.006**	-0.014***	0.001	0.002*	-0.196***	0.205***	0.003	0.010	0.174***	-0.650	-0.094***	-0.001	-0.001	0.001	0.44	1.71
	(-3.03)	(1.69)	(2.07)	(-4.51)	(0.74)	(1.69)	(-4.88)	(4.67)	(0.03)	(0.46)	(4.54)	(-1.58)	(-2.82)	(-0.22)	(-0.37)	(0.24)		
TBCD	0.147	0.006**	0.000	0.010*	-0.012***	-0.005	0.336*	-0.119	0.465	-1.808***	0.033	-3.461*	-0.136	-0.021	-0.004	-0.039**	0.86	0.77
	(1.41)	(2.07)	(0.03)	(1.76)	(-4.03)	(-0.97)	(1.78)	(-0.56)	(1.15)	(-16.78)	(0.18)	(-1.89)	(-0.85)	(-1.34)	(-0.24)	(-2.50)		
BD	-0.206***	-0.014***	0.010*	-0.001	0.008**	-0.001	-0.416***	0.364***	0.083	0.169***	0.375***	-0.793	-0.158**	0.004	-0.007	0.000	0.68	0.86
	(-4.15)	(-4.51)	(1.76)	(-0.16)	(3.05)	(-0.25)	(-5.82)	(4.42)	(0.53)	(4.07)	(5.54)	(-1.11)	(2.62)	(0.60)	(-1.15)	(0.05)		
OI	0.043	0.001	-0.012***	0.008***	0.082**	-0.001	-0.041	0.043	-0.145*	0.013	-0.059	1.435***	0.046	0.001	0.000	0.000	0.68	0.73
	(1.47)	(0.74)	(-4.03)	(3.05)	(2.20)	(-0.95)	(-1.15)	(0.98)	(-1.77)	(0.58)	(-1.18)	(4.08)	(1.44)	(0.49)	(0.16)	(0.04)		
L	0.112*	0.002	-0.005	-0.001	-0.001	0.005	-0.684***	0.507***	0.601**	0.615***	0.457***	2.447*	-0.662**	0.017	0.011	0.058**	0.72	0.90
	(1.50)	(1.69)	(-0.97)	(-0.25)	(-0.95)	(1.28)	(-5.08)	(3.33)	(2.08)	(7.97)	(3.58)	(1.89)	(-5.83)	(1.48)	(1.01)	(3.40)		

APPENDIX 8B: Level Estimations.

Table 8B1: Full Estimation[11]

	R2	TR	DR	B1	B2	NFA	ND	CRS	NUB	SS1	LG	RR					R2	DW
NSR	-18.175	46.740**	-12.231	-24.742**	11.546**	-0.419*	-0.069***	0.025	0.208***	-0.201**	-0.142	0.0004					0.91	1.95
	(-1.51)	(2.39)	(-0.62)	(-2.56)	(2.10)	(-1.90)	(-2.83)	(0.064)	(2.58)	(-2.31)	(-0.453)	(0.01)						
TBCD	-43.806	89.406	-112.130*	2.108	38.716**	0.082	-0.390***	1.072	-0.873***	-0.665**	-8.499***	-0.531***					0.96	1.30
	(-1.11)	(1.39)	(-1.72)	(0.07)	(2.15)	(0.11)	(-4.85)	(0.83)	(-3.31)	(-2.340)	(-8.22)	(-4.58)						
BD	-3.052	-3.326	1.726	8.196***	-3.500**	-0.084	-0.0006	-0.096	0.045**	0.011	0.241**	0.017*					0.53	0.65
	(-0.98)	(-0.65)	(0.33)	(3.25)	(-2.44)	(-1.46)	(-1.09)	(-0.931)	(2.17)	(0.47)	(2.95)	(1.87)						
OI	-15.171*	3.308	6.907	4.234	-2.849	-0.841***	0.125***	-0.791***	0.118**	0.083	0.238	0.059**					0.98	1.34
	(-1.92)	(0.26)	(0.56)	(0.67)	(-0.79)	(5.83)	(-7.79)	(3.05)	(-2.23)	(1.45)	(-1.16)	(-2.54)						
L	80.167**	-136.069**	111.737**	10.19	-43.924*	-1.420**	-0.415***	-2.794**	-0.263	-0.227	7.588***	-0.427***					0.96	1.39
	(2.28)	(-2.38)	(1.99)	(0.36)	(-2.73)	(-2.21)	(-5.79)	(-2.42)	(-1.12)	(-0.90)	(8.27)	(-4.13)						

