A QUARTERLY ECONOMETRIC MODEL

OF

THE INDIAN MONETARY SECTOR

BY

CHANDRA PRAKASH KHETAN, M.A.

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AUTHOR: Chandra Prakash Khetan, B.A. (University of Rajasthan)
M.A. (University of Rajasthan)
M.A. (McMaster University)

SUPERVISOR: Dr. R. C. McIvor

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ABSTRACT

The primary objective of this thesis is to construct and estimate a quarterly econometric model of the monetary sector of India. A significant portion of the thesis is devoted to the estimation of the quarterly time series on national income and its components - a prerequisite for any such study. The monetary economy is considered to be made up of three sectors, namely, the Commercial Banking Sector, the Private Non-bank Sector, and the Government Sector. Eight behavioral equations have been estimated for the demand and supply of six principal financial assets in the Indian money market. It was found that the seasonal variations in some of the monetary aggregates could be traced back, directly or indirectly, to seasonal variations in the agricultural income and output. The response of endogenous variables to exogenous shifts in principal policy variables has also been analysed in the present study. The price level was found to be quite sensitive to changes in the high powered money supply.

ACKNOWLEDGEMENTS

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List and explanation of variables*:-

(A) Endogenous variables:

BB - Commercial Banks Borrowing from the Reserve Bank of India. The figures are average of monthly-borrowings outstanding.

BC - Bank Credit.

BC^d - Bank Credit demand.

BC^s - Bank Credit Supply.

CUP - Currency with the Public = Notes in circulation + Circulation of Rupee coins + Circulation of small coins - Balances held at treasuries - Cash on hand with banks.

DD - Demand Deposits.

DD* Disposable Demand Deposits.

DL - Demand Liabilities.

ER - Excess Reserves. Excess Reserves = Cash in hand and Balance with Reserve Bank of India - Required reserves of banks.

FR - Free Reserves = Excess Reserves - BB.

GS - Commercial Banks Holdings of Government Securities.
Adjusted for PL480 & 665 Deposits

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* All variables are in Billions of Rupees. Interest rate variables are in percentages. All the quarterly figures are averages of the last Friday of the month figures.

P - Consumer Price Index, 1949 = 1.00.

RCM - Call Money Rate. Rate paid on call money from other banks by major selected scheduled banks.

RD_3 - Rate on Fixed Deposits for 3 Months or 91 Days. This is the rate offered by scheduled commercial banks on 3 months time deposits (91 days since October 1964). The rate is the average of monthly rates prevailing in Bombay. All monthly figures are the last Friday of the month figures.

RD_{12} - Rate on Fixed Deposits for 12 Months.

RL - Loan Rate. Average of the Call Money Rate (RCM) and the State Bank of India Prime Lending Rate (RPL).

RPL - Prime Lending Rate (or State Bank of India Advance Rate). This is the prime lending rate which regulates all interest rates for the various categories and classes of advances granted by the State Bank (average of monthly rates).

RR - Required Reserves of Banks.

RRADL - Required Reserves Against Demand Liabilities of Commercial Banks.

RRATL - Required Reserves Against Time Liabilities of Commercial Banks.

RRATL* - Required Reserves on Time Liabilities Adjusted for Required Reserves on PL480 & 665 Deposits.

TD' - Time Deposits.

TD - Time Deposits Adjusted for PL480 & 665 Deposits.

TD* - Disposable Time Deposits.

(T+D) - Total Deposits (Time + Demand).

(T+D)*- Total Disposable Deposits.

TL - Time Liabilities.

Y - Real National Income in 1949 Prices.

(B) Exogenous variables:

(i) Non-Policy Exogenous Variables

IBDD - Inter-Bank Demand Deposits.

IBTD - Inter-Bank Time Deposits.

ONLB - Other Net Liabilities of the Commercial Banks (Capital & Reserves - Physical Assets + Statistical discrepancy).

PLD - Time Deposits of Banks Held by the U.S. Government in Counterpart to P.L. Fund Receipts.

RBB - Bazzar Bill Rate. Taken as a representative of the rates prevailing in the unorganized money market. These are the rates at which bills of small traders are reported to have been discounted by Shroffs and are unofficial quotations. All India figure is arrived at by averaging the prevailing rates of the financial centres - Bombay, Calcutta and Madrass.

RYIS - Yield on Variable Dividend Industrial Securities (tax free rates).

TT - Time Trend (1, 1, 1, 1, 2, 2, ...) starting 1952 QII.

YNA - Real Non-Agricultural Income in 1949 Prices.

YA - Real Agricultural Income in 1949 Prices.

(ii) Policy Variables

HPMS - High Powered Money Supply $\equiv$ RR+FR + CUP.

rd - Reserve Requirements Ratio Against the Demand Liabilities of the Commercial Banks.

rt - Reserve Requirements Ratio Against the Time Liabilities of the Commercial Banks.

RGBY - Government Bond Yield. Yield on 3 percent conversion loan 1986 or later. The yields are based on prices quoted in Bombay.

RRBL - Reserve Bank of India Lending Rate to the Commercial Banks. This rate is same as the Bank Rate from 1952 II to 1960 III. Since October 1960, however, it is the weighted average of the rates charged by the Reserve Bank to commercial banks on their borrowings. The quarterly figures taken are averages of the monthly weighted rates reported in various issues of the Report on Currency and Finance.

INTRODUCTION

The dissertation undertakes to construct, estimate and test a quarterly econometric model of the Indian monetary sector. The real sector variables are assumed to be exogenous to the monetary sector in this model. This is assumed not so much because we believe that the monetary variables are unlikely to have significant determining influence over real variables in a country like India, but, mainly because of data limitations. Quarterly time series for most of the important non-monetary macro economic aggregates simply do not exist for India. Even the quarterly national income time series was non-existent. This perhaps explains the lack of any econometric work on a quarterly basis for the Indian economy. One of the most important part of this work has, therefore, to be the estimation of the quarterly national income (agricultural and non-agricultural) of India.

In any discussion and/or analysis of the Indian monetary sector there is usually a reference to the seasonality in the monetary variables associated with the seasonality in agricultural output and marketing. However, to our knowledge, this is the first time that a systematic

econometric analysis of this phenomenon has been attempted. We believe that, as a result, the econometric estimates of monetary sector relations presented here are superior to the estimates based on annual data since the response of an endogenous variable to changes in the vector of explanatory variables is likely to (and the present study shows that it does) depend significantly on which quarter of a particular year one is referring to. The seasonal variations in monetary aggregates have been the preoccupation of the monetary authorities, since it is the seasonal magnitudes of these aggregates which are most interesting from the point of view of efficient short-term monetary management. It is hoped that the present study will prove to be a stepping stone for future econometric work in this unexplored and (therefore) highly rewarding (from the point of view of monetary management) field.

Organisation of the Study

The study is divided into six Chapters and an Appendix which contains the time series data (estimated or otherwise) for variables used in constructing the Model. Chapter I, which is basically descriptive in nature, is designed to provide a useful background for the econometric analysis in Chapter III. It provides an overview of the nature and structure of the Indian Money Market. . Chapter II

is devoted to the estimation of the quarterly agricultural and non-agricultural national income of India. This is perhaps a very crucial part of the study, since the econometric estimates presented in Chapter III are likely to depend crucially on these estimates. Chapter III contains a detailed discussion of the various stochastic equations along with the OLS estimates for their alternative specifications. In Chapter IV the TSLS estimates for the stochastic equations in the Model are presented and the complete model is then written down which, of course, includes both stochastic and non-stochastic equations. In Chapter V, the important short-term and long-term impact multipliers are presented and are systematically analyzed. Chapter VI, which is the final Chapter of the Study, contains the Summary and Conclusions of the Study.

CHAPTER I

THE INDIAN MONEY MARKET

This chapter, as indicated earlier, is more factual than analytical. In preparation of this chapter we have drawn freely from the existing studies of the Indian Money Market listed in the bibliography.

1.1 The Salient Features of the Indian Economy

The Republic of India, in terms of population, is the world's largest democracy and the second most populous nation following the Peoples Republic of China. It has to support more than fourteen percent of the world's population on a little more than 2.4 percent of the total land area of the world. The country's economy is largely dependent on subsistence agriculture and small-scale industry and the per capita national income is among the lowest in the world (See Table 1.1). The data presented in Table 1.1 on some of the strategic economic variables for India and six other selected countries illuminate the comparative salient features of these economies. During the decade 1950 to 1960 the GDP of India increased at an annual average rate of 3.5 percent. However, with an accelerating growth

TABLE 1.1

Selected Indices of Economic Development
(Current $ figures)

Economic Indicator	India		Indonesia		Egypt		Japan		France		Canada		U.S.A.	
	1958	1968	1958	1968	1958	1968	1954	1968	1958	1968	1968	1968	1958	1968
(1)National Income(Net) (Billions U.S.$)*	26.5	37.4	7.33	9.66	2.73	4.83	26.56	113	38.21	96.22	25.73	46.68	369.96	719.80
(2)Per Capita Income (U.S. $)*	64	71	82	86	111	156	290	1122	853	1927	1503	2247	2115	3578
(3)Avg. Annual % Growth Rates of														
a) Real GDP														
i)Between 1950-'60	3.5						8.0		4.4		4.0		2.9	
ii)Between 1960-'68		2.8		2.2		4.8		10.3		5.6		5.6		5.1
b) Real Per Capita GDP														
i)Between 1950-,60	1.6						6.8		3.5		1.2		1. 2	
ii)Between 1960-'68		0.3		-0.2		2.2		9.2		4.4		3.7		3.7
(4)% of GDP														
a)Income originating from Agriculture:	(1) 45.0	(2) 45.3	55	52	33	30	18	10	10	7	7	6	5	3
b)Income originating from Industry:	(1) 19.0	(2) 22.1	9	13	19	24	28	31	41	38	34	34	32	32
c)Exports	4.3	5.9	13	11	21	17	10	10	13	14	19	24	4	5
d)Imports	7.8	8.2	13	17	20	22	14	9	13	14	20	23	5	5

Sources: Various issues of
i) I.M.F. International Financial Statistics.
ii) U.N. Statistical Yearbook.
iii) U.N. Yearbook of National Accounts.

* Official exchange rates have been used for converting the national currency figures to U.S. Dollar equivalents.

(1) The figures refer to fiscal year 1957-58 and are taken from Table 2.1.These are percentages of NDP & not GDP.

(2) The figures refer to fiscal year 1967-68 and are taken from C.S.O., Estimates of National Products 1960-61 to 1967-68,Page 7. These are percentages of NDP & not GDP.

of population, per capita GDP rose by only 1.6 percent. The corresponding growth rates were 2.8 percent and 0.3 percent, respectively, for the period 1960-68.

India is a mixed economy, where both the private and government sectors exist simultaneously. The share of government has been expanding over the years of planned economic development, but it is still small compared to the private sector in absolute size. Thus contribution of the government sector to GDP increased from 11 percent in 1960-61 to 13.2 percent in 1966-67.[1] The profile of the Indian economy has been slowly changing under the impact of planned development, but the occupational pattern, as well as the distribution of net domestic product by sectors, indicates the continued predominance of agriculture which still accounts for roughly one half of the NDP. More than two thirds of the total working force is still engaged in agriculture.

Foreign trade is an important sector of the Indian economy although as a proportion of GDP it remains small. Both imports and exports have grown over time. The role of foreign assistance in financing the imports remains

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1. See Central Statistical Organization, Estimates of National Products 1960-61 to 1967-68, Department of Statistics, Government of India, March 1969, p.9.

significant, but has been declining over the period. The relative indices for various countries reported in Table 1.1 reflect both the absolute and relative economic backwardness of India. The relatively underdeveloped nature of the economy is also reflected in the underdeveloped nature of money and capital markets in India. The structure and operation of the Indian money market is discussed at length in the following section.

1.2 The Indian Money Market

A well-developed money market is essential to an effective monetary policy. It is in the money market that the central bank comes into contact with the financial sectors of the economy as a whole and it is through varying the liquidity in the market and thereby influencing the cost and availability of credit that thecentral bank achieves its economic objectives. A money market is a mechanism which makes possible a process of financial intermediaton, i.e., makes it possible for borrowers to obtain funds and for lenders to find suitable outlets for their money. In the broad sense of the term, the capital or money market includes the entire mechanism used for financing all types of business and government. But in the more common usage of the term, the money market is restricted to borrowing

and lending of short-term funds. Thus the money market may be defined as an organization where short-term funds are bought and sold. Unlike other ordinary markets, the money market is not a particular place where buyers and sellers meet together to exchange their goods. It is really a loosely organised institution with a number of divisions and sub-divisions, each of which is devoted to a particular type of credit operation and these form separate markets within the money market.

The market dealing with medium and relatively long-term funds is known as the capital market. In the absence of an unambiguous definition of the short-term and long-term it will be difficult to draw a strict cut-off line between the two markets. Besides, there is likely to be an overlapping between the two markets. An important characteristic of the Indian money and capital markets is that while they may be considered to be comparatively well developed from the point of view of specialisation of functions and organised relationships, they are very poorly developed in terms of the links among their principal sectors.

Another important characteristic of the Indian money market is its dual nature. On the one hand, it has a sophisticated organised banking system, but on the other hand it has a sizeable unorganised money market with even a little non-monetized market which has been becom-

ing less significant over time. The organized market comprises the Reserve Bank of India, the nationalised Indian banks and the other joint-stock banks. The core of the Indian money market is the inter-bank call money market. Even though the magnitude of funds involved is not large in relation to the deposits liabilities of the commercial banks, it is perhaps the most sensitive sector of the money market. In the Indian system, there is no true market for bills, either commercial or treasury. The unorganized part of the Indian money market, which is by no means homogeneous, is largely made up of what are generally known as 'indigenous' bankers and money lenders. In this market, there is no clear demarcation between short-term and long-term finance, nor even among the purposes of finance.

Another important feature of the Indian money market is that it ".....is an insular one with little contact with foreign money markets. The money markets of advanced Western countries are characterized by large movements of capital between them. Due partly to the exchange control restrictions on capital movements; there is hardly any movement of funds between the Indian money market and the foreign markets."[2].

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2. Reserve Bank of India, The Reserve Bank of India: Functions and Working, Bombay, 1970, p. 35.

TABLE 1.2

Indices of Banking Development

Country	Population Per Banking Office (1961)*	Aggregate Deposits as % of National Income		Per Capita Deposits U.S.$		Deposit Money As % of Money	
		1950	1969	1950	1969	1950	1969
INDIA	86,000	9	16	5	13	30	36
INDONESIA			6		3	29	32
EGYPT		18	19	15	35	30	33
JAPAN	16,000	24	88	25	1,142	48	71
FRANCE	5,800	18	30	40	641	40	76
CANADA	3,580	52	41	536	1,084	72	73
U.S.A.	7,000	53	46	856	1,706	79	81

Sources: (i) I.M.F., International Financial Statistics, Various Issues.

(ii) U.N., Statistical Yearbook, Various Issues.

(iii) Column (2) has been reproduced from G.S. Gupta, Monetary Policy Model of the Indian Economy, Ph.D. Dissertation, John Hopkins University, 1971, p. 27.

Table 1.2 presents data on four chosen indices of banking and money market development for seven selected countries. The format of the table was adopted from Table 1.4 in G. S. Gupta[3]. The comparatively underdeveloped nature of the Indian money market is reflected in the larger number of people served per banking office, the low deposit-national income ratio, and the low proportion of deposit money to total money supply (defined as demand deposits plus currency with the public). According to all these criteria, India has one of the least developed money markets among the seven countries for which the indices are reported in Table 1.2. Moreover, this position of relative underdevelopment of the Indian money market has not changed significantly during the past two decades (1950 to 1969).

The Structure of the Indian Money Market

The present structure of India's money market is summarized in the form of a chart which we have adopted from Gupta (p.13). Discussion of the major constituents of the market follows.

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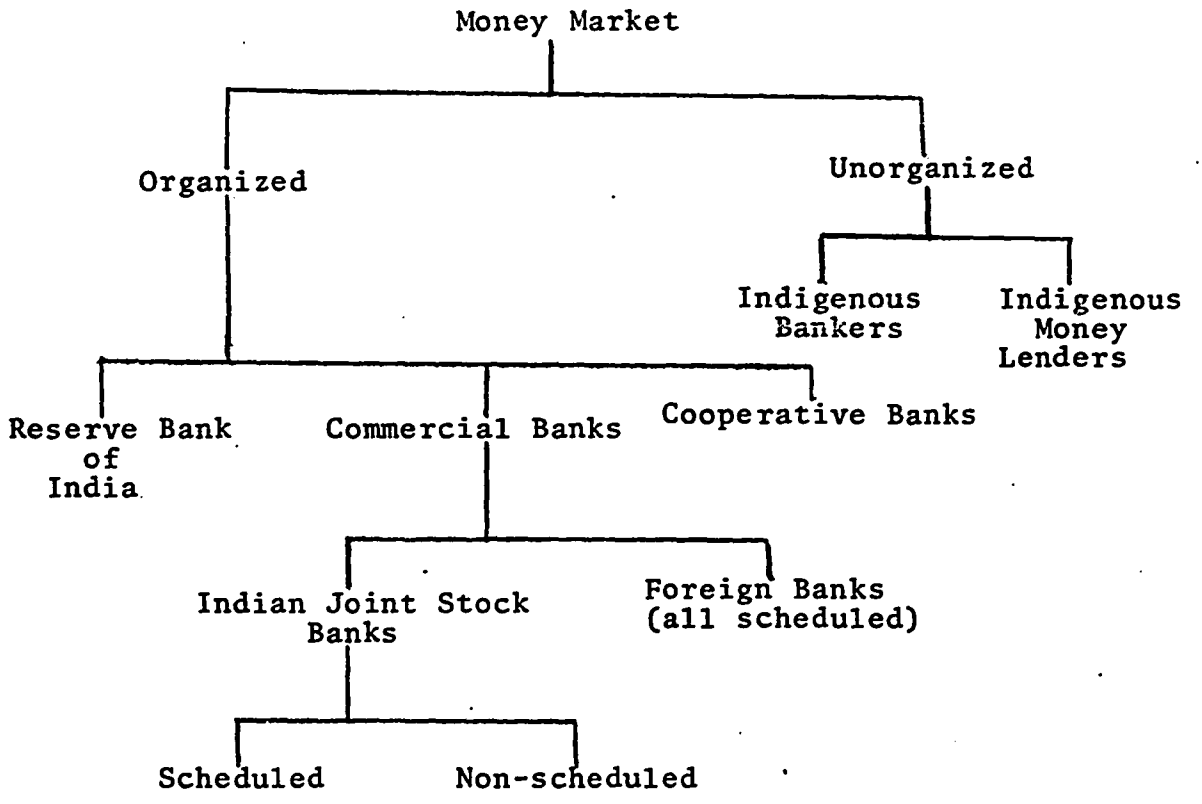
3. Gupta, G.S., Monetary Policy Model of the Indian Economy, Ph.D. Dissertation, John Hopkins University, 1971, p. 27.



(a) The Reserve Bank of India

The Reserve Bank of India is the central bank of the country. It was originally constituted as a private shareholders' institution in 1935. The Bank's share capital was Rupees 50 million divided into 500,000 shares of Rs.100 each. The share Capital has remained unchanged to this day. The Reserve Bank was nationalised as of Jan. 1, 1949. It acts as a banker to the govern-

ment and performs all the other well known central banking functions, including the implementation of the country's monetary policy. A main objective of the Reserve Bank, like any other central bank, is to maintain monetary stability and operate the currency credit system of the country to the country's advantage. The task of promoting sustained economic growth comprises the promotion of a healthy functional development of the banking system, and in particular the establishment of an appropriate network of financial institutions. To this end the Reserve Bank has: (i) tried to place the commercial banking system on a sound and healthy footing through, among other things, the licensing of banks and periodic inspection; (ii) directed its efforts towards revitalizing and reinforcing the entire structure of co-operative credit and other institutions in order to relieve the agricultural sector of the economy (accounting for approximately 50% of the GNP) of its traditional credit stringency. In the past, this credit stringency in agriculture had resulted in severe exploitation of farmers by the village money lenders, thus making it impossible to modernize agriculture since no surplus was to be found for capital spending in agriculture. In addition to all this, efforts have also been made to

improve the scope (developing banking habits in rural areas) and functioning of the banking system by creating a State sector in the commercial banking field and inducing banks to restructure their policies mainly in the direction of industrial lending. As the general structure of financial institutions becomes better developed and the sphere of the organized financial system widens, the scope for exercise of the Bank's influence increases and the area of effectiveness of its monetary policy is extended.[4]

The Reserve Bank has also another important role to play in the maintenance of the exchange value of the rupee, in view of the close inter-dependence of international trade and national economic growth. For the performance of this function, the Bank is entrusted with the custody and the management of the country's international reserves. It also exercises control over payments and receipts for international transactions in conformity with the exchange control system which is operated by the Government of India.

A photocopy of the Balance Sheet of the Reserve Bank of India (RBI) is reproduced here from the Annual

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4. See Section 1.4 for a discussion on the monetary policy of the Bank.

RESERVE BANK OF INDIA

BALANCE SHEET AS AT JUNE 30, 1971

ISSUE DEPARTMENT

LIABILITIES	Rs. P.	Rs. P.	ASSETS	Rs. P.	Rs. P.
Notes held in the Banking Department	18,00,36,776·00		Gold Coin and Bullion: —		
			(a) Held in India ..	182,53,10,862·72	
			(b) Held outside India	.....	
Notes in circulation ..	4435,03,88,195·50		Foreign Securities ..	278,41,99,950·06	
Total Notes issued ..		4453,04,24,971·50	Total		460,95,10,812·78
			Rupee Coin		39,15,33,741·55
			Government of India Rupee Securities ..		3952,93,80,417·17
			Internal Bills of Exchange and other Commercial Paper		.....
Total Liabilities ..		4453,04,24,971·50	Total Assets ..		4453,04,24,971·50

BANKING DEPARTMENT

LIABILITIES	Rs. P.	ASSETS	Rs. P.
Capital Paid-up	5,00,00,000·00	Notes	18,00,36,776·00
Reserve Fund	150,00,00,000·00	Rupee Coin	92,062·00
National Agricultural Credit (Long-Term Operations) Fund	190,00,00,000·00	Small Coin	3,14,775·60
National Agricultural Credit (Stabilisation) Fund	39,00,00,000·00	Bills Purchased and Discounted :—	
National Industrial Credit (Long-Term Operations) Fund	135,00,00,000·00	(a) Internal	10,02,29,513·79
		(b) External	.....
		(c) Government Treasury Bills ..	15,79,86,288·22
Deposits :—		Balances held Abroad*	94,12,01,406·35
		Investments**	423,54,81,728·38
(a) Government		Loans and Advances to :—	
(i) Central Government	54,98,95,012·38	(i) Central Government	.....
(ii) State Governments	86,63,13,036·17	(ii) State Governments‡	55,77,00,000·00
(b) Banks		Loans and Advances to :—	
(i) Scheduled Commercial Banks ..	248,69,06,124·78	(i) Scheduled Commercial Banks† ..	265,84,70,000·00
(ii) Scheduled State Co-operative Banks	18,83,72,356·57	(ii) State Co-operative Banks†† ..	206,83,71,602·00
(iii) Non-Scheduled State Co-operative Banks	83,62,402·90	(iii) Others	13,78,60,000·00
(iv) Other Banks	1,02,07,228·20	Loans, Advances and Investments from National Agricultural Credit (Long-Term Operations) Fund	
(c) Others	162,56,14,761·21	(a) Loans and Advances to:—	
		(i) State Governments	42,03,55,630·52
Bills Payable	37,24,27,049·41	(ii) State Co-operative Banks ..	24,31,43,271·00
		(iii) Central Land Mortgage Banks ..	.....
Other Liabilities	194,31,73,420·38	(b) Investment in Central Land Mortgage Bank Debentures	10,14,98,135·00
		Loans and Advances from National Agricultural Credit (Stabilisation) Fund	
		Loans and Advances to State Co-operative Banks	13,06,14,387·00
		Loans, Advances and Investments from National Industrial Credit (Long-Term Operations) Fund	
		(a) Loans and Advances to the Development Bank	35,04,21,044·00
		(b) Investment in bonds/debentures issued by the Development Bank ..	.....
		Other Assets	75,14,90,362·28
Total Liabilities	1324,12,73,192·00	Total Assets	1324,12,73,192·00

Contingent liability on partly paid shares Rs. 8,09,982·80 (Sterling Investments of £ 50,000 converted @ Rs. 100=£7·5556).

* Includes Cash, Fixed Deposits and Short-term Securities.

** (i) Excluding Investments from the National Agricultural Credit (Long-Term Operations) Fund and the National Industrial Credit (Long-Term Operations) Fund.

(ii) Includes Rs. 5,31,09,367·80 (equivalent of £ 50,000 and U.S. $ 6,961,250) held abroad.

‡ Excluding Loans and Advances from the National Agricultural Credit (Long-Term Operations) Fund.

† Includes Rs. 171,91,00,000 advanced to scheduled commercial banks against usance bills under Section 17(4)(c) of the Reserve Bank of India Act.

†† Excluding Loans and Advances from the National Agricultural Credit (Long-Term Operations) Fund and the National Agricultural Credit (Stabilisation) Fund.

S. JAGANNATHAN, *Governor.*
P. N. DAMRY, *Deputy Governor.*
R. K. HAZARI, *Deputy Governor.*
V. V. CHARI, *Deputy Governor.*
S. S. SHIRALKAR, *Deputy Governor.*

J. S. NARULA,
Chief Accountant.
Dated the 28th July 1971.

Report for 1971.[5] Being modeled on the British pattern, the Bank maintains two separate departments, the Issue Department and the Banking Department. The only rationale for having two separate departments seems to be its desire to separate the note-issuing activities from its banking activities. In practice, however, the distinction between the two Departments has little economic significance. In the balance sheet reproduced above, the liability side of the Issue Department is made up of two items, viz, (i) Notes held in the Banking Department and (ii) Notes in Circulation. Notes held in the Banking Department form part of the cash of the bank to meet the immediate currency requirements of the Department. Notes in Circulation comprise those held outside the Reserve Bank. The assets of the Issue Department consist of gold coin and bullion, foreign securities, rupee coin and rupee securities, equivalent of total liabilities. The Reserve Bank of India (Second Amendment) Act, 1957 prescribed that the aggregate value of gold coin, gold bullion and foreign securities held in the Issue Department should not at any time be less than Rs. 2,000 million; of this, the value of gold (bullion plus coin) was not to be less than Rs. 1,150 million. Under

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5. See Reserve Bank of India, Annual Report and Trend and Progress of Banking in India for the year ended June 30, 1971, p. 113.

Section 26 of the Banking Laws (Amendement) Act, 1968, the gold holdings were again revalued to take account of the devaluation of the rupee by 36.5 percent in June 1966. Consequently, the value of the gold held in the Issue Department, which was Rs. 1158.9 million before the devaluation, went up to Rs. 1825.3 million (the present figure). The Banking Department's liabilities side consists of paid-up capital and reserves, agricultural and industrial credit funds, and deposits of the Central and State Governments and scheduled and non-scheduled banks. The other deposits item in the balance sheet consists of miscellaneous items such as: (i) deposits of quasi-government institutions like the Industrial Development Bank of India, the Industrial Finance Corporation, etc., (ii) provident, pension and guarantee funds of the Reserve Bank's staff, (iii) balance of foreign central banks and governments, and (iv) accounts of the IMF and the World Bank. On the asset side the most important item is investments which consists of rupee securities of the Central and State Governments, as well as other approved securities like the shares of the State Bank of India, the Industrial Finance Corporation, the Industrial Development Bank of India, etc. The Bank (RBI) is authorized to purchase, sell and hold in the Banking Department securities of the Central and State Governments of any

maturity. Loans and Advances to Governments refer to short-term accommodation provided through ways-and-means advances to State and Central Governments. However, the Central Government has not availed itself of ways-and-means advances since 1943-44. The heading "other Loans and Advances" shown in the statement relates to loans and advances made by the RBI to scheduled banks, State co-operative banks, the Industrial Finance Corporation of India, State Financial Corporations, etc.

(b) Commercial Banks

Commercial banks constitute another group of financial intermediaries which belong to the organized money market in India. They also constitute the most important group of financial intermediaries and are, therefore, the key part of the present study. With the inauguration of the Reserve Bank, Commercial banks in India came to be classified under two main groups, viz, scheduled and non-scheduled banks. Scheduled banks are those banks which are included in the Second Schedule to the Reserve Bank of India and may be broadly compared to the member banks in the United States. The RBI Act lays down the conditions which a bank must fulfil to qualify for inclusion in the Second Schedule. These are: (i) the bank must have a paid-up capital and reserves of an aggregate value of not

less than Rs. 500 thousand, (ii) it must satisfy the Reserve Bank that its affairs are not being conducted in a manner detrimental to the interests of its depositors, and (iii) it must be a company as defined in the Companies Act, 1956 or a corporation or a company incorporated by or under any law in force in any place outside India. At the end of December 1969 there were, in all, 73 commercial banks included in the Second Schedule. Scheduled banks may be grouped into three categories, viz., the nationalized banks, the foreign banks, and the other scheduled banks. Among the nationalized banks, the State Bank of India stands in a class by itself; it is the largest commercial bank and held over one-fifth of the deposits of all scheduled banks at the end of 1969. The 14 scheduled banks nationalized in July 1969 account for a further 55 percent of total deposits of all scheduled banks. Thus over 75% of the scheduled banks' deposits are now in the public sector. However, over the period of this study, 1952 QII to 1967 QI all of these fourteen banks were in the private sector, and the only nationalized commercial bank was the State Bank of India (nationalized in 1955). Another category of commercial banks comprises the foreign banks, numbering 15, which specialize in the financing of foreign trade; these banks have extended their activities to internal trade and industry also, and to this extent they form an integral part of the domestic

banking system. The other scheduled commercial banks, numbering 36, are relatively smaller banks with deposits of less than Rs. 500 million.

Non-scheduled banks, as the term implies, are banking companies other than those included in the Second Schedule to the Reserve Bank of India Act. The number of non-scheduled banks has declined steadily over the years, owing partly to some of them attaining "scheduled bank" status but mainly to their inability to conform to the operational standards laid down in the Banking Regulation Act. Their numbers have also decreased because of the Reserve Bank's policy of strengthening the banking structure through transfers of assets and liabilities by weaker units to other banks, voluntary amalgamations and compulsory mergers of the smaller and weaker units. There were 14 non-scheduled banks at the end of December 1969, as against 335 at the end of 1960. These banks account for a negligible part of the banking business in the country; their deposits amounted to less than one percent of the total deposits of the scheduled banks at the end of December 1969. For the purposes of the present study, the commercial banks include both the scheduled and non-scheduled banks. The latter do not have access to borrowing facilities from the Reserve Bank. However, the

insignificant size of them did not warrant their separate treatment.

(c) Co-operative Banks

The co-operative credit institutions occupy a somewhat intermediate position between the organized and the unorganized sectors of the money market. These institutions were set up mainly with a view to supplanting the indigenous sources of rural credit, particularly the money lenders, since the credit provided by the money lenders was subject to many drawbacks, especially the charging of high interest rates. At present there are Co-operative Credit Societies at three different levels. At the bottom are the small primary credit societies, distributed mainly in villages. These primary societies are headed by a co-operative bank in each district. At the top are the State Co-operative banks which stand at the apex of the cooperative movement in each State and so are also known as Apex banks.

The aggregate deposit liabilities of the State Co-operative banks are very small compared to the commercial banks. For instance, during 1960-61 the aggregate deposit liabilities of the State Co-operative banks were only 2% of the aggregate deposit liabilities of the commercial banks. The ratio was only slightly

higher - 2.25% - at the end of the fiscal year (April 1 to March 31) 1966-67. The State Co-operative banks, like the commercial banks, accept deposits from the private sector, borrow funds from the RBI, invest part of their funds in government bonds, and advance loans to the farmers through Central Cooperative banks and the primary credit societies. Thus it would seem that the State Cooperative banks are engaged in the same type of activities as their counterpart commercial banks except that the former largely meet the demand of farmers, the latter that of non-farmers. There are, however, some fundamental differences between the two. While the commercial banks concentrate on short-term financing, the State Co-operative banks make medium-term loans also for agricultural purposes. The most important difference, however, lies in the fact that while commercial banks are run primarily on the basis of the "profit" motive (this is true whether they are in the public or private sector), the motto of the State Co-operative banks is "service" rather than "profit". In the present study we have not dealt with the State Co-operative banks partly because of their insignificance in the total deposit liabilities but mainly because when the motto is such as to obscure the optimization of some clearly identifiable concept, an acceptable economic theory on which to base empirical analysis, does

not exist. Besides, the State Co-operative bank deposits are hardly the most volatile part of the money supply.[6]

(d) The Unorganized Money Market

The unorganized money market, which itself is not homogeneous, is largely made up of what are known as 'indigenous' bankers. In this market, there is no clear demarcation between short-term and long-term finance, nor even as to the purposes of finance, inasmuch as there is usually nothing on a "Hundi" (which is the indigenous bill of exchange) to indicate whether it has been issued for financing trade or simply for providing financial accommodation. In other words, it may be a trade bill or a financial paper. In view of the paucity of trade bills, there is no well developed discount market in India. Trade bills are usually carried until maturity.

In general, indigenous financial institutions may be broadly divided into two groups - the money-lenders and the indigenous bankers. The generally accepted difference between the two is that the indigenous bankers

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6. The money supply is officially defined as equal to Currency notes and coins with the public (excluding the balances of Central and State Governments held at treasuries and cash on hand of Scheduled and reporting Non-scheduled banks and State Cooperative banks) plus the demand deposits (excluding interbank demand deposits of Scheduled and reporting Non-scheduled banks and State Co-operative banks) plus other deposits (excluding the balances in Account No. 1 of the International Monetary Fund) held with the Reserve Bank of India. See 'Analysis of Money Supply in India", Reserve Bank of India Bulletin, vol. 15, July-August 1961, p. 1046.

usually supplement their financial resources by accepting deposits from the public, while the money-lenders trade primarily on their own capital. Money lenders do not accept deposits from the public or undertake any other functions of modern banking. They have an intimate knowledge of the credit-worthiness of the borrowers. The relationships between the money-lenders and borrowers is so personal that ordinary loans are made without any security, sometimes with not even a promissory note. The rate of interest charged by money-lenders until recently was exceedingly high, varying between 10 and 50 percent per annum and sometimes even higher.

The indigenous bankers are either individuals or partnerships and they finance mostly industry and trade. Usuaully they receive deposits and render other banking services like discounting "Hundis", the indigenous bills of exchange. Besides their banking function, most of them carry on trade and various other forms of business. The indigenous bankers enjoy rediscount facilities from the commercial banks which in turn have access to the Reserve Bank. Recourse on the part of the indigenous money market to the resources of the organized market takes place usually during the busy season when the crops are being harvested and moved from the grower to the wholesaler. Recently, however, such recourse by the indigenous bankers

to the organized sector has been reduced considerably. The RBI, through Cooperative banks and through encouraging the commercial banks to open new branches in rural and semi-urban areas, has been trying to curb the activities of the money lenders who have been exploiting the poor for centuries. The unorganized money market in India lies outside the purview of central banking control. Therefore, insofar as indigenous bankers and money lenders are substitutes for commercial and state cooperative banks, they impede the effectiveness of monetary controls. In the absence of any reliable statistical information on the operation of the unorganized market, we had to restrict the present study to the organized sector of the money market alone.

1.3 Assets and Liabilities of the Commercial Banks

Analysis of the assets and liabilities of the commercial banks is one of the most important parts of the present study. In this section we aggregate all the commercial banks and call it an 'aggregate commercial bank' or just 'Bank'. The consolidated balance-sheet of such an aggregate commercial bank could be written as follows:

Assets	Liabilities
BC + GS + RRADL + RRATL + ER	DD + TD + BB + ONLB

where, as noted earlier

BC - Bank's Credit to the private sector or what is (less conveniently) called Bank's holdings of private non-bank liabilities.

GS - Bank's holdings of government securities.

RRADL - Required reserves against demand liabilities of the Bank.

RRATL - Required reserves against the time liabilities of the Bank.

ER - Excess reserves of the 'Bank'.

DD - Demand deposits of the 'Bank'.

TD - Time deposits of the 'Bank'.

BB - 'Bank's' borrowings from the Reserve Bank of India.

ONLB - Other net liabilities of the Bank (= Capital and reserves + physical assets + statistical discrepancy).

Various items in the assets and liabilities of the 'Bank', expressed as percentages of total assets (or liabilities) are reported on a quarterly basis in Table 1.3 for years 1952-53, 1960-61 and 1966-67. The absolute figures used in constructing the table are reported in the Statistical Appendix Tables containing data on various assets and liabilities of the 'Bank'.

"Changes in the structure of liabilities and assets of commercial banks mirror developments in the economy in

TABLE 1.3

Commercial Bank Assets & Liabilities as Percentages of Total Assets (or Liabilities)

Years / Assets Liabilities	1952-53 IIQ	1952-53 IIIQ	1952-53 IVQ	1952-53 IQ	1960-61 IIQ	1960-61 IIIQ	1960-61 IVQ	1960-61 IQ	1966-67 IIQ	1966-67 IIIQ	1966-67 IVQ	1966-67 IQ
Assets												
1. BC	58.54	54.63	52.89	56.92	62.93	62.54	63.13	68.59	68.43	64.13	63.23	69.80
2. GS	32.43	34.51	37.04	34.54	26.43	26.87	26.09	22.51	25.82	30.28	30.30	24.60
3. RRADL	2.90	3.02	2.95	2.77	2.19	2.17	2.21	2.18	1.47	1.48	1.53	1.47
4. RRATL	0.72	0.75	0.76	0.74	3.54	3.52	3.51	3.43	1.53	1.59	1.64	1.50
5. ER	5.38	7.11	6.33	5.01	4.89	4.86	5.04	3.27	2.71	2.50	3.28	2.60
Liabilities												
1. DD	55.02	55.63	55.00	53.30	41.11	40.91	41.52	41.27	43.14	43.60	44.01	43.08
2. TD	33.36	36.56	37.48	37.10	51.40	52.59	52.46	51.30	48.28	49.33	50.96	48.29
3. BB	3.10	00.43	0.98	0.95	2.58	2.01	1.58	3.32	0.76	0.05	0.11	2.04
4. ONLB	8.49	7.44	6.55	8.63	4.89	4.51	4.42	4.14	7.80	7.00	4.90	6.58

many ways. On the liabilities side, the striking feature is the pace and magnitude of deposit growth, reflecting such factors as the spread of banking habits, the rise in the rate of domestic saving, the increasing monetization of the economy, and not the least the rate of monetary expansion. On the asset side, the changing pattern of advances both with regard to purpose as well as security is a fact of the shift in general emphasis of banking from commerce to industry, particularly the new industries, in the context of the acceleration of investment and diversification."[7]. The share of BC in total assets of the 'Bank' has gone up over the years (Table 1.3) while, on the other hand, the share of GS has gone down over the same time period (1952-53 to 1966-67). Quarter-to-quarter variations in BC reflect the seasonal pattern. Thus the seasonal peak for BC which was in QII in 1952-53 shifted to QI in 1960-61 and 1966-67. The official peak season (Nov. to April) and slack season (May to October) are obviously reflected in BC. The peak and slack seasons are associated with the peaks and slacks in agricultural output and its marketing. Thus while QII is the peak quarter for agricultural harvesting, the peak in marketing would be

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[7]. See Madam, B.K., "India" in Crick, W.F., (ed.), Commonwealth Banking Systems, Clarendon Press, Oxford, 1965. p. 202.

reached somewhere between the second half of QI and first half of QII. Since 'Bank's' seasonal advances are mainly against the security of agricultural commodities (food grains and industrial raw materials), a very high percentage of commercial banks advances are secured by goods, or financial assets. The margins on advance are also quite high. Table 1.4 presents the data on distribution of scheduled commercial banks credit to various sectors on a percentage basis.

Table 1.4

Scheduled Commercial Banks Advances According to Purpose (Percentage of total)

	Industry (1)	Commerce (2)	Agriculture (3)	Personal & Others (4)	Financial
March 1951	34.0	36.0	2.0	15.0	13.0
March 1956	37.0	36.5	2.0	15.5	9.0
March, 1961	50.8	28.6	3.1	12.4	5.1
March, 1965	59.5	25.2	2.8	8.0	4.5
March, 1967	64.3	19.4	2.1	10.6	3.6

Sources: (i) G.S. Gupta, Monetary Policy Model, p. 35.

(ii) RBI, Trend and Progress of Banking in India, various years.

Table 1.4 clearly shows that the contribution of commercial-banks to the financing of agriculture has been

only residual in nature, with most of the BC going to industry and commerce. The rising share of the industrial as against the commercial sector credit (in BC) reflects the rapid industrial advance within the economy. A real turn (of BC) in favour of the industrial sector took place after 1956, with a steep rise in investment in the second plan period (1956-57 to 1961-62).

The Commercial bank's investment in government securities shows the seasonal pattern in BC. This is to be expected. When the Commercial banks do not have the pressure of credit demand during the slack season they increase their holdings of government securities. Over the period 1952-53 to 1966-67 the share of GS in total assets or liabilities of 'Bank' has been secularly declining - just the reverse of the trend in BC. Investments in Government securities by Indian offices of the Scheduled Commercial bank are reported below in Table 1.5 by maturity.

Table 1.5

The Commercial Banks' Holdings of Government Securities

Maturity - Distribution

Items	March 31, 1960 (Percentage of total)	March 31, 1963 (Percentage of total)	March 31, 1967 (Percentage of total)
I. Treasury Bills	6.7	5.9	2.1
II, Securities Maturing			
1.Below 5 years	35.0	42.2	58.3
2.Between 5 and 10 years	42.1	45.5	31.4
3.Between 10 and 15 years	11.7	6.1	5.6
4.Over 15 years	4.5	3.3	2.6

Sources: RBI, Trend and Progress of Banking in India, Various Issues.

It is clear from Table 1.5 that approximately half of the investment in government securities (including treasury bills) is of maturity 5 years or less. The trend also seems to be in favour of short-term securities maturing in 5 years or less; the share of such securities in the total has been rising over the period 1960 to 1967.

Other items on the assets side of the 'Bank's' balance sheet do not require much explanation. Turning to the liabilities side of the balance sheet, the deposits (Time and Demand) constitute the principal source of funds for the Commercial banks. A close look at Table 1.3 reveals that the ratio of time deposits to demand deposits went up during the period 1952-53 to 1960-61. However, there was a reversal of this trend during the latter period, i.e., from 1960-61 to 1966-67. This has been mainly due to the reduction in the discriminatory reserve requirements against demand liabilities since September 1962. It made the time liabilities relatively less attractive for banks to hold than had been the case until September 1962. This (perhaps) resulted in relatively lower rates offered by the commercial banks on time deposits and hence a shift in the non-bank public's relative demand for these two types of deposits. No seasonality in the deposit liabilities of the 'Bank' is apparent from Table 1.3.

The next major item among the liabilities of the commercial banks is their borrowing from the Reserve Bank. The indebtedness of scheduled banks, which alone are entitled to normal borrowing facilities from the RBI, shows considerable fluctuation from year to year and from quarter to quarter. There is a definite seasonality in BB, with

the peak in BB associated with the peak in BC. A detailed discussion of the various provisions and formulas under which the scheduled commercial banks are entitled to borrow from the RBI will be found in the next section. The last item on the liabilities side, ONLB, was obtained as a residual item and is not subjected to systematic analysis in the present study.

1.4 Monetary Policy Instruments and their Use in India

Monetary policy refers to the use of instruments within the control of the central bank to influence the level of aggregate demand for goods and services. The traditional link between the real and monetary sectors via the investment function - which includes the cost of credit as one of its important arguments - will not really be very important in a developing country like India. What is likely to be more important in determining investment expenditure is the availability of credit, rather than its cost. The demand for credit in the organized money market is not likely to be sensitive to the lending rates of the commercial banks, owing partly to the high profitability of new investments and partly to the relatively higher cost of credit in the unorganized part of the money market. The RBI would, therefore, be able to exercise its greatest influence via its control of the overall availability of bank credit and its allocation among the

competing sectors of the economy.

The starting point, for all plans of economic development of underdeveloped countries, is to break the vicious circle of poverty at the point of low capital formation or investment. This requires massive autonomous investment on the part of the State to build the social overheads and infrastructure. The nature of these autonomous investments tends to be such that they yield fruits only in the long-term after a long gestation period. Inflationary pressures are bound to arise in such a situation. While rapid monetary expansion is inevitable in the initial stages of the development process, the inflationary spiral, if uncontrolled, is likely to (or at least it is feared that it might) undermine all the development efforts. The "key note of monetary policy" in India has, therefore, been "What may be called controlled expansion."[8].

The statutory basis for the regulation of the credit system by the RBI is embodied in the Reserve Bank of India Act and the Banking Regulation Act. The former Act confers on the RBI the usual powers available to central banks generally, while the latter provides special powers of direct regulation of the operations of commercial and co-operative banks. The powers available to the RBI

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8. Reserve Bank of India, The Reserve Bank of India: Functions and Working", Bombay, 1970, p. 34.

under the Banking Regulation Act are deemed to be important for ensuring the development of banking on "sound" and "healthy" lines. The RBI is empowered to operate with all the usual monetary policy instruments possessed by a central bank. We now turn to the discussion of the use of these instruments by the RBI, and their general effectiveness in the context of the Indian economic conditions.

Bank Rate

The Bank rate is defined in the RBI Act as "the standard rate at which it (the RBI) is prepared to buy or rediscount bills of exchange or other commercial papers eligible for purchase under this Act." In the absence of a developed bill market, the rate on advances by the RBI occupies the central place and is treated as the equivalent of the Bank rate.

The central bank discount rate or Bank rate policy seeks to affect both the cost and the availability of credit. The cost of borrowing is affected directly by changes in the effective bank rate. The availability of funds from the Bank would be affected by changes in the list of eligible bills for rediscounting, and of securities as collateral for advances, and by changes in the maximum period for which the credit is available.

In view of the lack of a well-developed and pro-

perly organized bill market, very little use of its rediscount powers has been made by the RBI. The Bank's (RBI's) assistance to the banking system has been made available, in the main, through the alternative facilities for advances from it. Such advances are repayable on demand or on the expiry of fixed deposits not exceeding 90 days (180 days in case of export bills). Government securities (among others) are eligible as collateral against such advances.

Bank rate changes have been made relatively infrequently in India. The Bank rate, which had been 3½ per cent since November 1951, was increased to 4 percent in May 1957. Subsequently, the rate was raised to 4½ percent in January 1963, 5 percent in September 1964, and further to 6 percent in February 1965. In March 1968 the rate was lowered to 5 percent to stimulate economic recovery in the economy. Effective January 9, 1971 the rate was restored to its earlier 6 percent level in the wake of a rising general price level. In addition to these changes, changes in the effective lending rate of the RBI have also come through the "back door". These are discussed below under the headings of Bill Market Scheme and The System of Differential Rates.

Bill Market Scheme

The Bill Market Scheme was introduced in January

1952. Under the scheme, the Bank (RBI) undertook to make demand loans to eligible scheduled banks against the security of usance promissory notes of their constituents. The Scheme provides for the lodgement of bills as security for advances from the RBI and not for their rediscount by it. It therefore means that the borrowing bank could withdraw any of the lodged bills and replace them by other eligible bills. This enables the banks to manage their portfolios more efficiently since they can minimize interest charges by borrowing according to their needs and by remitting spare funds to reduce their indebtedness. As an encouragement for the use of the facilities under the Bill Market Scheme, the loans against the eligible bills were charged initially at 3 percent (½ percent below Bank rate). The interest concession was withdrawn in two stages of ½ percent each and has ceased to be operative since November 1956. There have been several institutional changes in the Scheme since its inception in 1952. However, they are too numerous to be detailed here. In a nut-shell, the Scheme has enhanced the borrowing capacity of the scheduled commercial banks. The total commercial bank borrowings have, however, never accounted for a significant proportion of their total deposit liabilities (see Table 1.3).

The System of Differential Rates

It was noted by RBI that the scheduled banks were offsetting the impact of variable reserve ratios by indulging in larger borrowing from the Bank. A straight increase in Bank rate to curb this, it was felt, might have had adverse repercussions on the gilt-edged market. Consequently, between October 1960 and September 1964, a system of lending rates on a slab basis was operated by the Bank. Under this system, banks were given a basic quota equal to a specific percentage of the statutory required reserves. Any borrowings over and above the allocated quota were to be charged higher rates. The weaknesses of this system soon became apparent to the RBI. First, the system was indifferent as among the banks' varying asset portfolios. Second, the rise in the average cost of borrowing would be small and gradual, and hence might enable banks to pass on the higher cost to their customers in the form of higher lending rates.