Table 8B2: Full Estimation with a Constant Term

	R2	TR	DR	B1	B2	NFA	ND	CRS	NUB	SS1	LG	RR	CONSTANT				R2	DW
NSR	-12.336	37.659	-16.33	-52.52**	-0.189	-0.647***	-0.070**	0.212	-0.224***	0.198**	-0.046	-0.048	322.986***				0.92	1.87
	(-.107)	(2.01)	(-0.87)	(-4.15)	(-0.029)	(-2.94)	(-3.02)	(-0.56)	(2.92)	(-2.41)	(0.153)	(-1.30)	(3.17)					
TBOD	-30.350	58.476	-121.579*	-61.919	-11.670	-0.444	-0.391***	0.526	-0.836***	-0.658**	-8.014***	-0.642***	744.354**				0.96	1.26
	(-0.78)	(1.08)	(-1.91)	(-1.44)	(0.54)	(-0.60)	(-4.99)	(0.41)	(-3.24)	(-2.37)	(-7.82)	(-5.16)	(2.16)					
BD	-3.689	-2.336	2.193	11.225***	-2.221	-0.059	-0.005	-0.070	0.044**	0.010	0.221***	0.022**	-35.214				0.54	0.63
	(-1.17)	(-0.454)	(-0.42)	(3.229)	(-1.27)	(-0.98)	(-0.08)	(-0.67)	(2.09)	(0.46)	(2.66)	(2.23)	(-1.26)					
OI	-13.784*	1.151	5.933	-2.365	-5.636**	0.787***	-0.125***	0.734***	-0.114**	0.083	-0.193	-0.070***	76.717				0.98	1.33
	(-1.73)	(0.088)	(0.45)	(-0.27)	(-2.17)	(5.16)	(-7.81)	(2.78)	(-2.16)	(1.47)	(-0.92)	(-2.77)	(1.09)					
L	60.115*	104.881*	124.818**	105.598***	-3.623	-0.635	-0.412***	-1.979*	-0.317	-0.238	6.940***	-0.262**	-1109.19***				0.99	1.23
	(1.83)	(-1.97)	(2.42)	(2.93)	(-0.20)	(1.01)	(-6.24)	(-1.82)	(-1.46)	(-1.02)	(9.05)	(-2.51)	(-3.83)					

Table 8B3: Full with Dummies[11]