The slab system was replaced, therefore, in September 1964 by a new system involving a sliding scale of interest rates based on the net liquidity ratios of the borrowing banks. Net liquidity is defined as the total of a bank's cash and balances with the RBI and other notified banks, balances in current account with other banks and investment in Government and other approved securities,

less borrowings from the RBI, the State Bank of India and the Industrial Development Bank. The minimum net liquidity ratio at the time was put at 28 percent, and for every percentage point drop in the ratio, the cost of borrowing from the RBI on the entire amount was to go up by ½ percent. The system, as it operates now, is such that the minimum net liquidity ratio is fixed at 34 percent and the rate charged on borrowings from the RBI rise by 1 percent above the Bank rate (6 percent) for every drop of one point or a fraction thereof in the net liquidity ratio. The system might look similar to the slab system but it really is quite different. Unlike the slab system, it discriminates in favour of banks with higher liquidity ratios. In addition to this system of penal rates, a ceiling of 9 percent was prescribed for the lending rate of foreign banks and larger Indian scheduled banks to discourage these banks from borrowing from the Bank at higher rates.

Data on the weighted average rate of lending by the RBI to commercial banks were available on a quarterly basis only after October 1960 (since the introduction of the slab system). For the period prior to this, we have assumed that all the lending by the Bank was done at the Bank rate. This may not be strictly correct but the actual

rate charged could be expected to be close to the Bank rate. Thus the Reserve Bank Lending Rate (RRBL) variable (see Chapter III) is equal to the Bank rate up to 1960 QIII, and equal to the weighted average rate of lending by the RBI, thereafter.

Open Market Operations

Open market operations refer broadly to the purchase and sale by the central bank of a variety of assets such as Treasury bills, gold, Government securities, etc. Unlike the situations in the United States and U.K., where open market operations are mainly in Treasury bills, open market operations in India are entirely in Government bonds, in the absence of a Treasury bill market. Even the gilt-edged (Government securities) market is quite narrow. A sizeable proportion of the public debt is held by a few large institutions (most of them Government owned) and the volume of transactions in the securities market for the purpose of varying their portfolios is limited. The narrow gilt-edged market precludes large-scale operations by the RBI, since they would unduly disturb Government security prices. In India, open market operations have not been used much for influencing the cost and availability of credit through changes in the cash reserves of banks. The main purpose of open market operations in India has

been to assist in Government debt operations and to provide seasonal finance to banks.

Variable Reserve Requirements

This is a comparatively new tool in the kit of central banks of underdeveloped countries. In many advanced countries, this is considered to be a blunt and unfair weapon, and has been abandoned in many of them. In Canada it was adopted only recently. But in underdeveloped countries it assumes special significance in the context of the ineffectiveness of bank rate policy and open market operations. The central bank can directly and effectively regulate the volume of credit created by commercial banks by changing the percentage of reserves which these banks are required to keep with the central bank.

In India, the RBI Amendment Act of 1956 empowered the Bank, for the first time, to vary the minimum reserves required to be maintained with it by scheduled banks between 5 and 20 percent in respect of their demand liabilities and 2 and 8 percent in respect of their time liabilities. The minimum reserve requirement is related to the average daily balance of banks with the RBI. The Act was further amended in 1962 and, since September 16, 1962, scheduled commercial banks have been required to maintain statutory balances at not less than 3 percent of their demand and time liabilities and the RBI is empowered to increase this

ratio up to 15 percent. The RBI also has the power to impose supplementary reserve requirements on net increases in the demand and time liabilities of the commercial banks after a date specified by it. This provision is designed to ensure equity in the operation of additional reserve requirements when the acquisition of fresh deposits by banks is highly uneven. The Act also provides for the payment of interest by the Reserve Bank, at its discretion, at a rate or rates which it may determine from time to time, on the amount of reserves which exceed the minimum of 3 percent of the bank's demand and time liabilities.

The technique of variable reserve requirements has so far been used only once. In 1960, it took the form of requiring the banks to maintain with the RBI additional cash reserves on the increase in demand and time liabilities. This had only a limited success since the banks evaded it largely by recourse to borrowings from the Reserve Bank and partly by liquidating Government securities.

To prevent the banks from offsetting the impact of variable reserve requirements by running down their holdings of Government securities, the Amendment of 1962 requires all banks to maintain a minimum amount of liquid assets equal to not less than 25 percent of their demand and time liabilities in India, exclusive of the statutory required

reserves (i.e., effectively 28%) they hold with the RBI. In practice, however, it has never impinged on banks' portfolio preferences since traditionally the banks have voluntarily maintained a liquid asset ratio higher than the prescribed minimum of 28 percent.

The existence of the unorganized money markets, and the practice of keeping high excess reserves on the part of the commercial banks, limit the effectiveness of this potentially most powerful instrument in India. The increases in reserve requirements must be very substantial if they are to impinge significantly upon the liquidity position of the banks. But, on the other hand, violent and frequent changes in reserve requirements may seriously hinder the growth of sound commercial banking and thus may, in a way, defeat the very purpose of development policy.

Selective Credit Controls

All the measures discussed above could be termed quantitative measures since they are aimed at influencing the economy by influencing the quantity of credit. However, sometimes it might be equally important to influence simply the direction of credit. In the context of a developing country like India, which is characterized by acute capital shortage, "qualitative" measures for achieving this assume special significance. The great advantage

of qualitative controls, if they are effective, is that they curtail sharply those investment areas which have low priority value, while the quantitative instruments curtail investment in general and are, therefore, inefficient in diverting resources towards desired channels. It should be recognized, however, that some element of selectivity can be imparted to quantitative credit controls also by giving concessions to priority sectors or activities; this has been so in India.

In India, selective credit controls are considered as a useful supplement to general credit regulation and are found to be most effective when they are used together with general credit controls. The main forms which these controls have assumed in India are: (1) directives to increase margin requirements, (2) regulation of the total credit per borrower, and (3) maintenance of credit ceilings against specified commodities. These directives have sought to prevent speculative hoarding of commodities like food grains and essential raw materials to check an undue rise in their prices. Historically, these measures have not been very effective in arresting the rising prices of food and other articles. In the present study we shall ignore these selective credit control instruments, partly because of the difficulties involved in incorporating them in our monetary equations, and partly because of their

dubious effectiveness.

CHAPTER II

ESTIMATION OF THE QUARTERLY NATIONAL INCOME OF INDIA, 1951-52 TO 1966-67

This chapter, in some sense, represents the "backward linkage" effect of our efforts to build a quarterly econometric model of the Indian monetary sector. Since quarterly data are available for most of the monetary variables, the lack of these for national income seemed to be the only major bottleneck in building the model. In this chapter we report our estimates of quarterly national income[1] and describe in detail how they were arrived at.

The methods used for the estimation of national income in India by the Central Statistical Organisation (the agency responsible for preparing and publishing official estimates) are unique, as they combine both Income and Product approaches to the estimation of national income, the choice of method being dictated by the availability of data. Thus while the product method is used for Agriculture,

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[1] Our estimates reported in this chapter are actually those of net domestic product at factor cost (NDP) rather than national income (net national income at factor cost), which is equal to NDP-net factor income from abroad. In this chapter, however, we shall be using the term national income to refer to the NDP. Yearly estimates of national income in India correspond to financial years running from April 1 to March 31. Thus the year 1952-52 means the period between April 1, 1951 and March 31, 1952.

Mining and Manufacturing, etc., an extensive use of the income method is made in arriving at the contribution of sectors like Trade, Transportation and Services. Due to the lack of availability and comparability of data over time, an element of arbitrariness becomes unavoidable. The estimates have been criticized for this reason. As an example, we quote from Natonal Income of India ....[2.], "The analysis of the growth in national income, in the aggregate and sector-wise, has clearly brought out that the current estimates of national income cannot be relied on as a basis for measuring the growth in income in the last decade or in measuring the rate of growth from year to year. There are two main defects: the basic data for the estimation of sector incomes have not been mobilised and organised on a scientific basis and, therefore, the latter suffer from a large element of conjecture. This applies both to the calculation of the working force when the 'income method' is applied and for commodity production when the product method is applied. In the combination of these two methods, based on certain assumptions, arbitrary estimations have been arrived at ... In any event, it would be futile to seek an answer to the question whether national income has grown in real terms in the past decade? and at what rate? from the data that are made

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2. The Indian Merchant's Chamber, Economic Research and Training Foundation, National Income of India, Growth and Distribution (1950-51 to 1960-61), Bombay, 1963, pp. 95-96.

available."

This may be considered as a somewhat extreme view. However, it is hard to resist expression of such views if one happens to probe deeper into the methods employed in arriving at the national income estimates. Since the availability of data on a quarterly basis is far more limited than that on a yearly basis, the estimation of quarterly national income by employing methods parallel to those employed for the estimation of annual series is ruled out. Thus, instead of trying to estimate quarterly national income by employing primary income and product data, we have constructed some indices which are broadly indicative of the relative share of each quarter in the annual output and could, therefore, be used to apportion the yearly national income among the quarters. What these indices are and how they are constructed are the questions with which the rest of this chapter is concerned.

We have divided the economy into three sectors. These sectors are:

(i) the Agricultural Sector: does not include Fishing, Forestry and Logging;

(ii) the Industrial Sector: consisting of (a) Mining and Quarrying, (b) Large-scale Manufacturing, (c) Small-scale Manufacturing, (d) Construction, (e) Electricity,

Gas and Water Supply;

(iii) the Other Economic Activities Sector: consisting of whatever is not included in the above two sectors. Thus it includes (a) Fishing, Forestry and Logging, (b) Transport and Communication, (c) Trade, Storage, Hotels and Restaurants, (d) Services.[3.]

The national income originating in each of these three sectors will be termed (i) "Agricultural Income", (ii) "Industrial Income", and (iii) "Other Income". Table 2.1 contains a statement of sector-wise (sectors as above) national income (i.e., NDP) from 1951-52 to 1966-67, at constant (1960-61) and current prices. We are now ready to embark upon the discussion of how these "sectoral incomes" are allocated among different quarters.

2.1. The Agricultural Sector

The "agricultural income" is allocated among different quarters on the basis of a quarterly index of

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3. For the sectoral classification and estimates of national income, see Central Statistical Organization, Estimates of National Product 1960-61 to 1967-68, Department of Statistics, Cabinet Secretariat, Government of India, March 1969, pp. 4-7.

agricultural production which we have constructed for this purpose.

A yearly index of agricultural production, based on the yearly production of 28 major agricultural crops (food and non-food), is published by the Directorate of Economics and Statistics, Ministry of Food and Agriculture.[4] These crops, together with their respective weights in the aggregate index, are listed in Table 2.2. We have used the yearly index as the starting point for construction of the quarterly index. The quarterly index is based on the quarterly production of the same 28 crops and the weights used for arriving at this aggregate index are also the same as those in the yearly index. For calculating the proportion of total production of a crop falling in each quarter, two basic assumptions have been made: (i) output of a crop is assumed to accrue in the quarter in which it is harvested and (ii) if the harvesting season of a crop extends over more than one quarter, the total output of the crop is allocated between quarters involved in proportion to the number of months of the harvesting season

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[4]. The yearly index numbers of agricultural production published in Estimates of Area and Production of Principal Crops in India, are for the "Agricultural years" (July 1 to June 30)" 1950-51 to 1966-67, i.e., 1950 QIII to 1967 QII, with the Agricultural year 1949-50 as the base year. The indices for 1964-65 to 1965-66 were based on "partially revised" estimates, while those for 1966-67 were based on "Final Estimates". These indices are, therefore, subject to revision and so would, therefore, be the quarterly indices for these years which we have constructed on the basis of yearly "indices".

falling in each quarter. For example, the harvesting season for maize in Jammu and Kashmire extends from August to October[5]; hence two-thirds of the output of maize in Jammu and Kashmir would be allocated to the third quarter (July to September) and one-third to the fourth quarter (October to December).

To illustrate the procedure fully, let us take the example of the rice crop for the year 1962-63. State-wise production data are available in the Estimates of Area and Production of Principal Crops, for three seasons of rice, viz., (i) Winter Rice, (ii) Autumn Rice, and (iii) Summer Rice. The crop calendar gives the state-wise harvesting seasons for each of these three categories of rice. Let us consider the Autumn Rice first. The harvesting season for Autumn Rice in the state of Andhra extends from June to September. Hence, one-fourth of the total production of Autumn rice in Andhra is allocated to Quarter II and three-fourths to Quarter III. In Assam the season extends from June to August; thus 1/3 goes to Quarter II and 2/3 goes to Quarter III. The same procedure is applied to the remaining States and Union Territories. Now the quarter-wise addition of output over States and Territories would give quarter-wise aggregate output of Autumn Rice in

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[5] See Indian Crop Calendar, 1967, p. 31.

1962-63. The procedure described above is repeated with respect to Winter Rice and Summer Rice. Adding the three will give the quarterly output of Rice in 1962-63 (1962 QIII to 1963 QII). The quarterly output figures are then converted into percentages. Thus the allocation of the total output of Rice in 1962-63 among different quarters was obtained as follows: Quarter III - 10.0%, Quarter IV - 65.2% Quarter I - 21.3% and Quarter II - 3.5%. The whole procedure described above was repeated with respect to each of the remaining 27 commodities to give similar indices for the year 1962-63. Similar indices (for all the 28 commodities) were calculated in an identical manner for years 1963-64 to 1966-67. A weighted average of the quarterly indices for these five years (1962-63 to 1966-67) was then calculated. The weighted average so obtained was then assumed to be applicable (uniformly) to years 1950-51 to 1961-62. The weighted average was assumed to represent the years prior to 1962-63 because the state-wise breakdown of the total crop output for these years was not available to us, and hence ratios similar to those for years from 1962-63 to 1966-67 could not be calculated for years prior to 1962-63. It is recognized that the results might have been more reliable if it were possible to calculate these indices separately for each year prior

to 1962-1963. Results might also have been improved by further disaggregating the computation of these indices to district levels instead of state levels. Limited availability of data and resources have kept us from incorporating these refinements in calculating the indices. The indices for five major crops over the years 1962-63 to 1966-67 and the weighted average of these indices are reported in Table 2.3.

The yearly index numbers of production (1949-50 100) for 28 crops are published in the Estimates of Area and Production of Principal Crops in India. The quarterly index numbers of production could be calculated very easily by combining these yearly index numbers with the quarterly indices calculated as described above. For example, the quarterly index number of production for rice (1949-50 = 100) for the first quarter of 1963 would (at an annual rate) be .213 X 4 X 132.6 = 113.0, where 132.6 is the index number of rice production in 1962-63 and 0.213 is, as described above, the proportion of annual rice output produced in the first quarter. This procedure is used to compute the quarterly index numbers of production for each commodity for the years 1950-51 to 1966-67. The aggregate quarterly index of agricultural production based on 28 crops is finally obtained by combining the index num-

bers for individual commodities according to their weights. Table 2.4 contains the quarterly index numbers of Food, Non-food and Agricultural (Food and Non-food) production for the years 1950-51 to 1966-67.

The 28 commodities included in the quarterly index account for roughly 70% of the "Agricultural Income" in a typical year. What about the remaining 30%? We did not have any significant statistical information on quarter to quarter variations in this portion of the "Agricultural Income". We have therefore chosen the quarterly index of agricultural production (reported in Table 2.4) to allocate the "Agricultural Income" among the various quarters. To see how this is done, suppose we want to calculate the "Agricultural Income in 1963 QI. Let QIAP63I denote the quarterly index of agricultural production in Quarter I of 1963 and YA62-63 denote the "Agricultural Income" in financial year 1962-63 (1962 QII to 1963 QI). Now the "Agricultural Income" in quarter I of 1963 (QYA63I) will be given by:

$$(2.1) \qquad QYA631 = \left(\frac{QIAP63I}{QIAP62II + QIAP62III + QIAP62IV + QIAP63I}\right)^{YA62-63}$$

Table 2.5 contains the quarterly time series on "Agricultural Income", computed by utilising formula (2.1) above, for

years from 1951-52 to 1966-67

2.2. The Industrial Sector

This sector, as we have defined it, accounts for roughly 20% of the national income. A procedure similar to the one adopted for "Agricultural Income" has been used for allocating the "Industrial Income" among the quarters. However, we did not have to construct a quarterly index in this case since a monthly index of industrial production is compiled and published by the Central Statistical Organization. We have obtained the index from various issues of the Report on Currency and Finance and the Reserve Bank of India Bulletin. Quarterly estimates of "Industrial Income" are obtained by substituting, in formula (2.1), the "Industrial Income" and the "Index of Industrial Production" respectively for the "Agricultural Income" and the "Index of Agricultural Production". These estimates may also be subject to the same kind of defects; the quarterly index of Industrial Production may not be an entirely satisfactory index of quarter-to-quarter variations in the "Industrial Income" since the commodities included in the Index account for only a minor fraction of the Industrial Income. Another drawback of using the Index of Industrial Production stems from the fact that these indices are not strictly comparable over the period 1951-52 to

1966-67. The indices (of industrial production) are on different bases (1948 and 1956) and with varying degree of coverage, the number of commodities included being much higher for 1956 as compared to 1948. However, one can draw comfort from the fact that the index numbers for a particular quarter did not differ materially when shifted from one base to another, i.e., the index was not very sensitive to a change in the coverage. This fact tempts us to think that the index may not be too bad a representative of the "Industrial Sector" as a whole.

However, the realization of the limited coverage of the "Index of Industrial Production" has led us to try quadratic minimization techniques (to be described in detail in the next section) for the estimation of quarterly "industrial income". In Table 2.6 we present two separate estimates of quarterly "industrial income", one computed by using the "Index of Industrial Production" and the other by using the quadratic minimization techniques. In arriving at the quarterly national income (by aggregating the quarterly income of the three sectors), we have, however, used the quarterly "industrial income" estimated by using the "Index of Industrial Production".

2.3. Other Economic Activities Sector

Quadratic minimization techniques have been used to allocate the national income originating in this sector (i.e., "Other Income") among the quarters. A discussion of the techniques follows.

The problem of creating a monthly or quarterly series given only a set of annual figures has been explored by Lisman and Sandee[6]. and by Boot, Feibes and Lisman.[7]. Friedman[8]. is also concerned with the related but different problem of interpolating time series by employing other series which are correlated with them. Thus for applying Friedman's approach to this specific case we would need to have quarterly data on series related to the national income

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6. Lisman, J.H.C., and Sandeė, J., "Derivation of Quarterly Figures from Annual Data", Applied Statistics, 13, 1964, pp. 87-90.

7. Boot, J.C.A., Feibes, W., and Lisman, J.H.C., "Further Methods of Derivation of Quarterly Figures from Annual Data", Applied Statistics, 16, 1967, pp. 65-75.

8. Friedman, M., "The Interpolation of Time Series by Related Series", Journal of the American Statistical Association, 57, 1962, pp. 729-57.

series. Friedman does not deal in any detail with the problem of allocating annual totals among quarters. Denton[9] poses the problem as a problem of adjusting monthly or quarterly time series to independent annual totals. Thus he is concerned with the problem of "...adjusting monthly or quarterly values obtained from one source to make them accord with annual totals or averages obtained from another".[10] Although Denton's approach may seem only remotely concerned with the problem of creating a fresh series, it has been possible for him to show that the approach advocated by Boot, Feibes and Lisman could be considered as a special case of his general "adjustment problem". The discussion of this problem that follows is drawn directly from Denton.[11]

Let us assume that we have an original quarterly time series for m years represented in column vector form by $z = (z_1, z_2, \ldots, z_{4m})$. Let it be assumed further that a set of m annual totals represented by $y = (y_1, y_2 \ldots, y_m)$

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[9] Denton, F.T., "Adjustment of Monthly or Quarterly Series to Annual Totals: An Approach Based on Quadratic Minimization", Journal of the American Statistical Association, March 1971, pp. 99-102.

[10] Denton, op. cit., p. 99.

[11] Ibid.

is given to us independently of the quarterly time series. The "adjustment problem" could now be defined as the problem of adjusting the original vector z to obtain a new vector $x = (x_1, x_2, \ldots, x_{4m})$ by a method which (i) minimizes the distortion of the original series, in some sense, and (ii) satisfies the condition that the four quarterly values of the new series within each year sum to the given annual total for that year. For a fuller discussion and solution of the "adjustment problem", refer to Denton.[12].

Boot, Feibes and Lisman have suggested that a reasonable procedure for generating a monthly or quarterly series, given only a set of annual totals, is to choose values for the generated (estimated) series such that the sum of squares of either the first or second differences is a minimum. Since in the case with which Boot, et. al. are concerned, we do not have the so-called original series (z); we assume an artificial series in its place such that $z_t = z_{t-1}$ for all t. With this choice of an artificial series the "adjustment approach" would reduce to the approach advocated by Boot, et. al. for creating a series in cases where no initial estimates of the series existed.

The estimated series so obtained, by employing an artificial series with the property $z_t = z_{t-1}$, will be

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12. Ibid.

independent of the choice of artificial series. It is very important to have this property, because otherwise it will introduce into the estimated series a further degree of arbitrariness (in addition to one already inherent in the choice of a penalty function) based on the choice of the artificial series. Quarterly estimates for "industrial income" and "other income" (at constant 1960-1961 and current prices) were obtained by minimizing the sum of squares of first-order to fourth-order differences. However, in Table 2.6, which contains the estimates of quarterly "industrial income", only "first-order difference" results are reported. Only first and second-order difference results are reported in Table 2.7, containing the estimates of quarterly "other income".

Frank Denton had suggested that it may, in some sense, be more reasonable if, in the above estimates, we replace the artificial series ($z_t = z_{t-1}$) by a series obtained by fitting a polynomial to the yearly series. In the polynomially approximated series we will no longer have $z_t = z_{t-1}$, and hence the estimated series will not be independent of the polynomially approximated series. Two separate polynomials were fitted to "other income" (YOI) at constant (1960-1961) and current prices. They are res-

pectively:[13].

(2.2) YOI (Constant (1960-1961) prices) = 39.5276668 - .81987465 T
(-1.302)

+ 0.598062819.T^2 - .00128408478.T^3
(1.976) (-2.151)

+ .000011144.T^4 - .00000000337.T^5
(2.17) (-2.11)

$\bar{R}^2$ = .8422

(2.3) YOI (Current prices) = 30.8856839 + .396857928 T
(2.793)

- .0073107936 T^2 + .0000577672 T^3
(-2.832) (4.356)

R^{-2} = .9757

The polynomial estimates of quarterly YOI obtained from (2.2) and (2.3) do not necessarily add to the yearly totals. Now we can think of these polynomial estimates as "original" series and apply the "adjustment" approach to modify these estimates to add to yearly totals. Table 2.8 contains the quarterly "other income" estimates obtained bu minimizing the sum of squares of the first-order

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13. The period covered was from 1951-52 to 1966-67, assuming 1951-52 = 1, 1952-53 = 2, 1966-67 = 16. We had chosen T such that $T_i = 4 + 8(i - 1)$, where i = 1, 2, ..., 16. Thus the estimates of the quarterly YOI (at annual rates) could be obtained by simply putting T = 1, 3, 5, 7 (in 2.2 or 2.3) for the first year; 9, 11, 13, 15, for the second year, and so on. For the last year (i.e., 1966-67) one would have to put T = 121, 123, 125, 127, respectively, for the four quarters. When divided by four, these estimates would yield the quarterly YOI estimates which are reported in Table VIII. Figures in paranthesis in (2.2) and (2.3) represent t-ratios.

difference between the original and the estimated series. On comparing these estimates obtained by using the polynomially estimated series with those obtained by using the artificial series (see Tables 2.7 and 2.8), it is obvious that there is hardly any difference between the two. We had further employed the "adjustment" approach by employing the penalty function in terms of proportionate differences between the estimated series and the original (polynomially approximated) series. The proportionate differences in period t could be defined as $(x_t - z_t)/z_t$. We have not reported the estimates obtained by minimizing the proportionate differences since they were virtually the same as those obtained by using arithmetic differences.

It should be clear that there is nothing inherent in the methods discussed above to make them necessarily superior to other methods one might choose. If one has some additional information about the relative strength of the quarters in terms of economic activity, then that information should preferably be utilized along with (or instead of) these quadratic minimization procedures in estimating the relevant series. However, if a definite seasonal pattern from quarter to quarter is not suspected, these quadratic minimization procedures should be quite satisfactory. After all, these minimization procedures do seem to provide some spicy ups and downs from quarter to quarter

(see Tables 2.7 and 2.8). The quarterly estimates of national income (at constant and current prices) are reported in Table 2.9 separately for the cases where: (i) the artificial series ($z_t = z_{t-1}$) was used to estimate "other income", and (ii) the polynomially approximated series was used to estimate "other income". Finally, Table 2.10 contains index numbers of quarterly national income (1960-1961 = 100) at annual rates at constant and current prices.