	R2	TR	DR	B1	B2	NFA	ND	CRS	NUB	SS1	LG	RR	D1	D2	D3	D4	R2	DW
NSR	-12.551	39.299	18.321	-50.283***	0.853	-0.665***	-0.071***	-0.144	0.222***	-0.212**	0.022	-0.044	302.222***	298.310***	295.465***	315.818***	0.92	1.89
	(-1.08)	(2.08)	(-0.96)	(-3.93)	(0.13)	(-2.98)	(-2.96)	(-0.37)	(2.88)	(-2.54)	(0.07)	(-1.19)	(2.89)	(2.88)	(2.85)	(3.08)		
TBOD	-27.130	62.518	-115.376*	-69.118	5.322	-0.342	-0.374***	0.165	-0.860***	-0.608**	-7.953***	-0.650***	846.310**	822.965**	842.864**	785.040**	0.96	1.24
	(-0.69)	(0.97)	(-1.78)	(-1.59)	(0.24)	(-0.45)	(-4.60)	(0.12)	(-3.28)	(-2.14)	(-7.72)	(-5.19)	(2.38)	(2.34)	(2.39)	(2.26)		
BD	-3.887	-2.627	2.616	11.345***	-2.200	-0.066	0.004	-0.064	0.041*	0.006	0.218***	0.023**	- 35.006	-36.480	-39.509	-34.986	0.55	0.56
	(-1.21)	(-0.50)	(0.49)	(3.22)	(-1.21)	(-1.07)	(0.06)	(-0.59)	(1.94)	(0.24)	(2.60)	(2.30)	(-1.21)	(-1.28)	(-1.38)	(-1.238)		
OI	-13.343*	2.181	4.454	- 1.667	-5.521	0.794***	-0.126***	0.739***	-0.113**	0.085	-0.200	-0.070***	77.330	58.987	73.354	75.100	0.98	1.33
	(-1.63)	(0.16)	(0.33)	(-0.18)	(-1.19)	(5.05)	(-7.47)	(2.69)	(-2.09)	(1.45)	(-0.94)	(-2.70)**	(0.96)	(0.94)	(1.004)	(1.04)		
L	56.867*	-101.297*	126.633	109.745***	1.549	-0.722	-0.429***	-1.697	-0.290	-0.271	6.912***	-0.259	-1185.24***	-1154.11***	-1172.57***	-1141.33***	0.99	1.24
	(1.70)	(-1.87)	(2.30)	(2.99)	(0.08)	(-1.12)	(-6.223)	(-1.51)	(-1.31)	(-1.13)	(7.93)	(-2.45)	(-3.95)	(-3.88)	(-3.93)	(-3.88)		

Table 8B4: Full Estimation with Symmetry

	R2	TR	DR	B1	B2	NFA	ND	CRS	NUB	SS1	LG	RR				R2	DW
NSR	-18.811**	32.313***	4.540**	-18.475***	9.482**	-0.417**	0.066***	0.00	-0.203***	-0.203**	-0.117	-0.002				0.91	1.94
	(-2.13)	(1.71)	(-1.93)	(-4.356)	)2.367)	(-2.04)	(-3.15)	(0.02)	(2.88)	(-2.55)	(-0.41)	(-0.07)					
TBCD	32.313***	-53.451**	0.486	15.955***	4.766	0.228	-0.299***	0.200	-1.017***	-0.537*	-8.408***	-0.478***				0.95	1.24
	(2.72)	(-2.82)	(0.125)	(2.61)	(0.51)	(0.31)	(-4.18)	(0.17)	(-4.10)	(-1.89)	(-8.19)	(-4.88)					
BD	-4.540*	0.486	-0.454	7.292***	-2.799**	-0.088*	-0.002	-0.078	0.048**	0.009	0.243***	0.017**				0.52	0.65
	(-1.93)	)9.125)	(-0.10)	(3.86)	(-2.25)	(-1.64)	(-0.39)	(0.82)	(2.52)	(0.42)	(3.19)	(2.14)					
OI	-18.475***	15.955***	7.292***	-2.489	-2.292	0.870**	-0.123**	0.765***	-0.116**	0.089*	-0.205	-0.055***				0.98	1.29
	(4.36)	(2.61)	(3.86)	(-0.623)	(-0.73)	(6.58)	(-8.85)	(3.46)	(-2.43)	(1.70)	(-1.08)	(-3.12)					
L	9.482**	4.766	-2.799***	-1.191	-9.163	-1.524**	-0.505***	-1.90*	-0.126	-0.357	7.493***	-0.486***				0.95	1.21
	(2.37)	(0.51)	(-2.25)	(-0.73)	(-1.15)	(-2.29)	(-7.83)	(-1.78)	(-o.56)	(-1.28)	(8.04)	(-5.54)					

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