In any discussion on the Indian Monetary Sector it is quite customary to talk in terms of the "busy season" (November to April) and the "slack season" (May to October) in the money market. The estimates presented above are clearly in conformity with the above division of the year in terms of the "busy" and "slack" seasons, since they show a heavy concentration of economic activity in quarters IV and I, which roughly span the "busy season". These estimates might, therefore, be very useful in relating the seasonal variations in monetary variables to those in national income.

TABLE 2.1

STATEMENT OF SECTOR WISE NATIONAL INCOME AT CONSTANT AND CURRENT PRICES

(In Billions of Rupees)

	CONSTANT (60-61) PRICES			CURRENT PRICES		
YEARS	AGRICULTURAL INCOME	INDUSTRIAL INCOME	OTHER INCOME	AGRICULTURAL INCOME	INDUSTRIAL INCOME	OTHER INCOME
1951-52	48.42	17.00	36.28	49.10	16.80	34.00
1952-53	50.14	17.60	37.76	47.10	17.00	34.20
1953-54	54.45	18.40	39.05	52.00	17.70	35.10
1954-55	54.46	19.00	41.14	42.30	18.00	35.80
1955-56	54.29	19.60	42.81	43.90	18.50	37.40
1956-57	56.91	20.50	44.99	53.80	20.00	39.20
1957-58	54.12	20.70	46.28	51.30	21.20	41.50
1958-59	60.22	20.90	48.58	60.80	21.70	43.70
1959-60	59.63	21.90	50.57	60.90	23.20	45.70
1960-61	65.71	26.88	41.21	65.71	26.88	41.21
1961-62	66.27	28.85	43.79	67.69	29.19	44.73
1962-63	64.41	30.98	46.38	69.06	32.06	48.87
1963-64	66.10	33.93	49.97	80.18	37.05	55.08
1964-65	72.26	35.93	52.71	98.45	40.93	62.91
1965-66	61.08	36.51	54.40	94.35	44.34	68.84
1966-67	60.95	36.70	55.68	113.01	48.26	77.75

TABLE 2.2

COMMODITIES INCLUDED IN THE INDEX OF AGRICULTURAL PRODUCTION

FOOD GRAINS

S.N.	COMMODITIES	WEIGHTS
1.	Rice	35.3
2.	Jowar	5.0
3.	Bajara	2.7
4.	Maize	2.1
5.	Ragi	1.2
6.	Small Millets	1.5
7.	Wheat	8.5
8.	Barley	2.0
9.	Gram	3.7
10.	Tur	1.1
11.	Other Pulses	3.8
	Total Food Grains	66.9

NON-FOOD GRAINS

S.N.	COMMODITIES	WEIGHTS
1.	Ground Nut	5.7
2.	Sesamum	1.2
3.	Rape Seed & Mustard	2.0
4.	Lin Seed	0.8
5.	Castor Seed	0.2
6.	Cotton	2.8
7.	Jute	1.4
8.	Mesta	0.3
9.	Tea	3.3
10.	Coffee	0.2
11.	Rubber	0.1
12.	Sugar Cane	8.7
13.	Tobaco	1.9
14.	Potatoes	1.0
15.	Black Pepper	1.2
16.	Chillies (Dry)	2.0
17.	Ginger (Dry)	0.3
	Total Non-Food Grains	33.1
	All Commodities	100.00

TABLE 2.3

QUARTERLY INDICES - PERCENTAGES OF TOTAL OUTPUT ACCURING IN EACH QUARTER - FOR SELECTED AGRICULTURAL COMMODITIES

COMMODITIES	AGRICULTURAL YEAR 62-63				AGRICULTURAL YEAR 63-64				AGRICULTURAL YEAR 64-65			
	62 III	63 IV	63 I	63 II	63 III	63 IV	64 I	64 II	64 III	64 IV	65 I	65 II
1. Rice	10.0	65.2	21.3	3.5	10.0	66.5	20.4	3.1	13.1	64.2	17.1	5.6
2. Jowar	--	47.4	45.9	6.7	--	45.1	47.4	7.5	--	49.2	44.3	6.5
3. Wheat	--	--	35.6	64.4	--	--	34.3	65.7	--	--	33.4	66.6
4. Gram	--	--	62.2	37.8	--	--	62.9	37.1	--	--	61.0	39.0
5. Groundnut	17.8	67.4	6.8	8.0	17.4	69.1	6.4	7.1	18.3	70.4	5.9	5.4
6. Jute	84.5	15.5	--	--	85.5	14.5	--	--	83.8	16.2	--	--
7. Ginger (Dry)	--	65.8	34.2	--	--	65.0	35.0	--	--	64.1	35.9	--

COMMODITIES	AGRICULTURAL YEAR 65-66				AGRICULTURAL YEAR 66-67				WEIGHTED AVERAGE TO BE BE USED FOR YEARS 1951-52 to 1961-62			
	65 III	65 IV	66 I	66 II	66 III	66 IV	67 I	67 II	III	IV	I	II
1. Rice	13.0	63.5	17.5	6.0	14.7	56.2	20.6	8.5	12.0	63.3	19.4	5.3
2. Jowar	--	49.3	43.4	7.3	--	42.4	49.2	8.4	--	46.6	46.1	7.3
3. Wheat	--	--	33.7	66.3	--	--	35.7	64.3	--	--	34.5	65.5
4. Gram	--	--	63.1	36.9	--	--	62.4	37.6	--	--	62.2	37.8
5. Ground Nut	16.3	69.2	7.0	7.5	16.4	69.7	7.1	6.8	17.3	69.2	6.6	6.9
6. Jute	85.8	14.2	--	--	85.3	14.7	--	--	84.9	15.1	--	--
7. Ginger (Dry)	--	62.0	38.0	--	--	61.8	38.2	--	--	63.8	36.2	--

TABLE 2.4

QUARTERLY INDEX OF AGRICULTURAL PRODUCTION: AGRICULTURAL YEAR 1950-51 to 1966-67 (AT ANNUAL RATES)

BASE: AGRICULTURAL YEAR 1949-50 = 100

S.N.	ITEMS	1950-51				1951-52				1952-53				1953-54				1954-	
		III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.	Food Grains	35.6	157.5	99.3	69.5	37.3	161.8	98.9	66.5	41.3	175.7	110.3	77.1	49.7	214.5	126.9	85.2	45.5	195.8
2.	Non-Food Grains	53.7	178.7	151.1	40.2	60.3	183.6	155.8	42.3	59.0	166.7	148.6	40.9	53.3	175.4	149.3	40.8	58.7	208.0
3.	All Commodities	41.6	164.5	116.4	59.8	44.9	169.0	117.7	58.5	47.2	172.7	123.0	65.1	50.9	201.6	134.3	70.5	49.9	199.8

S.N.	ITEMS	-1955		1955-56		1956-57				1957-58				1958-59			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
1.	Food Grains	128.5	90.5	46.08	201.77	128.44	91.28	50.87	210.21	138.35	97.31	44.99	194.54	117.76	82.71	52.48	228.19	147.5	99.5
2.	Non-Food Grains	170.3	46.6	62.97	201.64	170.69	44.4	67.91	222.63	186.38	49.11	66.94	224.6	178.57	47.74	74.96	238.58	192.33	51.4
3.	All Commodities	142.3	78.0	51.67	201.72	142.42	75.76	56.51	214.32	154.25	81.35	52.26	204.49	137.89	71.14	59.92	231.63	162.33	83.6

S.N.	ITEMS	1959-60				1960-61				1961-62				1962-63			
		III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
1.	Food Grains	53.13	224.34	138.3	101.4	54.85	239.88	153.62	107.83	57.38	246.12	153.24	113.56	50.54	242.52	152.96	97.44
2.	Non-Food Grains	68.13	228.03	192.03	51.42	67.33	245.89	208.78	54.83	82.22	257.80	217.9	57.73	79.07	255.14	218.93	57.08
3.	All Commodities	58.10	225.56	156.09	84.61	58.98	241.87	171.88	90.29	65.60	249.98	174.64	95.08	59.99	246.70	174.80	84.08

S.N.	ITEMS	1963-64				1964-65				1965-66				1966-67			
		III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
1.	Food Grains	52.30	264.96	151.65	89.68	65.89	273.37	153.43	117.29	54.71	216.29	124.41	97.35	60.04	201.17	138.66	107.59
2.	Non-Food Grains	84.55	262.17	219.46	55.18	85.31	292.44	245.87	62.97	72.30	266.03	227.45	59.86	77.92	240.91	215.0	59.14
3.	All Commodities	62.98	264.04	174.09	78.26	72.32	279.68	184.03	99.31	60.53	232.76	158.52	84.94	65.96	214.32	163.93	91.55

TABLE 2.5

QUARTERLY AGRICULTURAL INCOME, 1951-52 TO 1966-67

A. AT CONSTANT (1960-61) PRICES (IN BILLIONS OF RUPEES).

QUARTERS	FINANCIAL YEARS															
	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	7.40	7.31	7.85	8.30	8.94	8.61	9.25	8.16	9.53	9.97	10.31	10.62	9.50	9.21	11.01	8.94
III	5.55	5.90	6.13	5.88	5.92	6.42	5.94	6.87	6.62	6.96	7.49	6.70	7.11	8.51	6.71	6.94
IV	20.91	21.57	24.29	23.53	23.11	24.35	23.25	26.57	25.70	28.52	28.54	27.56	29.83	32.89	25.79	27.82
I	14.56	15.36	16.18	16.75	16.32	17.53	15.68	18.62	17.78	20.26	19.93	19.53	19.66	21.65	17.57	17.25

B. AT CURRENT PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	FINANCIAL YEARS															
	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	7.50	6.87	7.49	6.45	7.23	8.14	8.77	8.24	9.73	9.97	10.53	11.39	11.52	12.55	17.01	16.58
III	5.64	5.54	5.86	4.57	4.79	6.07	5.63	6.91	6.76	6.96	7.65	7.19	8.62	11.57	10.36	12.87
IV	21.20	20.26	23.19	18.27	18.69	23.02	22.04	26.84	26.24	28.52	29.15	29.54	36.18	44.83	39.84	51.57
I	14.76	14.43	15.46	13.01	13.19	16.57	14.86	18.81	18.17	20.26	20.36	20.94	23.86	29.50	27.14	31.99

TABLE 2.6 A

ESTIMATES OF "INDUSTRIAL INCOME" - USING THE INDEX OF INDUSTRIAL PRODUCTION

1. AT CONSTANT (1960-61) PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	4.14	4.29	4.58	4.50	4.90	5.69	5.58	4.97	5.01	6.30	6.85	7.40	8.01	8.32	8.94	8.97
III	4.15	4.31	4.54	4.69	4.92	5.07	5.03	5.10	5.34	6.42	7.16	7.62	8.39	8.99	9.12	9.14
IV	4.25	4.52	4.64	4.89	4.86	4.81	4.97	5.24	5.56	6.90	7.21	7.82	8.71	9.21	9.07	9.31
I	4.46	4.48	4.64	4.92	4.92	4.93	5.12	5.59	5.99	7.26	7.63	8.14	8.82	9.41	9.38	9.28

2. AT CURRENT PRICES: (IN BILLIONS OF RUPEES)

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	4.09	4.14	4.40	4.26	4.62	5.55	5.72	5.16	5.31	6.30	6.93	7.66	8.76	9.47	10.85	11.81
III	4.10	4.17	4.36	4.45	4.64	4.95	5.15	5.30	5.66	6.41	7.25	7.88	9.17	10.25	11.08	12.02
IV	4.20	4.37	4.47	4.63	4.59	4.69	5.08	5.44	5.88	6.90	7.29	8.10	9.50	10.49	11.01	12.24
I	4.41	4.32	4.47	4.66	4.65	4.81	5.25	5.80	6.35	7.27	7.72	8.42	9.62	10.72	11.40	12.19

TABLE 2.6 B

ESTIMATES OF "INDUSTRIAL INCOME" - USING THE "QUADRATIC MINIMIZATION PROCEDURES";

USING ARTIFICIAL SERIES ($z_t = z_{t-1} = 10$) AND "ADJUSTMENT" OF "ORDER ONE".

1. AT CONSTANT (1960-61) PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	5.44	4.04	4.60	4.68	4.83	5.06	5.16	5.21	5.21	6.30	7.09	7.50	8.22	8.85	9.13	9.07
III	4.29	4.36	4.58	4.73	4.87	5.12	5.17	5.23	5.31	6.65	7.15	7.65	8.41	8.95	9.14	9.09
IV	3.68	4.56	4.59	4.78	4.92	5.15	5.18	5.23	5.52	6.89	7.25	7.82	8.58	9.04	9.13	9.19
I	3.59	4.64	4.63	4.81	4.98	5.17	5.19	5.23	5.86	7.04	7.36	8.01	8.72	9.09	9.11	9.35

B. AT CURRENT PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	5.41	3.92	4.44	4.46	4.54	4.85	5.22	5.37	5.56	6.40	7.11	7.65	8.79	9.93	10.66	12.06
III	4.26	4.21	4.42	4.49	4.58	4.96	5.29	5.40	5.68	6.64	7.23	7.86	9.13	10.15	10.89	12.25
IV	3.62	4.40	4.41	4.52	4.65	5.05	5.33	5.44	5.86	6.84	7.35	8.82	9.43	10.34	11.20	12.16
I	3.51	4.47	4.43	4.53	4.73	5.14	5.36	5.49	6.10	7.00	7.50	8.43	9.70	10.51	11.59	11.79

TABLE 2.7 A

ESTIMATES OF "OTHER INCOME" USING ARTIFICIAL SERIES ($z_t = z_{t-1} = 10$) AND ADJUSTMENT OF "ORDER ONE".

1. AT CONSTANT (1960-61) PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	9.21	9.25	9.63	10.09	10.53	11.07	11.46	11.80	12.96	10.90	10.65	11.45	11.90	13.06	13.33	14.32
III	9.03	9.40	9.69	10.24	10.63	11.20	11.52	11.98	12.99	10.23	10.98	11.39	12.38	13.15	13.46	14.31
IV	8.98	9.52	9.80	10.36	10.75	11.32	11.60	12.24	12.66	9.97	11.11	11.57	12.73	13.22	13.66	13.91
I	9.06	9.59	9.93	10.45	10.90	11.40	11.70	12.56	11.96	10.11	11.05	11.97	12.96	13.28	13.95	13.14

2. AT CURRENT PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	8.81	8.42	8.71	8.86	9.18	9.61	10.17	10.66	11.53	10.55	10.70	11.81	13.06	15.15	16.24	19.97
III	8.52	8.52	8.76	8.90	9.30	9.72	10.32	10.80	11.60	10.22	11.06	12.05	13.49	15.63	16.66	20.33
IV	8.35	8.60	8.80	8.97	9.41	9.86	10.45	11.00	11.46	10.14	11.36	12.34	13.99	15.96	17.42	19.62
I	8.32	8.66	8.83	9.07	9.51	10.01	10.56	11.24	11.11	10.30	11.61	12.67	14.54	16.17	18.52	17.83

TABLE 2.7 B

ESTIMATES OF "OTHER INCOME" USING ARTIFICIAL SERIES ($z_t = z_{t-1} = 10$) AND "SECOND ORDER" ADJUSTMENT

1. AT CONSTANT (1960-61) PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67
II	9.24	9.20	9.66	10.07	10.55	11.03	11.53	11.68	13.05	10.92	10.56	11.55	11.76	13.23	13.11	14.57
III	9.05	9.39	9.70	10.23	10.64	11.18	11.57	11.91	13.05	10.23	10.97	11.42	12.32	13.23	13.33	14.45
IV	8.97	9.54	9.78	10.37	10.74	11.33	11.58	12.28	12.63	9.95	11.16	11.53	12.79	13.16	13.74	13.81
I	9.02	9.63	9.91	10.47	10.88	11.45	11.60	12.71	11.84	10.11	11.10	11.88	13.10	13.09	14.22	12.85

2. AT CURRENT PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67
II	8.94	8.33	8.77	8.83	9.20	9.59	10.20	10.60	11.56	10.59	10.61	11.92	12.89	15.40	15.84	20.40
III	8.55	8.49	8.77	8.90	9.30	9.72	10.34	10.77	11.62	10.24	11.02	12.11	13.40	15.80	16.38	20.59
IV	8.29	8.64	8.77	8.98	9.40	9.86	10.44	11.02	11.45	10.12	11.40	12.30	14.04	15.89	17.54	19.42
I	8.22	8.74	8.79	9.09	9.50	10.03	10.52	11.31	11.07	10.26	11.70	12.54	14.75	15.82	19.08	17.34

TABLE 2.8 A.

POLYNOMIALLY APPROXIMATED SERIES FOR "OTHER INCOME"

1. AT CONSTANT (1960-61) PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67
II	9.69	9.03	9.36	10.09	10.84	11.38	11.65	11.67	11.53	11.37	11.32	11.52	11.99	12.69	13.46	13.96
III	9.39	9.05	9.53	10.29	11.00	11.48	11.67	11.64	11.48	11.34	11.35	11.61	12.14	12.89	13.63	13.98
IV	9.19	9.12	9.71	10.48	11.14	11.55	11.68	11.61	11.44	11.32	11.39	11.72	12.32	13.09	13.77	13.95
I	9.08	9.22	9.90	10.66	11.27	11.61	11.68	11.57	11.40	11.32	11.44	11.84	12.50	13.28	13.89	13.85

2. AT CURRENT PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951-52	1952-53	1953-54	1954-55	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67
II	7.82	8.48	8.95	9.29	9.52	9.71	9.89	10.11	10.41	10.84	11.44	12.26	13.33	14.71	16.43	18.55
III	8.0	8.61	9.05	9.35	9.57	9.76	9.94	10.18	10.51	10.97	11.62	12.50	13.64	15.10	16.92	19.12
IV	8.17	8.73	9.13	9.41	9.12	9.80	10.00	10.25	10.61	11.12	11.82	12.76	13.98	15.52	17.44	19.77
I	8.33	8.85	9.21	9.47	9.67	9.85	10.05	10.33	10.72	11.27	12.02	13.03	14.33	15.97	17.98	20.43

TABLE 2.8 B

ESTIMATES OF "OTHER INCOME", USING THE "POLYNOMIALLY APPROXIMATED SERIES" AND ADJUSTMENT OF "ORDER ONE"

1. AT CONSTANT (1960-61) PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	9.36	9.20	9.63	10.09	10.53	11.06	11.46	11.81	12.96	10.94	10.50	11.37	12.15	12.97	13.43	13.90
III	9.03	9.40	9.69	10.24	10.63	11.21	11.52	11.98	12.98	10.26	10.87	11.48	12.39	13.12	13.54	13.96
IV	8.91	9.54	9.80	10.36	10.75	11.32	11.60	12.23	12.66	9.96	11.13	11.66	12.62	13.26	13.65	13.96
I	8.98	9.62	9.93	10.45	10.90	11.40	11.70	12.56	11.97	10.05	11.29	11.87	12.81	13.36	13.78	13.86

2. AT CURRENT PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	8.25	8.57	8.68	8.87	9.18	9.61	10.17	10.66	11.52	10.54	10.71	11.80	13.08	15.07	16.60	18.50
III	8.49	8.52	8.76	8.90	9.30	9.73	10.32	10.80	11.61	10.22	11.06	12.05	13.51	15.55	16.95	19.08
IV	8.62	8.53	8.81	8.97	9.41	9.85	10.45	11.00	11.46	10.15	11.36	12.34	13.99	15.97	17.39	19.75
I	8.64	8.58	8.85	9.06	9.51	10.01	10.56	11.24	11.11	10.30	11.60	12.68	14.50	16.32	17.90	20.42

TABLE 2.9 A

ESTIMATES OF NATIONAL INCOME

(QUARTERLY) NATIONAL INCOME = "AGRICULTURAL INCOME" (TABLE V) + "INDUSTRIAL INCOME" (TABLE VI A) + "OTHER INCOME" (TABLE VII A) [USING ARTIFICIAL SERIES ($z_t = z_{t-1}$) AND THE ADJUSTMENT OF "ORDER ONE"]

1. AT CONSTANT (1960-61) PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	20.75	20.85	22.06	22.89	24.37	25.37	26.29	24.93	27.50	27.17	27.81	29.47	29.41	30.59	33.28	32.23
III	18.73	19.61	20.36	20.81	21.47	22.69	22.49	23.95	24.95	23.61	25.63	25.71	27.88	30.65	29.29	30.39
IV	34.14	35.61	38.73	38.78	38.72	40.48	39.82	44.05	43.92	45.39	46.86	46.95	51.27	55.32	48.52	51.04
I	28.08	29.43	30.75	32.12	32.14	33.86	32.50	36.77	35.73	37.63	38.61	39.64	41.44	44.34	40.90	39.67

2. CURRENT PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	20.40	19.43	20.60	19.57	21.03	23.30	24.66	24.06	26.57	26.82	28.16	30.86	33.34	37.17	44.10	48.36
III	18.26	18.23	18.98	17.92	18.73	20.74	21.10	23.01	24.02	23.59	25.96	27.12	31.28	37.45	38.10	45.22
IV	33.75	33.23	36.46	31.87	32.69	37.57	37.57	43.28	43.58	45.56	47.80	49.98	59.67	71.28	68.27	83.43
I	27.49	27.41	28.76	26.74	27.35	31.39	30.67	35.85	35.63	37.83	39.69	42.03	48.02	56.39	57.06	62.01

TABLE 2.9 B

ESTIMATES OF NATIONAL INCOME

(QUARTERLY) NATIONAL INCOME = "AGRICULTURAL INCOME" (TABLE V) + "INDUSTRIAL INCOME" (TABLE VI A) + "OTHER INCOME" (TABLE VIII. B), [USING THE POLYNOMIALLY APPROXIMATED SERIES AND THE ADJUSTMENT OF "ORDER ONE"]

1. AT CONSTANT (1960-61) PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	20.90	20.80	22.06	22.89	24.37	25.36	26.29	24.94	27.50	27.21	27.66	29.39	29.66	30.50	33.38	31.81
III	18.75	19.61	20.36	20.81	21.47	22.70	22.49	23.95	24.94	23.64	25.52	25.80	27.89	30.62	29.37	30.04
IV	34.07	35.63	38.73	38.78	38.72	40.48	39.82	44.04	43.92	45.38	46.88	47.04	51.16	55.36	48.51	51.09
I	28.00	29.46	30.75	32.12	32.14	33.86	32.50	36.77	35.74	37.57	38.85	39.54	41.29	44.42	40.73	40.39

2. AT CURRENT PRICES: (IN BILLIONS OF RUPEES).

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	19.84	19.58	20.57	19.58	21.03	23.30	24.66	24.06	26.56	26.81	28.17	30.85	33.36	37.09	44.46	46.89
III	18.23	18.23	18.98	17.92	18.73	20.75	21.10	23.01	24.03	23.59	25.96	27.12	31.30	37.37	38.39	43.97
IV	34.02	33.16	36.47	31.87	32.69	37.56	37.57	43.28	43.58	45.57	47.80	49.98	59.67	71.29	68.24	83.56
I	27.81	27.33	28.78	26.73	27.35	31.39	30.67	35.85	35.63	37.83	39.68	42.04	47.98	56.54	56.44	64.60

TABLE 2.10 A

INDEX No.'s OF NATIONAL INCOME (QUARTERLY) AT ANNUAL RATES CORRESPONDING TO ESTIMATES PRESENTED IN TABLE IX A

1. AT CONSTANT (1960-61) PRICES. BASE: 1960-61 = 100

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	62.03	62.33	65.95	68.43	72.85	75.84	78.59	74.53	82.21	81.22	83.14	88.10	87.92	91.45	99.49	96.35
III	55.99	58.62	60.87	62.21	64.18	67.83	67.23	71.60	74.59	70.58	76.62	76.86	83.35	91.63	87.56	90.85
IV	102.06	106.46	115.78	115.93	115.75	121.01	119.04	131.69	131.30	135.69	140.09	140.36	153.27	165.28	145.05	152.58
I	83.95	87.98	91.93	96.02	96.08	101.22	97.16	109.92	106.81	112.49	115.42	118.50	123.88	132.55	122.27	118.59

2. AT CURRENT PRICES: BASE: 1960-61 = 100

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	60.98	58.09	61.58	58.50	62.87	69.66	73.72	71.93	79.43	80.18	84.18	92.26	99.67	111.12	131.84	144.57
III	54.59	54.50	56.74	53.57	55.99	62.00	63.08	68.79	71.81	70.52	77.61	81.08	93.51	111.96	113.90	135.19
IV	100.90	99.34	109.00	95.28	97.73	112.32	112.32	129.39	130.28	136.20	142.90	149.42	178.38	213.09	204.09	249.41
I	82.18	81.94	85.98	79.94	81.76	93.84	91.69	107.17	106.52	113.09	118.65	125.65	143.56	168.58	170.58	185.38

TABLE 2.10 B

INDEX NUMBERS' OF (QUARTERLY) NATIONAL INCOME (AT ANNUAL RATES) CORRESPONDING TO ESTIMATES PRESENTED IN TABLE IX B

1. AT CONSTANT (1960-61) PRICES: BASE: 1960-61 = 100

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	62.48	62.18	65.95	68.43	72.85	75.81	78.59	74.56	82.21	81.34	82.69	87.86	88.67	91.18	99.79	95.10
III	55.99	58.62	60.87	62.21	64.18	67.86	67.23	71.60	74.56	70.67	76.29	77.13	83.38	91.54	87.80	89.80
IV	131.85	106.52	115.78	115.93	115.75	121.01	119.04	131.66	131.30	135.66	140.15	140.63	152.94	165.50	145.02	152.73
I	83.71	88.07	91.93	96.02	96.08	101.22	97.16	109.92	106.84	112.32	116.14	118.20	123.44	132.79	121.76	120.75

2. AT CURRENT PRICES: BASE: 1960-61 = 100

QUARTERS	1951 -52	1952 -53	1953 -54	1954 -55	1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64	1964 -65	1965 -66	1966 -67
II	59.31	58.53	61.49	58.53	62.87	69.66	73.72	71.93	79.40	80.15	84.21	92.23	99.73	110.88	132.91	140.18
III	54.50	54.50	56.74	53.57	55.99	62.03	63.08	68.79	71.84	70.52	77.61	81.08	93.57	111.72	114.77	131.45
IV	101.70	99.13	109.03	95.28	97.73	112.29	112.32	129.39	130.28	136.23	142.90	149.42	178.38	215.12	204.00	249.80
I	83.13	81.70	86.04	79.91	81.76	93.84	91.69	107.17	106.52	113.09	118.62	125.68	143.44	169.03	168.73	193.12

CHAPTER III

THE SPECIFICATION AND ESTIMATION OF THE MODEL'S STOCHASTIC EQUATIONS

In this chapter we present the OLS estimates for several alternative specifications of each of the stochastic equations in the Model. We have 12 stochastic equations, of which 10 are behavioral equations. The monetary economy is considered (from the point of view of this study) to be made up of three sectors, namely, the Commercial Banking Sector,[1] the Private Non-bank Sector, and the Government Sector (includes the Central and State Governments and the RBI).[2] The Commercial Banking Sector embraces all the foreign banks operating in the country, and the Indian scheduled and non-scheduled commercial banks. All these banks, except the State Bank of India since July 1, 1955, were owned and operated by the private sector during the sample period of this study (1952 QII to 1967 QI). The

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1. For reasons explained earlier, in the first Chapter, we are neglecting the unorganized part of the Indian Money Market and the Co-operative Banking Sector in our present treatment of the Monetary Sector of India.

2. The Reserve Bank of India is included within the Government Sector, since, in our judgement, the Bank has little independent authority of its own. It is essentially in the nature of a Government department looking after (among other things) the monetary system of the country.

Government sector is assumed to be exogenous to the Model; therefore, we shall not specify any behavioral equations for this sector. For the purpose of this study, each of the three sectors described above is assumed to be homogeneous.

Behavioral equations are specified for six main kinds of financial assets. They are:

(i) Bank Credit (BC), held by the private non-bank sector and supplied by the commercial banking sector;

(ii) Currency with the Public (CUP), held by the private non-bank sector and supplied by the government sector;

(iii) Demand Deposits (DD), held by the private non-bank sector and supplied by the commercial banking sector;

(iv) Excess Reserves (ER), held by the Commercial banking sector and supplied by the government sector;

(v) Government Securities (GS), held by the commercial banking sector and supplied by the government sector;

(vi) Time Deposits (TD), held by the private non-bank sector and supplied by the commercial banking sector.

Eight behavioral equations have been estimated for the demand and supply of these six financial assets. We have found it very useful to include the lagged value of the dependent variable. One way (among many others)[3] of rationalizing such a specification is to postulate a partial adjustment model.[4] Let us assume that there is an unobservable desired level of the stock of a financial variable Y, defined by Y^*, which depends on the vector of explanatory variables X such that

$$Y^*_t = f(X_t). \tag{3.1}$$

We further assume that the adjustment of the actual level Y_t towards the desired level Y^*_t is not an instantaneous process; in particular, we assume that during a given period t(quarter) only a fraction r of the difference between the desired level Y^*_t and the initial level Y_{t-1} is made up.

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3. See Feige, E., "Expectations and Adjustments in the Monetary Sector", American Economic Review, May, 1967; and Griliches, Z., "Distributed Lags: A Survey", Econometrica, January 1967, for a good discussion of the "other-ways".

4. Gupta, G.S., Monetary Policy Model of the Indian Economy, 1971, uses a similar argument for justifying the inclusion of lagged dependent variables in his equations. The argument, however, is likely to be more appropriate for a quarterly model (like ours) than for an annual one (like Gupta's).

Thus

$$Y_t - Y_{t-1} = r(Y^*_t - Y_{t-1}), \quad 0<r<1.$$

Hence $$Y_t = rY^*_t + (1 - r)Y_{t-1}$$

(3.2) or $$Y_t = rf(X_t) + (1 - r)Y_{t-1}$$

Thus the coefficient of adjustment (r) would be given by one minus the coefficient of the lagged dependent variable in the equation. The higher is the coefficient of the lagged dependent variable, the lower would be the speed of adjustment.

The average lag between Y* and Y in the adjustment equation above would simply be $\frac{1 - r}{r}$, since $Y^*_t = \frac{1}{r}Y_t - \frac{1 - r}{r}Y_{t-1}$. However, the meaningful measure of lag would be the measure of average lag between the observed Y and the current and past values of Y*. This would, however, simply be the same absolute magnitude with the algebraic sign reversed. Thus the average lag between Y and Y* would be $\frac{1 - r}{r}$.[5]

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5. An alternative way of calculating this average lag would be to express the adjustment equation as

$$Y_t = rY^*_t + r(1 - r)Y^*_{t-1} + r(1 - r)^2Y^*_{t-2} \ldots.$$

and then calculate average lag as

$$= 0.(r) + 1.(r)(1 - r) + 2.(r)(1 - r)^2 \ldots.$$

$$= \frac{1 - r}{r}$$

It seems useful, at this stage, to write out in very general form the typical equation (in the model) explaining the holdings of a financial asset. Let A represent the item the holdings of which the equation attempts to explain, r's represent interest rates and other rates of return, and W represent some sort of wealth (or budget) contraint or a proxy for it. The typical equation would then be:

$$A_t = f(r_{0_t}, r_{1_t}, r_{2_t} \cdots r_{n_t}, W_t, A_{t-1}) \tag{3.3}$$

Here A_t represent the holdings of asset A in period t, r_0 is the own rate of return and the rest of the r's represent the rates of return on other competing assets. The theory of "rational" portfolio choice would have one expect

$$f_i > 0 \qquad i = 1$$

$$f_i < 0 \qquad i = 2, 3 \ldots n+1$$

$$f_i > 0 \qquad i = n+2, \quad n+3$$

Where f_i is the partial derivative of A_t with respect to the i th argument in equation 3.3. There are few equations in the model which do not really fit into this type of format; the demand for currency is one obvious example. We shall discuss such equations in detail when we individually

discuss each equation in the model - a course on which we now embark.

3.1 Supply of Bank Credit Equation

In the market for Bank Loans, the loan rate is perhaps the most important decision parameter for a participating bank. It is well known, however, that in times of credit tightness the banks employ non-price rationing techniques rather than promptly resorting to loan rate increases which perform the function automatically. This is largely due to the need, on the part of most of the banks, to keep good customer relationships. This, however, only implies a sluggish response of loan rate to credit conditions since, "after a judicious interval of time, banks will, as Samuelson has stated: '... do what any normal prudent commercial-minded man would do; namely, if a thing is in short supply he will gradually raise the interest charges on it, and let the higher prices help him do the rationing.'"[6]. If the responses of the commercial banks in the loan market are due to a varying mix of the changes in the loan rate and the rigidity of non-price limitations (including selective credit controls by the Reserve Bank),

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6. Goldfeld, S.M., Commerical Bank Behavior and Economic Activity, North Holland, Amsterdam, 1966, p. 64.

one is likely to mis-specify the loan market equations by relying on the loan rate alone. Unfortunately, we have found it impossible to deal with this matter empirically since it was not possible to quantify the non-price factors influencing the supply of bank credit (loans). We simply had to rely on the loan rate alone.

A quarterly series for the average rate charged by the commercial banks on their credit to the private non-bank sector is not available for India. Even on an annual basis the figures are not readily available. We, therefore, had no real choice but to resort to some sort of approximation. The Loan Rate (RL) used in the Bank Credit Supply equations was calculated as equal to ½ Prime Lending Rate (RPL) + Call Money Rate (RCM) .[7] The rationale behind using RCM is that it is, perhaps, the best single indicator of credit conditions in the banking sector, and hence, the commercial bank lending rate movements are likely to be highly correlated with movements in RCM. This may not be a very satisfactory way of approximating the loan rate. However, under the circumstances we could not think of anything better.

After much experimentation with various other forms of equations, we have chosen the following equation -

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[7] We got the idea of using this approach from G.S. Gupta, op. cit. He calculated the loan rate in a similar fashion for his annual model.

being the best of the lot, in our judgement - to explain the supply of bank credit (or the demand for private non-bank liabilities) by the commercial banks. The values in parentheses below the regression coefficients are the t-ratios.

$$(3.4)' \quad BC^S = \underset{(4.26)}{0.1601}\ D_2.(T+D)^* + \underset{(2.88)}{0.1091}\ D_3.(T+D)^* + \underset{(3.92)}{0.1408}\ D_4.(T+D)^*$$

$$\underset{(5.55)}{0.1959}\ D_1.(T+D)^* + \underset{(17.93)}{0.8250}\ BC_{-1} + \underset{(4.17)}{0.2976}\ R_L$$

$$\underset{(-5.62)}{-0.3163}\ RGBY$$

$$\bar{R}^2 = 0.9988$$

$$DW = 1.44$$

Auto regressive transformation:

$$(3.4) \quad BC^S = \underset{(5.49)}{0.2995}\ D_2.(T+D)^* + \underset{(4.59)}{0.2521}\ D_3(T+D)^* + \underset{(5.28)}{0.2761}\ D_4.(T+D)^*$$

$$\underset{(6.36)}{0.3271}\ D_1.(T+D)^* + \underset{(9.70)}{0.6464}\ BC_{-1} + \underset{(4.34)}{0.3508}\ RL$$

$$\underset{(-5.60)}{-0.4068}\ RGBY$$

$$P = 0.5655$$

$$DW = 2.21$$

Equation (3.4) has a serious autocorrelation problem and to deal with this problem the Hildreth-Lu-autoregressive transformation has been used. The value of p chosen is such that it minimizes the error variance. One would notice that the equation (3.4) does not have an intercept or constant term. It means that $\bar{R}^2$ as a measure of goodness of fit is no longer meaningful.[8] We have one other equation in the model - the Government Security holdings equation - which also does not have an intercept term. When equation (3.4) was estimated with an intercept term included, the following was obtained:

(3.5) BC^S $-0.7530 + 0.3063\ D_2(T+D)^* + 0.2590\ D_3\ (T+D)^* + 0.2815$
(-0.85) (5.55) (4.66) (5.34)

$D_4(T+D)^* + 0.3323\ D_1\ (T+D)^*$
(6.41)

$+ 0.6154\ BC_{-1} + 0.3459\ RL$
(8.21) (4.26)

$-0.1680\ RGBY$
(-0.57)

$P = .5700$

$DW = 2.20$

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[8] For a full discussion of the problems associated with using $\bar{R}^2$ as an indicator of goodness of fit in cases where there is no intercept term, refer to D.J. Aigner, Basic Econometrics, Prentice Hall, 1971, pp. 85-92.

The variable RRBL had an "incorrect" sign when included in equation (3.4) and hence was dropped. There is not much basis for choosing between (3.4) and (3.5), both being more or less satisfactory. We prefer, however, (3.4) over (3.5) because of the insignificance of the coefficient of RGBY and the intercept term in the latter. The long-run coefficients of $(T+D)^*$ implied in (3.4) and (3.5) are a bit on the high side - perhaps due to a deficiency in our synthetic variable RL. Judging in the context of a portfolio model which includes the BC^s equation, the Government Securities (GS) demand equation and the identity $(T+D)^* + ONLB = BC + GS + FR$ (to be used in solving for FR), equations (3.4) and (3.5) are quite satisfactory. When considered in conjunction with the Government Securities demand equation (3.6) the coefficient of RL in (3.4) is quite satisfactory since the coefficients of RL in these two equations sum to a small positive amount. The coefficient of RGBY is a bit on the high side in equation (3.4) by this criterion, since contrary to what would be expected the coefficients of RGBY in (3.4) and (3.6) sum to a small negative number. This is an undesirable feature in equation (3.4) and equation (3.5) is superior to (3.4) in this respect. Equation (3.4) would not, however, have this undesirable feature in the long-run since the sum of the long-run coefficients of RGBY in (3.4) and (3.6) would be positive. The rate RRBL could, in a sense, be regarded as the cost of running out of free (or

excess) reserves. RRBL would therefore be expected to have a negative coefficient in both (3.4) and (3.6). As explained earlier, RRBL does not appear in the BC^S equations. In the case of the GS equation (3.6), RRBL enters with the "correct" sign even though its coefficient is not significant.

As indicated earlier, the coefficient of the logged dependent variable is directly related to the coefficient of adjustment. Equation (3.4) implies a definite process of adjustment between the desired and actual supply of BC. In the context of a portfolio model, one would expect the adjustment of one asset holding to depend not only on its own deviation (between actual and desired) but also on the deviations (from their desired levels) of other assets in the portfolio.[9] It implies that each equation should include the logged stock of other assets in the portfolio besides its own. Equation (3.4) (or 3.6), as we have it, includes only its own (BC's) lagged stock and hence does not fulfil this requirement. This means that the missing or the residual equation - FR

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[9] For a full discussion of this and other important points regarding the proper specification of a portfolio behaviour model, refer to Ladenson, "Pitfalls in Financial Model Building: Some Extensions," American Economic Review, March 1971, pp. 179-186; and Brainard, W., and Tobin, J., "Pitfalls in Financial Model Building", American Economic Review, May 1968, pp. 99-122.

in this case - would be loaded with the counter parts of all the own-adjustments specified in BC^S and GS equations. In the above context it implies, for example, that when the Commercial Banks increase their holdings of GS (or BC) to bring them up to the desired level they get all the funds by depleting their stock of free reserves (FR). In our judgement this is not a very restrictive assumption, considering the volatile nature of FR. After all, if, say, the stock of BC were equal to its desired level then there would be no reason necessarily to expect that the banks would disturb that equilibrium in order to bridge the gap between the actual and the desired levels of GS. This assumption implies that they would simply bridge the gap by changing their holdings of FR, the actual stock of which - if one were to assume "rational desires" on the part of the commercial banks - would be off by the same absolute magnitude.

We have used the "seasonal dummies" in equation (3.4) in a multiplicative form rather than additive. Our experimentation with the additive form was not at all successful. The "seasonal dummies" when included in additive form in equation (3.4) were found to be insignificant and tended to distort some of the other coefficients in the equation. We shall reserve our further comments on the BC^S equation until Chapters IV and V when we shall discuss

its merits and weaknesses in the context of the complete monetary sector model.

3.2 The Demand for Government Securities (GS) Equation

The demand for government securities by the Commercial banks would obviously depend positively on total commercial bank deposits - a sort of wealth constraint - and the yield on government securities, which we call the Government Bond Yield (RGBY). By the same token, the stock of government securities held by the Commercial banks would depend negatively on the yield on alternative assets - Bank Credit and Free Reserves. The choice of total disposable deposits - in this equation and others - to represent the wealth (budget) constraint facing the commercial banks was based on the following considerations:

(1) The other net liabilities of banks (ONLB) which are a part of the total liabilities (= ONLB + (T+D)) of the banks have as their counterpart (more or less) the funds invested in fixed assets like immovable property, office equipment, etc. The holdings of such assets can not be readily changed in the short-run and they are certainly not the most significant or interesting part of a banking company's investment portfolio. This leaves one with the total deposits ((T+D)) to represent the wealth constraint.. However, the banks

are statutorily required[10]. to hold a fraction of their total deposit liabilities in the form of cash or deposits with the Reserve Bank of India and this fraction is more or less frozen for all practical purposes.[11]. Thus the banks are left with only their total disposable deposits to be allocated among the competing assets, namely, Bank Credit, Government Securities and Free Reserves.
(2) Using $(T+D)^*$ instead of $(T+D)$ to represent the wealth constraint permits one to use the model to simulate with respect to changes in the statutory reserve requirements in a more realistic way than would be possible if one were to pick $(T+D)$ to represent the wealth constraint facing the banks.

After much experimentation we picked equation (3.6) - being the overall most satisfactory equation in our judgement - to explain the commercial bank holdings of

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10. For a detailed discussion of the statutory reserve requirements prevailing in India, refer to section 1.4.

11. Of course, theoretically, the commercial banks could get around the constraint on their total liabilities by borrowing from the Reserve Bank of India. In practice, however, borrowing from the Reserve Bank has never been a significant part of total bank liabilities, perhaps because the Reserve Bank has in general discouraged the commercial banks from resorting to large-scale borrowing from it for the purpose of financing the holdings of other assets.

government securities.[12]

(3.6)' $GS = 0.0789\ D_2\ (T+D)^* + 0.1078\ D_3\ (T+D)^* + 0.0785\ D_4\ (T+D)^*$
(4.70) (7.14) (4.51)

$+ 0.0593\ D_1\ (T+D)^* + 0.8452\ GS_{-1} - 0.4401\ RL + 0.1642\ RGBY$
(3.22) (13.93) (-4.83) (1.91)

$+ 0.1678\ RRBL$
(1.45)

$R^2 = 0.9849$
DW = 1.33
C.O.V. (percent) = 4.77

Antoregressive transformation:

(3.6) $GS = 0.1400\ D_2\ (T+D)^* + 0.1678 D_3\ (T+D)^* + 0.1506\ D_4\ (T+D)^*$
(4.60) (5.76) (4.58)

$+ 0.1297\ D_1\ (T+D)^* + 0.5612\ GS_{-1} - 0.3449\ RL + 0.3702\ RGBY$
(3.92) (5.26) (-3.18) (3.19)

$-0.0631\ RRBL$
(-0.45)

P = 0.6879
DW = 1.70

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[12] Unless, otherwise indicated, all the equations included in the Model are estimated over the period 1952 QII to 1967 QI - 60 observations in all. Choice of the time period was dictated by the availability of data.

When equation (3.6) was estimated with an intercept term included the following equation was obtained.

$$(3.7)\quad GS = \underset{(0.01)}{0.0178} + \underset{(3.32)}{0.1407}\ D_2\ (T+D)^* + \underset{(4.03)}{0.1685}\ D_3\ (T+D)^* + \underset{(3.33)}{0.1514}\ D_4\ (T+D)^* + \underset{(2.90)}{0.1305}\ D_1\ (T+D)^* + \underset{(5.03)}{0.5597}\ GS_{-1} - \underset{(-3.11)}{0.3443}\ RL + \underset{(0.99)}{0.3648}\ RGBY - \underset{(-0.44)}{0.0634}\ RRBL$$

$$P = 0.6892$$

$$DW = 1.70$$

As indicated earlier, our preferred equation is equation (3.6). All the coefficients in it have the expected signs and are significant except for the coefficient for RRBL. We have retained this variable in the equation since it has the correct sign and is necessary to keep the model consistent. The short-run and long-run coefficients implied in equation (3.6) seem quite satisfactory. Seasonal dummies in additive form were found to be insignificant when included along with dummies in multiplicative form.

The RGBY variable used in the model is the long-

term government bond yield (1968 or later) variable. From table 1.5 it is apparent that most of the securities held by the commercial banks are of short (0 to 5 years) or medium (5 to 10 years) term maturity, and that over time there has been a shift in favour of short-term securities. Our efforts to use a short-term average bond (Government) yield variable[13]. were not very successful. The variable, when included in demand for government securities equations, frequently had an "incorrect" sign and invariably had very low t scores. It is difficult to understand why the short-term bond yield variable would fail to capture to overall variations in the yield on government bonds. One plausible explanation could be that such an average yield (short-term) variable would be sensitive to changes in the maturity pattern of securities within the short-term securities group. When the present RGBY variable was used the results were drastically improved - perhaps this variable better represents the overall changes in average yield on government securities.

The two previous important econometric studies of the Indian monetary sector by T. Mammen and G.S. Gupta

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13. The time series for the average yield on short-term government securities was provided to us in private correspondence by Mr. T.R. Venkatachalam of the Department of Statistics, Reserve Bank of India, Bombay.

both use the same variable - RGBY - in their demand for government securities equations. There is no supply equation for the stock of government securities in this model since, unlike the previous two studies cited above, we have assumed RGBY to be determined exogenously by the central bank (Reserve Bank of India). Our understanding of the functioning of the Reserve Bank is that its open market operations are largely conducted for debt management and for providing seasonal finance to commercial banks. The Reserve Bank conducts the open market operations in such a fashion as to keep the interest cost to the Government of the public debt within "reasonable" limits. The whole operation could be looked upon as one involving the Reserve Bank fixing the yield on the Government Securities (including treasury bills) and letting the market[14] hold whatever stock of such securities it wants to hold at

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14. Commercial banks are the most important single group in the Government securities market. They hold almost one third of the total (internal) public debt outstanding (excluding the Reserve Bank holdings of Government securities). The insurance companies - mainly the publicly owned Life Insurance Corporation - and the Provident funds account for another 35 to 40 percent of the total public debt outstanding outside the Reserve Bank of India. Public enterprises and other government and semi-government institutions account for the rest of the public debt. Individual holdings of public debt are negligible - they were less than two percent during the period 1962-67. For further details, refer to the article "Pattern of ownership of Government debt, March 1967," in the Reserve Bank of India Bulletin, March 1968.

that rate of return. Madan helped us decide in favor of treating the RGBY as an exogenous variable. We quote him: "Unlike the system in advanced countries with a well-developed capital market, open market operations in India are largely conducted as ancillary to debt management rather than in relation to credit regulation as such ..... The Reserve Bank acts as agent of the Central and State governments for debt management, and advises them on the terms of their bond flotations. It underwrites the loans of the central government at the time of their flotation, and adds to its portfolio any unsubscribed portion of the issue. These securities it sells to institutional investors and others as and when demand for them arises, continuing to hold the residue, if any, on its own account."[15].

It would be interesting to compare our results with the previous studies on the Indian Money Market. Unfortunately we are not aware of any econometric study that has been done on a quarterly basis for either the monetary or the real sectors of India. We, therefore, have to be content with reporting results from studies conducted using annual data. G.S. Gupta fits the following equation to explain the Commercial bank holdings of Government Securities.

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15. Madan, B.K., "India", in Crick, W.F., (ed.), Commonwealth Banking Systems, Clarendon Press, Oxford, 1965, pp. 230-231.

$$GS = -0.4219 + 0.0338\ DD^* + 0.4248\ TD^* + 0.1315\ RGBY$$
$$\quad (0.21) \qquad (0.58) \qquad (4.91) \qquad (1.72)$$

$$-0.8328\ I_1 + 0.074\ GS_{-1}$$
$$(2.72) \qquad (0.41)$$

$$R^2 = 0.9826$$

$$DW = 1.8371$$

I_1 is a synthetic interest rate variable created by Gupta to represent the average commercial bank lending rate - the data for which were apparently not available even on an annual basis. It is interesting to observe here that the long-term elasticities of GS with respect to the interest rate variables implied in Gupta's equation above are not very different from those implied in our equation (3.6). The speed of adjustment between the desired and actual stock of GS are also not very different for these equations. As for the specification, we had tried, unsuccessfully, in the case of both equation (3.6) and (3.4), to separate the disposable demand and time deposits. Even in case of Gupta's equation we feel that the coefficients with respect to DD* and TD* are too far apart to be plausible.

3.3 The Call Money Rate (RCM) Equation:

The inter-bank call money market is the core of

the organized money market. The funds borrowed or lent in the market fluctuating greatly in amount but rarely ever exceed 700-800 million rupees. The characteristic feature of this market lies in the fact that inter-bank loans in this market are made without security. This unsecured basis enables the borrowing banks to replenish their resources without having to disturb other assets in their portfolio. In the call money market the commercial banks generally operate with their own surplus funds, so that the banks with excess funds lend to those which are short of funds. The market thus helps to spread the liquid funds more evenly among the constituent units, and thereby ensures a more economic use of resources.

The peaks and troughs in the call money market generally come during the busy (November to April) and slack (May to October) seasons. The rate on inter-bank call money (RCM) often rise sharply during the busy season and falls during the slack season to very low levels. The maximum RCM hardly ever used to go above the Bank rate because of unrestricted access to the borrowing facilities of the Reserve Bank prior to 1960. However, since the imposition of restrictions on borrowing facilities by the Reserve Bank in 1960, the RCM has frequently exceeded the Reserve Bank lending rate (RRBL) during the busy seasons.

The Call Money Rate equation presented here could be looked upon as a reduced form solution to the demand and supply equations in the Call Money market. Let DCM^*_t denote the desired demand for funds in the call money market during quarter t. We shall, then, have

(3.8) $$DCM^*_t = D(S, RCM_t, RRBL_t, BC/(T+D)^*_t),$$

$$d_2 < o, \quad d_3 > o, \text{ and } \quad d_4 > o$$

where di is the partial derivative of DCM^*_t with respect to the ith argument in equation (3.8), S is a seasonality factor and BC/(T+D)* is the variable to be used as a measure of liquidity (or illiquidity) of the aggregate portfolio of the Commercial banks. The higher is the value of BC/(T+D)*, the less liquid is the aggregate portfolio. The assumption $d_4 > o$ implies that a less liquid portfolio is likely to make it more probable that a banking unit would resort to temporary borrowing. Signs for other derivatives need no explanation.

Now let us further assume that SCM^*_t denotes the desired supply of funds in the Call Money market during quarter t. We shall, then, once again have:

(3.9) $SCM^*_t = S(S, RCM_t, RRBL_t, BC/(T+D^*_t),$

$s_2 > o, \quad s_3 < o \quad \text{and} \quad s_4 < o$

Now let us express (3.8) and (3.9) in linear form such that:

(3.10) $DCM^* = a_1 D_1 + a_2 D_2 + a_3 D_3 + a_4 D_5 - a_5 RCM$

$+ (a_6 D_1 + a_7 D_2 + a_8 D_3 + a_9 D_4) RRBL + a_{10} BC/(T+D)^*$

and

(3.11) $SCM^* = b_1 D_1 + b_2 D_2 + b_3 D_3 + b_4 D_4 + b_5 RCM$

$- (b_6 D_1 + b_7 D_2 + b_8 D_3 + b_9 D_4) RRBL - b_{10} BC/(T+D)^*$

where $a_i, b_i > o, \quad i = 5, ----10$

We further postulate that

(3.12) $RCM = RCM_{-1} + h (DCM^* - SCM^*),$

Where $h > o.$

Now, substituting for DCM* and SCM* in (3.12) their values from equations (3.10) and (3.11), we have:

$$RCM = \frac{1}{1+h(a_5+b_5)} RCM_{-1} + \frac{h(a_1-b_1)}{1+h(a_5+b_5)} D_1 + \frac{h(a_2-b_2)}{1+h(a_5+b_5)} D_2$$

$$+ \frac{h(a_3-b_3)}{1+h(a_5+b_5)} D_3 + \frac{h(a_4-b_4)}{1+h(a_5+b_5)} D_4 +$$

$$\frac{h\left[(a_6+b_6)\ D_1 + (a_7+b_7) D_2 + (a_8+b_8)\ D_3 \quad (a_9+b_9)\ D_4\right] RRBL}{1+h(a_5+b_5)}$$

$$+ \frac{h(a_{10}+b_{10})\ (BC/(T+D)^*)}{1+h(a_5+b_5)}$$

or

$$(3.13) \qquad RCM = C_1\ D_1 + C_2\ D_2 + C_3\ D_3 + C_4\ D_4$$

$$+ (D_5\ D_1 + C_6\ D_2 + C_7\ D_3 + C_8\ D_8)\ RRBL$$

$$+ C_9\ BC/(T+D)^* + C_{10}\ RCM_{-1}$$

This is the form in which we have estimated the call money rate equation. Our results are presented below.

$$(3.14)' \quad RCM = \underset{(-2.49)}{-3.5578\ D_2} \underset{(-1.77)}{-2.6729\ D_3} \underset{(-2.21)}{-3.0427\ D_4} \underset{(-2.09)}{-3.0169\ D_1}$$

$$\underset{(3.42)}{+.6194\ D_2}\ .RRBL + \underset{(0.94)}{0.2413\ D_3}\ .RRBL + \underset{(2.31)}{0.4942\ D_4}\ .RRBL$$

$$\underset{(3.52)}{+0.6620\ D_1}\ .RRBL + \underset{(2.13)}{4.3915\ \frac{BC}{(T+D)^*}} + \underset{(2.86)}{0.3640\ RCM_{-1}}$$

$$\bar{R}^2 = 0.7732$$

$$DW = 1.30$$

Autoregressive transformation.

$$(3.14) \quad RCM = \underset{(-2.65)}{-5.4388.D_2} \underset{(-2.52)}{-5.0433.D_3} \underset{(-2.76)}{-5.1426.D_4} \underset{(-2.46)}{-5.0236.D_1}$$

$$\underset{(4.47)}{+0.8962\ D_2}\ RRBL + \underset{(2.31)}{0.6645\ D_3}\ RRBL + \underset{(3.17)}{0.7812\ D_4}\ RRBL$$

$$\underset{(4.14)}{+0.9036\ D_1}\ RRBL + \underset{(2.18)}{6.7293\ BC/(T+D)^*} + \underset{(0.84)}{0.1070\ RCM_{-1}}$$

$$P = .5310$$

$$DW = 1.70$$

3.4 The Demand for Bank Credit Equation

Equation (3.15) presented below is the demand for bank credit by the non-bank public equation.

$$(3.15)' \quad BC^d = \underset{(-2.53)}{-1.3746\ D_2} \underset{(-1.91)}{- 0.9747\ D_3} \underset{(-2.95)}{- 1.5234\ D_4} \underset{(-3.11)}{- 1.74\ D_1}$$

$$\underset{(2.87)}{+ 0.0615\ D_1\ P.Y.} \underset{(0.69)}{+ 0.0161\ D_2\ P.Y.} \underset{(2.71)}{+ 0.0316\ D_3\ P.Y.}$$

$$\underset{(4.64)}{+ 0.0747\ D_4\ P.Y.} \underset{(2.01)}{+ 0.0641\ TT} \underset{(1.73)}{+ 0.0859\ RBB}$$

$$\underset{(16.52)}{+ 0.8802 BC_{-1}}$$

$$\bar{R}^2 = 0.9984$$

$$DW = 1.53$$

Autogressive transformation.

$$(3.15) \quad BC^d = \underset{(2.37)}{-1.3765\ D_2} \underset{(-1.75)}{- 0.9630\ D_3} \underset{(-2.64)}{- 1.4914\ D_4} \underset{(-2.84)}{- 1.7305\ D_1}$$

$$\underset{(2.86)}{+ 0.658\ D_1\ P.Y.} \underset{(0.81)}{+ 0.0205\ D_2\ P.Y.} \underset{(2.64)}{+ 0.0335\ D_3\ P.Y.}$$

$$+0.0773\ D_4\ P.Y. \quad +0.0710\ TT \quad +0.0789\ RBB \quad +0.8712\ BC_{-1}$$
$$(4.44) \qquad (1.89) \qquad (1.37) \qquad (15.12)$$

$$P = 0.2410$$
$$DW = 1.92$$

The time trend (TT) enters significantly in (3.15), perhaps due to the fact that over the time period (1952-67) the organized money market had grown at the expense of the unorganized market. Nominal quarterly national income (PY) has been used as a proxy for the wealth of the non-bank public sector, since a time series for the wealth of this sector is not available. RBB is taken as a representative rate in the unorganized market. The Loan Rate (RL) when introduced into (3.15) was found to be either very insignificant or to have incorrect sign. This brings us to the previous discussion about the inadequacy of RL as commercial bank lending rate. All the coefficients in the equation are correctly signed and most of them are significant at the 5% significance level. The demand for bank credit in (3.15) is expected to increase when the rate in the unorganized market (RBB) increases. We have assumed RBB exogenous in this model. This is not strictly true since the rate in the unorganized market is likely to be sensitive to the supply of commercial bank credit in the

organized money market. However, in the absence of any data on demand and supply of credit in the unorganized market it would have been unrealistic to try to determine RBB as a function only of variables in the organized market.

3.5 The Demand for Time Deposits Equation: (55 observations - 1953 III to 1967 I)

Our preferred equation for explaining the demand for time deposits by the private non-bank sector is equation (3.16):

$$(3.16)' \quad TD/P.YNA = \underset{}{0.0243} - \underset{(-0.33)}{0.0022}\, D_3 - \underset{(-2.20)}{0.0141}\, D_4 - \underset{(-1.88)}{0.0120}\, D_1$$
$$(1.43)$$

$$+ \underset{(33.09)}{0.9297}\,(TD/P.Y.NA)_{-1} + \underset{(2.52)}{0.0187}\, RD3 - \underset{(-1.92)}{0.0089}\, RYIS$$

$$\bar{R}^2 = 0.9579$$

$$DW = 1.70$$

Autoregressive transformation:

$$(3.16) \quad TD/P.YNA = \underset{}{0.0293} - \underset{(-0.34)}{0.0020}\, D_3 - \underset{(-2.25)}{0.0140}\, D_4 - \underset{(2.06)}{0.0120}\, DD_1$$
$$(1.50)$$

$$+ \underset{(28.75)}{0.9198}\,(TD/P.Y.NA)_{-1} + \underset{(2.55)}{0.0207}\, RD3 - \underset{(-2.05)}{0.0104}\, RYIS$$

$$P = 0.1648$$

$$DW = 1.94$$

The present equation (3.16) has been estimated in ratio form since when it was estimated in absolute form it had a very serious autocorrelation problem and the problem could not be properly corrected by autoregressive transformation. RYIS is the yield on industrial securities. We believe that industrial securities are probably the closest substitutes to time deposits. We have taken P.YNA to represent the wealth constraint instead of P.Y. since we believe that the depositors with the commercial banks are primarily non-agricultural. Since the weighted average rate on commercial bank time deposits was not available we have used the average rate on three month time deposits (RD3) offered by the commercial banks. RD3 gave slightly better results than those obtained by including RD12 - the average rate on twelve month time deposits - in equation (3.16). When RD12 replaced RD3 in (3.16) we obtained the following equation:

$$(3.17)\quad TD/P.YNA = \underset{(1.03)}{0.0553} - \underset{(-0.48)}{0.0031}\,D_3 - \underset{(2.19)}{0.0141}\,D_4 - \underset{(-1.86)}{0.0119}\,D_1 + \underset{(28.27)}{0.8969}(TD/YNA.P.)_{-1} + \underset{(1.89)}{0.0108}RD12 - \underset{(-1.44)}{0.0069}RYIS$$

$$\bar{R}^2 = 0.9543 \qquad DW = 1.70$$

The equations representing demand for time deposits (by the private non-bank sector) were fitted to annual data by Mammen and Gupta and are presented below:

Mammen: $TD = 3.7079 + 0.0941\ Y.P. - 0.6847\ RYIS + 0.8155RD12$

(8.274) (-3.703) (2.427)

Sample Period: 1948-49 to 1963-64 $\bar{R}^2 = 0.9849$

No. of Observations: 16 DW = 2.68

Gupta: $TD = -287.37 + 0.2599YNA.P + 863.74RD3$

(0.13) (14.01) (1.92)

$-2135.56\ RGBY - 1457.54RL + 300.62T$

(2.12) (3.36) (5.26)

Sample period: 1948-49 to 1967-68 $R^2 = 0.9788$

No. of Observations: 20 DW = 0.7688

Mammen expresses the time deposit and the national income variables in billions of rupees and Gupta expresses these variables in millions of rupees which in part accounts for the differences in the magnitude of the coefficient estimates. Interest variables are measured in percentage form in both equations. Variable T in Gupta's equation is a time trend variable. The choice of Y.P. instead of

YNA.P in Mammen's equation is inappropriate in our view for reasons we have discussed earlier. Choice of RL in Gupta's equation is quite curious and inappropriate; we have not been able to see any rationale behind this choice. The coefficients for the interest rate variables - particularly RGBY - are unusually high for Gupta's equation.

3.6 The Time Deposit Rate (or the Supply of Time Deposits) Equation:

The commercial banks can alter the supply of time deposits - one of their principal liabilities - only by changing the rate of interest offered on such deposits. Typically a bank never declines to accept a deposit, although it can discourage demand for time deposits by reducing the interest rate it offers on such deposits. In the case of demand deposits, however, the commercial banks do not have such an instrument to manipulate the demand since in principle demand deposits are supposed to be interest free. In India, some categories of savings deposits which do carry some interest charges are included under the heading of demand deposits and hence the above statement is not strictly true. However, in the context of our model we have assumed that the demand deposits carry zero interest rate - which is true in the case of a major portion of such deposits - and hence the commercial banks can encourage or discourage demand deposits only by non-price instruments

like the provision of better (or worse) services and by manipulating non-monetary benefits to customers in various other ways. In our model we have, therefore, assumed that the supply of demand deposits is always equal to its demand. In the case of time deposits, however, the banks control the time deposit rate and thus can effectively control the supply of such deposits. The equation fitted is, therefore, a time deposit rate equation. In India the term of time or fixed deposits varies from two weeks to a year or more. The majority of such deposits are for a term of six months or less. Due to the lack of availability of data, we were not able to calculate a weighted average time deposit rate. We have, therefore, chosen the three month time deposit rate as a representative rate. The relevant variables to explain the time deposit rate would obviously be the rates of return on various assets in the banking sector's portfolio, the cost of alternative ways of raising funds and the reserve requirements against time deposits vis-à-vis demand deposits. The time deposit rate (RD3) would be expected to have positive elasticity with respect to each of the above mentioned variables. The rate RD3 offered by the commercial banking sector on three month deposits would, on the other hand, tend to decrease with an increase in the demand for time

deposits. When a linear regression (with these variables included) was fitted to explain the RD3 the coefficient of RL was found to have a negative and statistically insignificant coefficient, contrary to what one would expect. Therefore, we replaced the RL variable by a variable measuring the proportion of total deposit liabilities (T+D) invested in bank credit (BC). Since the rate charged on bank credit (loans) is always higher than the yield on government bonds, the higher value of BC/(T+D) would mean a higher average rate of return on the bank portfolio and hence a positive coefficient with respect to RD3 could be expected for such a variable. The equation finally arrived at is presented below.

$$(3.18)' \quad RD_3 = \underset{(-4.52)}{-2.4576} \underset{(-.2.70)}{- 0.7197\ rt/rd} + \underset{(3.27)}{1.2974 BC/(T+D)} + \underset{(6.82)}{0.6049 RD3_{-1}}$$

$$+ \underset{(3.07)}{0.7917\ RGBY} \underset{(-4.58)}{- 0.0633 TD} + \underset{(2.24)}{0.1349\ RRBL}$$

$$\bar{R}^2 = 0.9549$$

$$DW = 1.56$$

Antogressive transformation:

$$(3.18) \quad RD_3 = \underset{}{-2.5909} \underset{(4.12)}{} - \underset{(-2.72)}{0.8071\ rt/rd} + \underset{(2.67)}{1.1653\ BC/(T+D)}$$

$$+ \underset{(5.55)}{0.5558\ RD3_{-1}} + \underset{(3.21)}{0.9228\ RGBY} - \underset{(-4.01)}{0.0658\ TD}$$

$$+ \underset{(1.79)}{0.1136\ RRBL}$$

$$P = 0.1963$$

$$DW = 1.70$$

Since borrowing from the Reserve Bank of India is not a genuine source of funds, the rate RRBL is more of a rate of return on free reserves - or rather the cost of running out of them - rather than the cost of alternative ways of obtaining funds. The most important alternative way is via demand deposits. However, as indicated earlier, since the rate on demand deposits is fixed at zero it has not been possible to include any rate on alternative sources of funds.

All the variables in (3.18)' and (3.18) are significant and have "correct" algebraic signs. The term rt/rd is very significant and in a way measures the relative desirability of obtaining funds from two alternative sources, namely, time and demand deposits. Since the

required reserves against deposit liabilities are a barren asset, i.e. yielding no return, in the portfolio of the commercial banking sector, the higher is the reserve requirement ratio against a particular type of deposit, the less desirable (relatively) it would be to raise money via such deposits. Hence, very appropriately, the ratio of rt to rd has a negative coefficient in (3.18).

The previous two systematic econometric studies of the Indian Money Market had done a very poor and casual job of explaining the time deposit rate. Mammen did not explicitly determine the RD_3 and had a very unsatisfactory equation for explaining RD12. His fitted equation for RD12 is reported below

Mammen: $RD12 = -1.5748 + 0.7345\ RGBY + 0.5870\ RD12_{-1}$

$\bar{R}^2 = 0.6302$

$DW = 1.548$

Gupta did a little better. His estimated equation was:

Gupta: $RD3 = -3.52 - .000074DD - .000023TD + 1.4828\ RGBY + 0.11RL + .222\ RD3_{-1}$

(2.88) (1.58) (0.58) (2.65) (0.50) (1.53)

$\bar{R}^2 = .9708$

$DW = 1.57$

The deposit variables in Gupta's equation are, as indicated earlier, measured in millions of rupees. The most serious omission in this equation would seem to be the variable representing the ratio of reserve requirements against time and demand deposits. It is common knowledge to all the students of the Indian money market that when the reserve requirements against demand deposits were lowered and those against time deposits were increased[16] in September 1962, there was a significant shift in the composition of bank liabilities in favour of demand deposits.

3.7 The Demand for Demand Deposits (DD) Equation

The demand for demand deposits by the private non-bank sector is estimated in real terms by deflating the nominal demand deposits by the price level index P(1949=1.0). After quite a bit of experimentation, the equation finally chosen to explain the demand for real demand deposits by the private non-bank sector was the following:

$$(3.19)\quad \frac{DD}{P} = \underset{(-4.55)}{-0.9327} + \underset{(15.41)}{0.9435}\left(\frac{DD}{P}\right)_{-1} \underset{(-5.36)}{-4.93}\,(P-P_{-1})/P_{-1}$$

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16. For details of the changes in reserve requirements against deposit liabilities of the commercial banks, refer to section 1.4, pp. 32-34.

$$-0.0262RD12 + 0.1001\ YNA + 0.0878\ (BC - BC_{-1})\ /P$$

$$(-0.86) \qquad (3.91) \qquad (2.54)$$

$$\bar{R}^2 = 0.9863$$

$$DW = 1.84$$

The rate of change of the price level could be considered as the negative yield on the holdings of real demand deposits. The closest substitute to demand deposits - besides CUP - is perhaps time deposits. In equation (3.19), we have used RD12 (not very successfully) since during our experimentation for arriving at the appropriate demand deposits equation we found RD3 to be very insignificant and often with "wrong" algebraic sign. This is perhaps due to the inclusion of a part of savings deposits in the definition of demand deposits. The yield on these (savings) deposits presumably moves in close association with RD3. The income variable YNA is used instead of Y since the demand deposits are held primarily by the urban-non-agricultural part of the private non-bank sector. The term $\frac{(Bc-Bc_{-1})}{P}$ is introduced into (3.19) to explain that part of demand deposits which is not in the nature of genuine demand deposits. It is common practice for the banks to credit the amount of loans granted to current

accounts of their customers. The variable $\frac{(Bc-Bc_{-1})}{P}$ enters significantly in (3.19) and its inclusion improved substantially the explanatory power of this equation. The seasonal dummies were found to be statistically insignificant when included in (3.19).

Gupta and Mammen both fitted equations to explain the demand for demand deposits. Their fitted equations are reported below:

Gupta: $DD = -2005.80 + 0.2397\ YNA - 1395.89\ RL$
$\qquad\qquad\quad (4.82) \qquad (10.09) \qquad (3.85)$

Period of estimation 1948-49 to 1967-68.

$R^2 = .9788$

$DW = 0.7688$

Mammen: $DD = 0.9563 + 0.0986\ YNA - 0.5138\ \ln RD3$
$\qquad\qquad\qquad\qquad\quad (12.084) \qquad (2.434)$

Period of estimation 1948-49 to 1963-64

$\bar{R}^2 = .932$

$DW = 1.05$

We have once again failed to grasp the wisdom or meaning of including RL in the demand deposits equation. Gupta does not talk about his reasons for including RL in the equation. Inclusion of ln RD3 instead of RD3 in

Mammen's equation is also quite curious and does not make much sense to us.

3.8 The Time Deposit Rate (RD12) Equation:

The following equation was deemed to be most satisfactory for explaining the rate on twelve month time deposits (RD12):

(3.20) $$RD12 = \underset{(-3.34)}{-1.5585} + \underset{(7.16)}{0.6056}\ RD12 + \underset{(3.28)}{0.2462}\ RD3 + \underset{(2.58)}{0.1495}\ RL + \underset{(1.34)}{0.7789}\ BC/(T+D) + \underset{(1.55)}{0.2208}\ RGBY$$

$$\bar{R}^2 = 0.9788$$

$$DW = 1.63$$

Equation (3.20) above is quite clear and needs no further comments.

3.9 Currency with the Public Equation:

This equation attempts to explain the demand for currency by the public non-bank sector. We consider it to be one of the most important equations in this Model. Specification of this equation is quite different from that of equations usually fitted to explain the currency holdings of the non-bank public. It's specification is most unique

and reflects - more than any other equation in this model - the underdeveloped nature of the Indian money market. The equation we have selected, after much experimentation, to explain the currency holdings of the non-bank public is equation (3.21) and is presented below.

$$(3.21)' \quad CUP/P = \underset{(-4.20)}{-1.3568} + \underset{(33.07)}{0.9609}\ (CUP/P)_{-1} \underset{(-7.46)}{-15.24}\ (P-P-1)/P_{-1}$$

$$\underset{(-3.32)}{-0.1123}\ RBB + \underset{(9.16)}{0.0724}\ Y + \underset{(11.04)}{0.0696}\ YA_{-1}$$

$$+ \underset{(5.36)}{0.0421}\ YA_{-2}$$

$$\bar{R}^2 = 0.9812$$

$$DW = 1.15$$

Autoregressive transformation:

$$(3.21) \quad CUP/P = \underset{(1.70)}{1.1544} + \underset{(17.42)}{0.8771}\ (CUP/P)_{-1} \underset{(-6.98)}{-11.46}\ (P-P_{-1})/P_{-1}$$

$$+ \underset{(15.08)}{0.0893}\ Y \underset{(-1.75)}{-0.0942}\ RBB + \underset{(17.37)}{0.0807}\ YA_{-1}$$

$$+ \underset{(13.46)}{0.0591}\ YA_{-2}$$

$$\rho = 0.6998$$

$$DW = 1.75$$

All the coefficients in the equation have the expected sign and are more or less significant. Inclusion of the lagged YA variables in the equation and the choice of RBB as the representative interest rate needs some explanation. The two lagged YA variables have been included in order to allow for the seasonality in the currency holdings of the public associated with the seasonality in the movement of agricultural produce. When the seasonal dummies were included along with the agricultural income variables they were found to be statistically insignificant and did not add anything to the $\bar{R}^2$ of the equation. The seasonality in currency holdings by the public is described by the Reserve Bank of India in these words, "The ebb and flow of currency in the slack and busy seasons are related mainly to the periods of agricultural harvests and movements of produce. Seasonal movements of currency take place in industrial countries also, e.g., during Christmas or the holiday season, but the "seasons" pertain to unusual movements in expending of incomes rather than in their accrual, ... In the busy season, there is a net efflux of cash from the Commercial banks representing the withdrawal by traders and industrialists of their balances with banks or of proceeds of loans sanctioned to them for the purchase of their requirements of trade stocks and of materials for manufacturing..... During the slack-

season the reverse process takes place. With the purchases of industrial and other goods by the rural population, there is a return-flow of cash to the urban areas."[17].

It may take up to two quarters before the harvested agricultural crop is marketed. In constructing the agricultural income (YA) series, we had assumed (see chapter 2) that agricultural income accrues in the quarter in which (we thought) the crop would have been harvested. The marketing of agricultural produce (which follows its harvesting earlier) would not necessarily lead to an increased demand for currency if the whole country had a developed banking system, since, in that case, it might simply mean a change in the ownership of the deposit liabilities of the banking system. However, in India the rural areas do not have adequate banking facilities and a typical farmer is unlikely to be receptive to the idea of accepting payments in any form other than cash. Again, due to the lack of adequate banking facilities in rural areas a significant portion of this cash comes back to the market only gradually as the farm families spend their cash on needed industrial and other goods. Inclusion of two lagged YA variables (three lagged variables did not work) in (3.21), we believe, takes care of this seasonality very well, as indicated by the high t-scores for both the lagged variables. An attempt to break down Y in YA and YNA in

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17. Reserve Bank of India, The Reserve Bank of India: Functions and Working, Bombay, 1970, pp.16-18.

(3.21) was unsuccessful; it resulted in a "wrong" algebraic sign for the coefficient of YNA. As indicated earlier, the seasonal dummies, when included along with other variables in equation (3.21), were found to be statistically insignificant.

Now we come to the question of inclusion of RBB in (3.21). We believe RBB to be a more appropriate indicator of the return on alternative assets than the time deposit rate RD3 - the choice of the two earlier studies by Gupta and Mammen. Only a very small fraction of the total population hold deposits with the commercial banks and the co-operative banks have also not been very successful in attracting the savings of the rural masses. We felt that the interest rate in the unorganized money market may, perhaps, be more representative of the yield on alternative assets - alternative to holding cash - for the masses. Gupta and Mammen both include the same variables - namely, the time deposit rate RD3, national income at current prices (Y.P in our notation), and a simple time trend - to explain the nominal stock of currency held by the non-bank public. The equations fitted by Gupta and Mammen are reported below:

$$\text{Gupta:} \quad CUP = \underset{(4.81)}{4081.07} + \underset{(8.14)}{0.0924}\ Y.P.$$

$$-1336.24\ RD3 + 644.60\ T$$
$$(2.19) \qquad (4.63)$$

$$DW = 1.8593$$
$$R^2 = 0.9817$$

Mammen: $CUP = 4.2764 + 0.0765\ Y.P. - 3.3561\ \ln RD3$
$$(3.991) \qquad (-6.3631)$$

$$+ 0.6828\ T$$
$$(4.934)$$

$$DW = 1.768$$
$$\bar{R}^2 = 0.9847$$

As indicated earlier, in Gupta's equation the variables are expressed in million's of rupees. The long-run income elasticity of demand for currency implied in (3.21) seems to be quite a bit higher than the one implicit in Gupta's or Mammen's equation. This brings us to the discussion of an equation we had fitted earlier and which included the same variables as (3.21) but with all the variables, except the rate of change of prices, expressed in logarithmic form. The equation had a very good fit and unusually high t-ratios. However, we decided in favor of (3.21) since the equation so obtained, i.e., equation (3.22) presented below, had implicit in it a speed of adjustment even

slower than the one implicit in the chosen equation (3.21), which too, we believe, implies a very low speed of adjustment between the desired and the actual stock of currency. The loglinear equation also implied what seemed to be an unrealistically high long-run income elasticity of demand for currency. For these reasons, we selected equation (3.21) over equation (3.22), which is presented below:

$$(3.22)\quad \ln(CUP/P) = \underset{(-3.88)}{-0.4230} + \underset{(20.04)}{0.9208}\ \ln(CUP/P)_{-1} - \underset{(-8.94)}{0.9129}\left(\frac{P-P_{-1}}{P_{-1}}\right)^{18}$$

$$\underset{(2.30)}{-0.0896}\ \ln RBB + \underset{(16.81)}{0.1837}\ \ln Y + \underset{(18.80)}{.0663}\ \ln YA_{-1}$$

$$+ \underset{(11.78)}{0.0426}\ \text{Log}\ YA_{-2}$$

$$DW = 1.91$$

$$P = 0.6824$$

3.10 The Excess Reserves (ER) Demand Equation:

The equation selected to explain the excess reserve holdings of commercial banks is a very simple equation and is presented below:

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18. The elasticity of demand for currency with respect to the rate of change prices in this equation would not be constant; it would be proportional to the rate of change of prices $\left(\frac{P-P_{-1}}{P_{-1}}\right)$. The elasticity of demand for currency with respect to the rate of change of prices in equation (3.22) is $0.9129\ \frac{(P-P_{-1})}{P_{-1}}$.

$$(3.23) \quad ER/(T+D)^* = \underset{(2.73)}{0.0488} - \underset{(-0.26)}{0.0008}\, D_3 + \underset{(0.31)}{0.00098}\, D_4$$

$$- \underset{(-3.39)}{0.0114}\, D1 + \underset{(5.22)}{0.6283}\, (ER/(T+D)^*)_{-1}$$

$$+ \underset{(1.12)}{0.0045}\, RRBL - \underset{(-1.51)}{0.0092}\, RGBY - \underset{(-0.71)}{0.002}\, RL$$

$$\bar{R}^2 = 0.7334$$

$$DW = 1.64$$

Obviously the fit of the equation is not very good and some of the t-scores are also very low. Despite our experimentation with numerous other forms of equations to explain the stock of ER we were not able to come up with any equation better than (3.23).

3.11 The Required Reserves against Demand Liabilities Equation:

The legal reserve requirements in India apply to the total deposit liabilities of the commercial banks. The total demand liabilities (DL) of the banks are the sum of demand deposit (DD) and the inter-bank demand liabilities (IBDD). Since the variable of interest to us - from the point of view of this model - was DD and not DL, we decided

to express the required reserves against demand liabilities (RRADL) as a function of demand deposits. The equation estimated is simple enough and is presented below:

(3.24) $RRADL = 1.0932\ rd.DD$
(193.08)

$\bar{R}^2 = 0.9576$
$DW = 0.204$

3.12 The Required Reserves against Time Liabilities Equation:

This is the equation relating the time deposits (net of U.S. PL 480 deposits) to the required reserves against time liabilities (net of the P.L. 480 deposits).[19] Our estimated equation is presented below:

(3.25) $RRATL^* = 1.0444\ rt.\ TD$
(264.96)

$\bar{R}^2 = 0.9974$
$DW = 1.10$

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[19] Details on the nature of PL 480 deposits and on the procedures used to interpolate the quarterly figures from the annual figures for these deposits can be found in the data appendix attached to this thesis.

CHAPTER IV

THE TWO STAGE LEAST SQUARES ESTIMATES AND THE COMPLETE MODEL

In this chapter we present the two stage least squares (TSLS) estimates for equations for which the simultaneous equation bias was considered to be serious.[1] The TSLS estimates are compared with the OLS estimates and a final choice for the equations to be included in the complete model is then made. The complete model of the monetary sector is presented and analysed in the last section of this chapter.

It is well known that OLS will, in general, provide inconsistent estimates of the parameters of an equation which is part of a simultaneous-equation system. One would normally be required to use simultaneous-estimation techniques to obtain consistent estimates. However, the import-

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1. The simultaneous-equation bias, for a given equation, was not considered serious if the set of "independent" variables in the equation consisted entirely of variables which were either pre-determined for the model as a whole, or were unlikely to be influenced significantly by the dependent variable in the equation. Equations explaining RCM, Bc^d, CUP/P and ER are the equations for which the simultaneous-equation bias was not considered serious.

ant question in the present context would be: can models which are subcomponents of some larger macroeconomic model be estimated with consistency even by applying simultaneous-estimation techniques? The answer depends, to a large extent, on whether or not the exogenous variables in such a subcomponent model are truly exogenous, i.e., whether or not the endogenous variables in such a model have only negligible direct and indirect effects on the exogenous variables. In carrying out simultaneous estimation (using TSLS) we are implicitly assuming that the endogenous variables in our subcomponent model do not significantly influence the exogenous variables.

We have used the method outlined by Franklin Fisher[2]. for creating the instrumental variables to be used as input at the second stage of the regression. Fisher's method consists of finding a largest invertible matrix from a given set of ordered,[3]. predetermined variables, starting from

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[2]. The method, outlined by Fisher in 'Dynamic Structures and Estimation in Economy-wide Econometric Models", in Duesenberry et. al., edt., The Brookings Quarterly Econometric Model of the United States, Chicago, 1965, 589-636, is called 'structurally ordered instrumental variables', or SOIV.

[3]. For the criteria to be used in ordering the variables and other details of the method, refer to Fisher's article cited above. Our set of predetermined variables consisted essentially of all the exogenous variables in the model plus the dependent variables four quarters lagged. Thus all the TSLS estimates reported in this chapter are, unless indicated otherwise, based on 56 observations.

the two highest-order variables, adding a variable at a time, dropping it if it results in singularity. From the set so selected the variables are tested in turn, beginning with those of lowest rank or order, for contribution to $\bar{R}^2$. Only variables that contribute are retained. The instrument is then created by regression on this final set of predetermined variables.

4.1 The Two Stage Least Squares Estimates:

In this section we present the TSLS estimates for some of the stochastic equations in the model.

$$(4.1)' \quad BC^S = \underset{(1.08)}{0.0705}\, D_3.(T+D)^* + \underset{(1.71)}{0.1065}\, D_4.(T+D)^* + \underset{(2.67)}{0.1652}\, D_1.(T+D)^*$$

$$\underset{(1.92)}{0.1260}\, D_2.(T+D)^* + \underset{(11.48)}{0.8776}\, BC_{-1} + \underset{(1.65)}{0.1763}RL - \underset{(-2.62)}{0.2056}\, RGBY$$

$$\bar{R}^2 = 0.9982$$

$$DW = 1.58$$

Autoregressive Transformation:

$$(4.1) \quad BC^S = \underset{(1.48)}{0.1119}\, D_3\,(T+D)^* + \underset{(2.03)}{0.1459}\, D_4(T+D)^* + \underset{(2.86)}{0.2040}\, D_1\,(T+D)^*$$

$$+0.1675\ D_2.(T+D)^* + 0.8291\ BC_{-1} + 0.1681\ RL - 0.2186\ RGBY$$
$$(2.21) \qquad (9.32) \qquad (1.43) \qquad (-2.43)$$

$$P = 0.2344$$
$$DW = 1.925$$

$$(4.2)'\quad GS = 0.0984\ D_3(T+D)^* + 0.0648\ D_4(T+D)^* + 0.0441\ D_1(T+D)^*$$
$$(5.67) \qquad (3.29) \qquad (2.04)$$

$$+0.0672\ D_2(T+D)^* + 0.8887\ GS_{-1} - 0.3623\ RL + 0.1445\ RGBY$$
$$(3,34) \qquad (13.62) \qquad (-2.51) \qquad (1.40)$$

$$+0.1083\ RRBL$$
$$(0.73)$$

$$\bar{R}^2 = 0.979$$
$$DW = 1.36$$

Autoregressive Transformation:

$$(4.2)\quad GS = 0.0982\ D_2(T+D)^* + 0.1346\ D_3\ (T+D)^* + 0.1104\ D_4\ (T+D)^*$$
$$(3.01) \qquad (4.10) \qquad (3.00)$$

$$+0.080\ D_1\ (T+D)^* + 0.6506\ GS_{-1} - 0.0150\ RL + 0.3394\ RGBY$$
$$(2.14) \qquad (5.80) \qquad (-0.09) \qquad (2.44)$$

$-0.3056\ RRBL$

(-1.77)

$DW = 1.59$

$P = 0.6910$

(4.3)' $RD_3 = 2.9341 - 0.8475\ rt/rd + 1.6721\ BC/(T+D) +$

$(-5.14)\quad (-3.30)\qquad (4.02)$

$0.5539\ RD3_{-1} + 0.9225\ RGBY - 0.0718\ TD + 0.1326\ RRBL$

$(6.41)\qquad (3.73)\qquad (-5.14)\qquad (2.29)$

$\bar{R}^2 = 0.95$

$DW = 1.486$

Autoregressive transformation:

(4.3) $RD3 = -3.0509 - 0.9230\ rt/rd\ \ 1.4730\ BC/(T+D) + 0.4879\ RD3_{-1}$

$(-4.46)\quad (-3.09)\qquad (3.26)\qquad (4.73)$

$+ 1.0922\ RGBY - 0.0754\ TD + 0.0948\ RRBL$

$(3.73)\qquad (-4.18)\qquad (1.52)$

$P = 0.31497$

$DW = 1.76$

(4.4)' $RD12 = -1.2222 + 0.6799\ RD12_{-1} + 0.1870\ RD3 + 0.1105\ RL$

$(-2.39)\quad (7.60)\qquad (2.22)\qquad (1.90)$

$$+ 0.4208\ BC/(T+D) + 0.2324\ RGBY$$
$$(0.68) \qquad (1.50)$$

$$\bar{R}^2 = 0.9746$$

$$DW = 1.59$$

Autoregressive transformation:

$$(4.4) \quad RD12 = -1.6461 \quad 0.5728\ RD12_{-1} + 0.2409\ RD3 + 0.0836\ RL + 0.3494$$
$$(-2.61) \quad (5.23) \qquad (2.29) \qquad (1.32) \qquad (0.48)$$

$$BC/(T+D) + 0.4135\ RGBY$$
$$(2.13)$$

$$P = 0.3127$$

$$DW = 2.03$$

$$(4.5)' \quad TD/P.YNA = 0.0257 - 0.0018\ D3 - 0.0139\ D4 - 0.0119\ D1$$
$$(1.54) \quad (-0.30) \qquad (-2.38) \qquad (-1.96)$$

$$+ 0.9217\ (TD/P.YNA)_{-1} + 0.0218\ RD3 - 0.0106\ RYIS$$
$$(32.01) \qquad (2.98) \qquad (-2.35)$$

$$DW = 1.67$$

$$\bar{R}^2 = 0.9775$$

No. of Observations = 55

Autoregressive transformation:

$$(4.5)\quad TD/P.YNA = \underset{(1.66)}{0.0328} - \underset{(-0.27)}{0.0015}\ D3 - \underset{(-2.31)}{0.0136}\ D4 - \underset{(-2.14)}{0.0118}\ D1 + \underset{(27.28)}{0.9060}$$

$$\cdot (TD/P.YNA)_{-1} + \underset{(3.07)}{0.0255}\ RD3 - \underset{(-2.57)}{0.0131}\ RYIS$$

$$P = 0.1990$$

$$DW = 1.95$$

$$(4.6)\quad DD/P = \underset{(-5.20)}{1.1041} + \underset{(14.87)}{0.9616}\ (DD/P)_{-1} - \underset{(-6.43)}{5.6497}\ \frac{(P-P_{-1})}{P_{-1}} - \underset{(-0.94)}{0.0308}\ RD12$$

$$+ \underset{(3.90)}{0.1069}\ YNA + \underset{(1.82)}{0.0348}\ \frac{(BC-BC_{-1})}{P}$$

$$\bar{R}^2 = 0.9839$$

$$DW = 1.92$$

Equations (4.1) to (4.6) above contain the TSLS estimates for their counterparts in Chapter 3. The TSLS estimates contained in equations (4.3) to (4.6) are very close to the OLS estimates. However, the difference between the two estimates is large in case of the Bank Credit Supply (BC^S) equation and the Government Securities

(GS) equation. We, therefore, prefer the OLS estimates for these two equations and accordingly include equations (3.4) and (3.6) in the complete model to be written down in the next section of this chapter. For other equations we prefer the TSLS estimates over the OLS estimates. Our choice between TSLS and OLS is based on the following decision rule, which is the outcome of a Monte Carlo experiment by Quandt and which takes account of the fact that while TSLS is consistent, OLS has a smaller variance.

"Calculate both OLS and TSLS. If the difference between the two estimates is large, accept OLS as the estimate. If the difference between them is small, accept TSLS . For the purpose of experimentation, the difference between the two kinds of estimates was deemed large if it exceeded in absolute value the absolute value of the [OLS] estimate".[4]

For equations for which the TSLS estimation was not deemed necessary, the equation estimated by using OLS is included in the complete model.

4.2 The Complete Model:

The complete model is now written down below:

Supply of Bank Credit Equation:

(E.1) $BC^S = \underset{(5.49)}{0.2995}\ D_2.(T+D)^* + \underset{(4.59)}{0.2521}\ D3\ (T+D)^* + \underset{(5.28)}{0.2761}\ D_4.(T+D)^*$

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[4]. Quandt, R.E., "On Certain Small Sample Properties of K-Class Estimates", International Economic Review, January 1966, p. 100.

$$+0.3271\ D_1(T\ D)^* + 0.6464\ BC_{-1} + 0.3508\ RL\ -0.4068\ RGBY$$
$$(6.36) \qquad (9.70) \qquad (4.34) \qquad (-5.60)$$

$P = 0.5655$

$DW = 2.21$

Method of Estimation = OLS

No. of Observations = 60

The Demand for Government Securities Equation:

(E.2) $$GS = 0.1400\ D2.(T+D)^* + 0.1678\ D3(T+D)^* + 0.1506\ D4.(T+D)^*$$
$$(4.60) \qquad (5.76) \qquad (4.58)$$

$$+0.1297\ D1(T\ D)^* + 0.5612\ GS_{-1} - 0.3449\ RL + 0.3702\ RGBY$$
$$(3.92) \qquad (5.26) \qquad (-3.18) \qquad (3.19)$$

$$-0.0631\ RRBL$$
$$(-0.45)$$

$P = 0.6879$

$DW = 1.70$

Method of Estimation = OLS

No. of Observations = 60

The Call Money Rate Equation:

(E.3) $$RCM = -5.4388.D2 - 5.0433.D3 - 5.1426.D4 - 5.0236.D1$$
$$(-2.65) \qquad (-2.52) \qquad (-2.76) \qquad (-2.46)$$

$+0.8962\ D2.\ RRBL + 0.6645\ D3.\ RRBL + 0.7812\ D4.\ RRBL$
(4.47) (2.31) (3.17)

$+0.9036\ D1.\ RRBL + 6.7293\ BC/(T+D)^{*} + 0.1070\ RCM_{-1}$
(4.14) (2.18) (0.84)

$P = 0.5310$

$DW = 1.70$

Method of Estimation = OLS

No. of Observations = 60

The Demand for Bank Credit Equation:

(E.4) $Bc^{d} = -1.3765.D2 - 0.9630.D3 - 1.4914\ D4 - 1.7305\ D1$
(2.37) (-1.75) (-2.64) (-2.84)

$+0.0658\ D1.P.Y. + 0.0205\ D2.P.Y. + 0.0335.D_{3}.PY$
(2.86) (0.81) (2.64)

$+0.0773\ D4.P.Y. + 0.0710\ TT + 0.0789\ RBB + 0.8712\ BC_{-1}$
(4.44) (1.89) (1.37) (15.12)

$P = 0.2410$

$DW = 1.92$

Method of Estimation = OLS

No. of Observations = 60

The Demand for Time Deposits Equation:

(E.5) $TD/P.YNA = 0.0328 - 0.0015\ D3 - 0.0136 D4 - 0.0118\ D1$
(1.66) (-0.27) (-2.31) (-2.14)

$+ 0.9060\ (TD/P.YNA)_{-1} + 0.0255\ RD3 - 0.0131\ RYIS$
(27.28) (3.07) (-2.57)

$P = 0.1990$
$DW = 1.95$
Method of Estimation = TSLS
No. of Observations = 55

The Time Deposit Rate (or the Supply of Time Deposits) Equation:

(E.6) $RD3 = -3.0509 - 09230\ rt/rd + 1.4730\ BC/(T+D) + 0.4879\ RD3_{-1}$
(-4.46) (-3.09) (3.26) (4.73)

$+ 1.0922\ RGBY - 0.0754\ TD + 0.0948\ RRBL$
(3.73) (-4.18) (1.52)

$P = 0.3149$
$DW = 1.76$
Method of Estimation = TSLS
No. of Observations = 56

The Demand for Demand Deposits Equation:

(E.7) $DD/P = -1.1041 + 0.9616\ (DD/P)_{-1} - 5.6497\ (P-P_{-1}) - 0.0308\ RD12$
(-5.20) (14.87) (-6.43) (-0.94)

$$+0.1069\ YNA \quad +0.0348\ \frac{(BC-BC_{-1})}{P}$$
$$(3.90) \qquad (1.82)$$

$$\bar{R}^2 = 0.9839$$
$$DW = 1.92$$
$$\text{Method of Estimation} = \text{TSLS}$$
$$\text{No. of Observations} = 56$$

The Time Deposit Rate (RD12) Equation:

$$(E.8) \quad RD12 = \underset{(-2.61)}{-1.6461} + \underset{(5.23)}{0.5728}\ RD12_{-1} + \underset{(2.29)}{0.2409}\ RD3 + \underset{(1.32)}{0.0836}\ RL$$

$$+\underset{(0.48)}{0.3494}\ BC/(T+D) + \underset{(2.13)}{0.4135}\ RGBY$$

$$P = 0.3127$$
$$DW = 2.03$$
$$\text{Method of Estimation} = \text{TSLS}$$
$$\text{No. of Observations} = 56$$

Currency with the Public Equation:

$$(E.9) \quad CUP/P = \underset{(1.70)}{1.1544} + \underset{(17.42)}{0.8771}\ (CUP/P)_{-1} \underset{(-6.98)}{-11.46}\ \frac{(P-P_{-1})}{P_{-1}} + \underset{(15.08)}{0.0893Y}$$

$$\underset{(-1.75)}{-0.0942}\ RBB + \underset{(17.37)}{0.0807}\ YA_{-1} + \underset{(13.46)}{0.0591}\ YA_{-2}$$

$\rho = 0.6998$

DW = 1.75

Method of Estimation = OLS

No. of Observations = 60

The Excess Reserves Demand Equation:

$$(E.10)\quad ER/(T+D)^* = \underset{(2.73)}{0.0488} - \underset{(-0.26)}{0.0008}\,D3 + \underset{(0.31)}{0.00098}\,D4 - \underset{(-3.39)}{0.0114}\,D1$$

$$+ \underset{(5.22)}{0.6283}\,(ER/(T+D)^*)_{-1} + \underset{(1.12)}{0.0045}RRBL - \underset{(-1.51)}{0.0092}\,RGBY$$

$$\underset{(-0.71)}{-0.0020}\,RL$$

$\bar{R}^2 = 0.7334$

DW = 1.64

Method of Estimation = OLS

No. of Observations = 60

The Required Reserves against Demand Liabilities Equation:

$$(E.11)\quad RRADL = \underset{(193.08)}{1.0932}\,rd.DD$$

$\bar{R}^2 = 0.9576$

DW = 0.204

Method of Estimation = OLS

No. of Observations = 60

The Required Reserves against Time Liabilities Equation:

(E.12) $RRATL^* = 1.0444\ rt.TD$

(264.96)

$\bar{R}^2 = 0.9974$

$DW = 1.10$

Method of Estimation = OLS

No. of Observations = 60

Non-Stochastic Equations:

(E.13) $RRATL = RRATL^* + rt.PLD$

(E.14) $RR = RRATL + RRADL$

(E.15) $BB = ER - FR$

(E.16) $TD = TD' - PLD$

(E.17) $TD' = TL - IBTD$

(E.18) $DD = DL - IBDD$

(E.19) $CUP = HPMS$[5] $- RR - FR$

(E.20) $FR = DD + TD + ONLD - BC - GS - RR$

(E.21) $(T+D) = TD + DD$

(E.22) $DD^* = DD - RRADL$

(E.23) $TD^* = TD - RRATL$

(E.24) $(T+D)^* = (T+D) - RR$

(E.25) $Bc^S = Bc^d = Bc$

(E.26)

(E.27) $RL = 0.5\ (RCM + RPL)$

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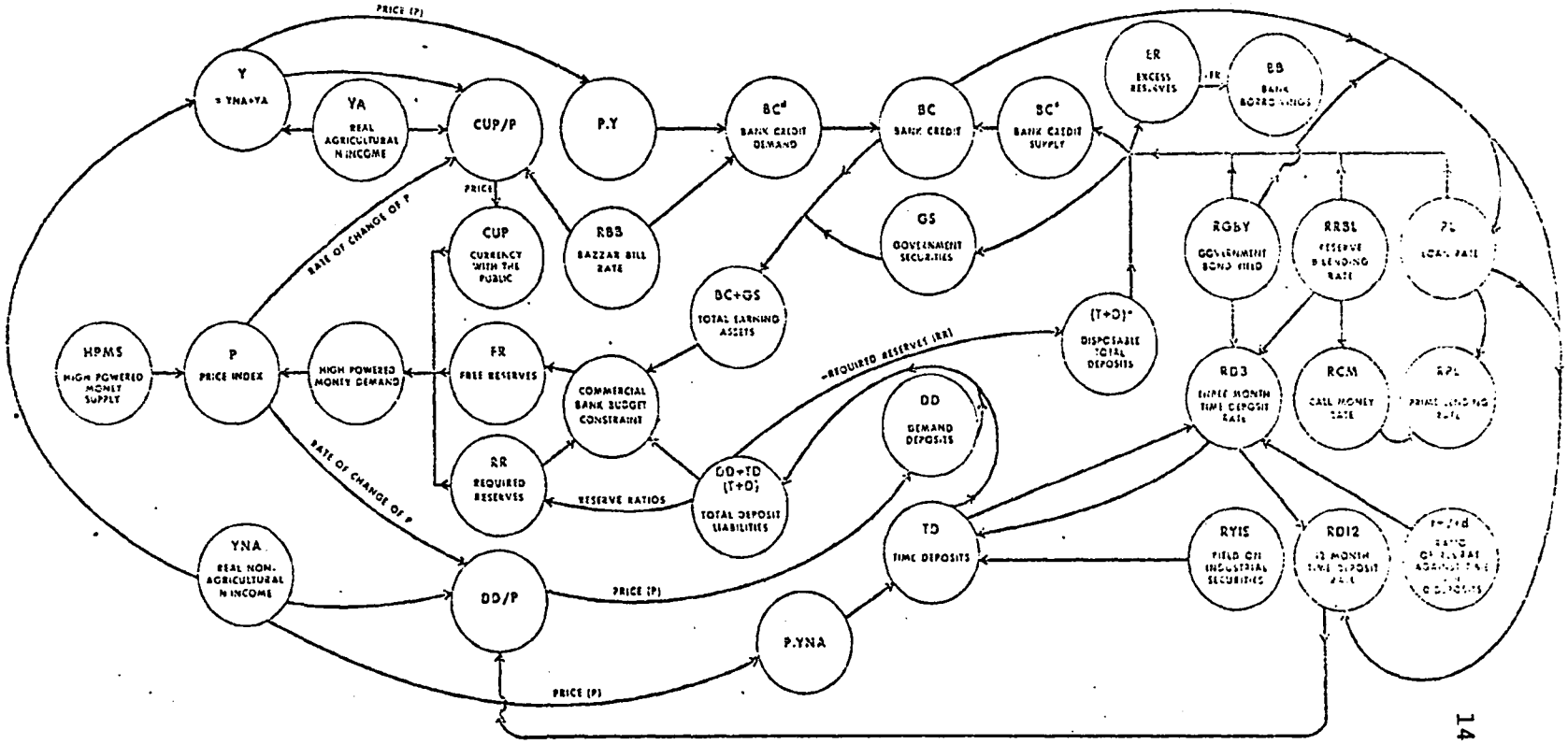
[5]. The choice of the 'hame high powered money supply" may be a bit misleading. The variable HPMS over here refers to the unborrowed reserves. The high powered money supply is generally defined as the sum of the borrowed and the unborrowed reserves.

(E.28) $Y \equiv YNA + YA$

Equation (E.1) to (E.12) are twelve stochastic equations of the Model of which the first ten are behavioural equations. Equations (E.13) to (E.28) are non-stochastic equations to close the model. A flow-chart of the model is attached to provide a better understanding of the linkages in the model.

The price level is determined within the model. The central equation from this point of view is equation (E.19). An exogenous increase in the high powered money supply (HPMS) would generate upward pressures on prices which would tend to increase CUP and RR, retaining the equality of HPMS and (RR + FR + CUP)in equation (E.19). It could legitimately be argued that RGBY and HPMS are not really two independent policy variables. If HPMS is increased by buying securities in the free market it would tend to push RGBY up. However, in this model we consolidate the central bank (Reserve Bank) with the government. Anyone aware of the workings of the Reserve Bank of India would realize that in practice it has very little independent authority. It would, therefore, be possible for the Government of India to increase HPMS by running a deficit. It could be argued that such a policy is likely to affect the real variables - perhaps to this extent this model is not

A FLOW CHART OF THE MODEL



strictly valid - and, of course, any model neglecting the real sector would have this deficiency.

CHAPTER V

ANALYSIS OF THE MODEL

5.1 Linearization of the Model and Calculation of the Multiplier Matrices

In this chapter, the model will be analyzed by recording the response of its principal endogenous variables to exogenous shocks. More specifically, the short-run and long-run impact multipliers for the model will be calculated and analyzed. The model, as reported in Chapter IV, contains 28 equations. However, for the purposes of carrying out analysis in this chapter, it was found convenient[1]. to reduce its size to fifteen equations. The reduced model would still enable one to solve for the fifteen endogenous variables of primary interest to this study. The remaining thirteen endogenous variables, if necessary, could be obtained easily by a linear combination of one or more of the exogenous and fifteen endogenous variables in the model. The fifteen endogenous variables considered to be of principal interest from the point of view of analyzing their response to changes in exogenous variables are: BC, GS, RCM, TD, DD, RD3, P, RD12, CUP, ER, RRADL, RRATL, FR, RPL, RL. The fifteen equations selected are: (i) Equations (E.1) to (E.11) with (T+D)*, wherever it appears, replaced by TD + DD - RRATL - RRADL,

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[1]. This was done primarily to cut down the effort (Human and non-human) involved in manipulating 28 x 28 matrices.

(ii) Equation (E.13) with RRATL* replaced by 1.0444rt.TD, (iii) Equations (E.19) and (E.20) with RR replaced by RRATL +RRADL, (iv) Equation (E.27) as in its original form in Chapter IV.

The equations described above could be re-written for second quarter values of the coefficients by putting D2 = 1 and D3 = D4 = D1 = 0 in these equations. The system of 15 equations in its present form is non-linear. In order to linearize it, total differentiation is performed by letting all the variables in the system except RBB[2] , RYIS, ONLB, PLD, TT and the lagged variables vary. The resulting equations could be written in matrix form as

(5.1) $$BY = CZ$$

where $B_{(15 \times 15)}$ is specified in Table 5.1

$C_{(15 \times 7)}$ is specified in Table 5.2

$$Y_{(15x1)} = \begin{bmatrix} d\,RL \\ d\,GS \\ d\,RCM \\ d\,BC \\ d\,P \\ d\,RD3 \\ d\,RD12 \\ d\,TD \\ d\,CUP \\ d\,ER \\ d\,DD \\ d\,RRATL \\ d\,RRADL \\ d\,FR \\ d\,RPL \end{bmatrix} \quad \text{and } Z_{(7x1)} = \begin{bmatrix} d\,YNA \\ d\,YA \\ d\,HPMS \\ d\,rd \\ d\,rt \\ d\,RGBY \\ d\,RRBL \end{bmatrix}$$

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2. Response of endogenous variables to variations in these exogenous variables was judged unlikely to be of enough interest to justify the computational (and other) efforts involved in calculating additional multipliers.

It would be clear from a look at matrices B (Table 5.1) and C (Table 5.2) that some of the elements in these matrices do not have fixed quantitative magnitudes. The exact magnitude of such an element would depend on the time period (year) one was referring to. In other words, the response of the endogenous variable to shifts in exogenous variables is not independent of the time period. In the present case, since the equations chosen contain QII values of the coefficients, one only has to decide on the year for which one intends to calculate these multipliers. Our choice was the year 1960, this being approximately in the middle of our sample period. The elements in Tables 5.1 and 5.2 were evaluated at their 1960 QII values so that all the elements in matrices B and C could have definite magnitudes. Quantitative inverse of B can now be defined. Multiplying both sides in equation (5.1) by the inverse of B, we have

(5.2) $Y = B^{-1}CZ$

or

(5.3) $Y = AZ,$

where $A = B^{-1}C$

The matrix A, so obtained, could be looked upon as the matrix of multipliers i.e., the matrix whose individual elements could be identified with individual multipliers - there are 105 elements in A. The Matrix A for the present

case is reported in Table 5.4 and contains the short-run (impact) multipliers evaluated at 1960 QII values. The A matrices pertaining to quarters I, III and IV of 1960 were obtained in a similar fashion, and are reported in Tables 5.3, 5.5 and 5.6 respectively.

The above discussion was related to the calculation of short-run impact multipliers. For calculating long-run impact multipliers the selected 15 equation system would have to be re-written with the substitution[3] $X_{-2} = X_{-1} = X$, where X stands for any endogenous or exogenous variable in the system. The rest of the procedure for calculating A matrices for the long-run case would be strictly similar to the one described above for the short-run case. The long-run multiplier matrices, pertaining to quarters I, II, III and IV of year 1960 are reported in Tables 5.7, 5.8, 5.9 and 5.10 respectively.

5.2. An analysis of the Results

A quick glance at the short-run and the long-run

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3. It is recognized that such an assumption is not very realistic in the presence of seasonality. The presence of additive seasonality would not, however, affect the magnitudes of long-run multipliers and, the multipliers obtained under the present assumptions would still be valid. The multiplicative seasonality, as present in some of our equations, is likely to affect the magnitude of long-run multipliers and to this extent our long-run multipliers are only approximately correct. The invariance of the long-run multipliers in the presence of additive seasonality could be seen easily as follows: Let, $Y = a_1 D_1 + a_2 D_2 + a_3 D_3 + a_4 D_4 + a_5 Y_{-1} + \sum_{i=1}^{n} b_i X_i$ -(1) be a typical equation in the model, where X_is are the independent variables and Y is the dependant variable. If it was desired to calculate long-run multipliers for QII, then $Y_{-1} = (Y + D_1 - D_2)$ should be substituted in equation (1) to give $Y(1-a_5) = (a_1 + a_5) D_1 + a_3 D_3 + a_4 D_4 + (a_2 - a_5) D_2 + \sum_{i=1}^{n} b_i X_i$ -(2). Total differentiation of (2) would give

multiplers presented in the last section would indicate that the magnitude of a multiplier varies from quarter to quarter. Some of the multipliers have even their algebraic sign vary from quarter to quarter. Most multiplers, however, have their algebraic sign invariant over the quarters. The multiplier magnitudes - and some times even the algebraic signs - seem to vary significantly between the short-run and the long-run.

The task of analyzing the response of endogenous variables to a unit sustained increase in one of the exogenous variables, with the rest of the exogenous variables unchanged, would be very simple if one were dealing with a recursive system of equations. The system of equations which we have in the model is by no means recursive; most of the endogenous variables act and react on each other in a complicated way when subjected to an exogenous shock. In the remainder of this section we will analyze the response of important endogenous variables to an increase, in turn, in one of the four policy exogenous variables, namely HPMS, rd, rt and RRBL.

(a) An increase in the high powered money supply (HPMS)

An increase of one billion rupees in the HPMS during 1960 QII would have increased the price index (P) in the same period by 0.11638. The magnitude of this short-run impact multiplier does not vary much from quarter to quarter. In the long-run, the increase in P would be somewhere between

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$(1-a_5)\ dy = \sum_{i=1}^{n} bidxi$ - (3), which is the same as what would have been obtained by carrying out directly (as done in the present study) the total differentiation of equation (1).

.06238 (QII) and .07722 (QI), i.e., approximately half of the short-run increase. The short-run and long-run elasticities of P with respect to the HPMS, reported in Table 5.11, are 1.955 (QII) and 1.048 (QII), respectively. In the short-run, the increase in the HPMS is absorbed partly by an increase in the nominal currency holdings of the public (CUP), and partly by an increase in the free reserves (FR). Only a very small fraction of the additional HPMS is absorbed by increased reserve requirements (RR), resulting from an increase in the total deposit liabilities ((T+D)) of the commercial banks. Since the excess reserves (ER) increase by a considerably smaller magnitude than do the FR, it indicates that the commercial banks borrowing (BB) from the Reserve Bank has gone down significantly as a result of this increase in the HPMS.

The situation in the long-run, at least with respect to the FR, is quite the reverse. Thus, while the increase in the CUP accounts for over 95 percent (QII and QIII) of the initial increase in the HPMS, the FR actually go down in the long-run. The ER, on the other hand, go up in the long-run, implying an increase in the commercial banks borrowing from the Reserve Bank. Thus an increase in the HPMS would initially result in a decrease in the commercial banks borrowing from the Reserve Bank with the situation reversing itself in the long-run.

So far in the discussion, we have dodged the question of

how the HPMS was increased. In general, the impact of an increase in the HPMS would depend on the way it was injected into the system. One most obvious way of increasing the HPMS would be for the Reserve Bank to buy government securities from the commercial banks. This, in general, would require reduction in RGBY by the Reserve Bank. In such a case, therefore, the changes in the HPMS and the RGBY would not be independent of each other and the assumption of exogenous RGBY would not be valid. Thus to the extent that the HPMS is increased by open market operations and RGBY is assumed exogenously fixed, the multipliers reported here are not strictly valid. Our assumption of exogenous RGBY is based on the view that the open market operations are conducted by the Reserve Bank as an ancillary to debt management and not primarily to vary the HPMS. The major source of variations in the HPMS, besides seasonal variations, has been the deficit spending by the government financed by increased borrowing from the Reserve Bank. Depending on the purpose for which it is spent, such government spending is likely to result in an increase in the real national income (Y), thus providing a leakage to the increased HPMS. The increase in P is, therefore, likely to be lower for the case where Y goes up as a result of an increase in the HPMS. The interest rate provides another leakage for the increased stock of currency. The interest rate entering the CUP equation should,

in general, go down with an increase in the HPMS - something not permitted in this model - thus inducing the non-bank public to hold extra cash. If the interest rate - in this case RBB - were permitted to vary with variations in the HPMS, the increase in P required to absorb the extra cash would be lower. In the present study, unfortunately, we were obliged to assume the interest rate RBB exogenous because of the lack of any data on the lending and borrowing activities in the unorganized part of the Indian money market. The two earlier econometric studies of the Indian money market could bypass this problem by introducing the organized money market rates in their demand for currency equations. For reasons outlined in Chapter III, we consider RBB to be the single most appropriate interest rate variable for explaining the demand for currency by the non-bank public. The short-run and the long-run elasticities of P with respect to the HPMS are likely to be lower (depending on the strength of the leakages) than those reported in the elasticity Table 5.11.

(b) An increase in the reserve requirements ratio against the demand liabilities of the commercial banks (rd)

An increase in rd of .01 would, in the short-run, result in a decrease in P by an amount somewhere between .00599 (QII) and .00664 (QIII). An increase in rd increases the demand for required reserves against demand liabilities (RRADL) and thereby, with HPMS constant, puts downward pressure

on P. Furthermore, an increase in rd makes it relatively more attractive for the commercial banks to have their liabilities in the form of time deposits. This induces the commercial banks to increase RD3 which in turn would lead to an increase in RD12. The higher RD12 would tend to reduce DD by discouraging the non-banks public from holding the demand deposits. This downward pressure on DD, further reinforced by a lower P, results in an aggregate decrease in DD of .00237 billion rupees in QII. In the case of TD, while the higher RD3 would tend to increase such deposits, the lower P is likely to push them down. The net result, rather unexpected, turns out to be a reduction of .01213 billion rupees in TD during QII.

The above result is reversed in the long-run. TD increase by .28441 billion rupees (QII) and DD decreases by .05348 billion rupees (QII) in the long-run. As a result, (T+D) increases in the long-run. The GS goes up as a result of this increase in (T+D). BC, on the other hand, goes down despite an increase in the total disposable deposits ((T+D)*). This is so, because, with Y and RBB constant, BC^d and P increase and decrease together.[4] In this case, since P had

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[4]This inflexible relationship between P and BC^d some times leads to rather unexpected results. However, the inflexible relationship between P and BC^d may not necessarily be unrealistic, particularly if one believes that the cost of credit was not a very significant factor in the demand for bank credit. In such a case, an increase in P, i.e., an inflationary boom, would result in an increased demand for bank credit due to higher profit expectations and capital project costs. The reverse would be true in the case of declining P.

gone down, BC^d also went down. Since BC^s would tend to increase as a result of higher (T+D)*, the equality between BC^d and BC^s is established primarily by a reduction in RL; thus reinforcing the initial increase in GS. The long-run elasticities for Q II of GS, (T+D) and BC, with respect to rd, are .158 , .070 and -.008 respectively as reported in Table 5.11.

(c) An increase in the reserve requirements ratio against the time liabilities of the commercial banks (rt)

An increase in rt of .01 reduces P by an amount somewhere between .00132 (QII) and .00078 (QIV). An increase in rt increases the RRATL, thus putting pressure on other components of the highpowered money demand. As a result, FR and CUP both decrease, with the latter putting downward pressure on prices and the former resulting in an increase in BB. The reduction in P leads to reductions in TD and DD. The increase in rt leads to a decrease in RD3, and thereby puts downward pressure on RD12. The lower RD3 would tend to reduce TD and thus reinforce the impetus provided by declining prices. The lower RD12, on the other hand, would tend to increase the DD and thus counter downward pressure exerted by reduced P. The net result is an increase of .00066 billion rupees (QII) in DD. The aggregate reduction in the TD amounts to .08416 billion rupees (QII). The lower (T+D)* perhaps reduces the BC^s by an amount more than the reduction

in BC^d brought about by lower P, and hence an increase in RL to restore equilibrium.

In the long-run there is a further significant reduction in both TD and DD. The short-run and the long-run elasticities of total deposits with respect to rt are -.010 (QII) and -.108 (QII), respectively. The decrease in P is also significantly higher in the long-run as compared to the short-run. The short-run and the long-run elasticities of P with respect to rt are -.001 (QIV) and -.007 (QIV), respectively. The respective figures for quarter two are -.002 and -.009.

(d) An increase in the Reserve Bank of India lending rate to the commercial banks (RRBL)

An increase in RRBL - equivalent of Bank Rate - would be deflationary and as expected, FR and ER would both go up. The increase in ER is more than the increase in FR, which implies an increase in the commercial banks borrowing from the Reserve Bank. This result is, of course, the reverse of what one would expect - perhaps a reflection of the weakness in the ER equation in the model. In the short-run, RL goes up during quarters two and three, with the reverse being true for quarters one and four. The increase in FR puts a downward pressure on CUP and thus results in a decrease in P. The lower P would tend to reduce TD, DD and BC^d. An increase in RRBL makes the time deposits relatively more attractive to the

commercial banks, and thus induces them to increase RD3. An increase in RD3 would push TD up and DD down, and thus offset in the case of TD, and reinforce, in the case of DD, the downward pressure generated by the reduced P. The end result seems to be a reduction in both the time and the demand deposits, which to some extent eases demand pressures on HPMS. The lower (T+D) would tend to reduce the BC^s and, during quarters two and three this reduction in BC^s is perhaps more pronounced than the reduction in BC^d brought about by lower P, and thus requires RL to go up to restore the equilibrium between the demand and the supply of bank credit. During quarters one and four, the reverse is perhaps the case, thus requiring a decrease in RL to restore equilibrium.

In the long-run, RL goes down in all the four quarters. The time deposits go up in the long-run, the reverse of their response in the short-run. In the long-run, TD increases by an amount enough to more than offset the decrease in DD. The net result is an increase in (T+D) in the long-run. The result is quite interesting, though not surprising, in suggesting that the higher cost of accommodation with the Reserve Bank would, in the long-run, result in an overall expansion of the commercial banks liabilities, with the time liabilities growing, to some extent, at the expense of demand liabilities. The short-run and the long-run elasticities of (T+D) with respect to RRBL are -.008 (QII) and

.067 (QII), respectively.

TABLE 5.1

THE SHORT-RUN B MATRIX

(Q II)

VARIABLES	RI	GS	RCM	BC	P	RD3	RD12	TD	CUP	ER	DD	RRATL	RRADL	FR	RPL
EQUATIONS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(E 1)	-.3508	0	0	1	0	0	0	- .2995	0	0	- .2995	.2995	.2995	0	0
(E 2)	.3449	1	0	0	0	0	0	- .14	0	0	- .14	.14	.14	0	0
(E 3)	0	0	1	$-6.7293/(T+D)^*$	0	0	0	$6.7293BC/(T+D)^{*2}$	0	0	$6.7293BC/(T+D)^{*2}$	$-6.7293BC/(T+D)^{*2}$	$-6.7293BC/(T+D)^{*2}$	0	0
(E 4)	0	0	0	1	$-.0205(YA+YNA)$	0	0	0	0	0	0	0	0	0	0
(E 5)	0	0	0	0	$-TD/P^2.YNA$	-.0255	0	$1/P.YNA$	0	0	0	0	0	0	0
(E 6)	0	0	0	$-1.473/(T+D)$	0	1	0	$1.473BC/(T+D)^2+.0754$	0	0	$1.473BC/(T+D)^2$	0	0	0	0
(E 7)	0	0	0	- .0348/P	$.0348(BC-BC_{-1})/P^2-DD/P^2+5.6497/P_{-1}$	0	.0308	0	0	0	1/P	0	0	0	0
(E 8)	-.0836	0	0	$-.3494/(T+D)$	0	-.2409	1	$.3494BC/(T+D)^2$	0	0	$.3494B/(T+D)^2$	0	0	0	0
(E 9)	0	0	0	0	$-CUP/P^2+11.46/P_{-1}$	0	0	0	1/P	0	0	0	0	0	0
(E 10)	.002	0	0	0	0	0	0	$-ER/(T+D)^{*2}$	0	$1/(T+D)^{*2}$	$-ER/(T+D)^{*2}$	$ER/(T+D)^{*2}$	$ER/(T+D)^{*2}$	0	0
(E 11)	0	0	0	0	0	0	0	0	0	0	-1.0932rd	0	1	0	0
(E 13)	0	0	0	0	0	0	0	-1.0444rt	0	0	0	1	0	0	0
(E 19)	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0
(E 20)	0	1	0	1	0	0	0	-1	0	0	-1	1	1	1	0
(E 27)	1	0	-.5	0	0	0	0	0	0	0	0	0	0	0	-.5

TABLE 5.2

The Short-Run C Matrix

(QII)

Variables / Equations	YNA (1)	YA (2)	HPMS (3)	rd (4)	rt (5)	RGBY (6)	RRBL (7)
(E1)	0	0	0	0	0	-.4068	0
(E2)	0	0	0	0	0	.3702	-.0631
(E3)	0	0	0	0	0	0	.8962
(E4)	.0205P	.0205P	0	0	0	0	0
(E5)	$TD/P_{(YNA)^2}$	0	0	0	0	0	0
(E6)	0	0	0	$.923rt/rd^2$	-.923/rd	1.0922	.0948
(E7)	.1069	0	0	0	0	0	0
(E8)	0	0	0	0	0	.4135	0
(E9)	.0893	.0893	0	0	0	0	0
(E10)	0	0	0	0	0	-.0092	.0045
(E11)	0	0	0	1.0932DD	0	0	0
(E13)	0	0	0	0	1.0444TD+PLD	0	0
(E19)	0	0	1	0	0	0	0
(E20)	0	0	0	0	0	0	0
(E27)	0	0	0	0	0	0	0

TABLE 5.3

Short-Run Multipliers

1960 QI

Endogenous Variables \ Exogenous Variables	YNA (1)	YA (2)	HPMS (3)	rd (4)	rt (5)	RGBY (6)	RRBL (7)
1. RL	-.34243	.23675	-.11238	5.15900	18.13270	.79577	-.02611
2. GS	.15170	-.09296	.14682	-2.98068	- 8.87549	.12136	-.05831
3. RCM	-.06550	.00296	-.36589	3.45414	6.45867	-.03382	.92267
4. BC	-.03540	.05455	.23311	-1.22000	-.25047	-.06304	-.01980
5. P	-.06046	-.01345	.12181	- .63751	-.13088	-.03294	-.01034
6. RD3	-.03225	.01725	-.09280	7.44463	-17.29212	1.05537	.09721
7. RD12	-.04121	.02650	-.03936	2.21920	- 2.52696	.72985	.02129
8. TD	.15775	-.08569	.80394	-1.11055	- 8.60362	.24110	-.02852
9. CUP	-.15226	.05081	.52627	-2.75426	-.56545	-.14231	-.04469
10. ER	.01926	-.01013	.03220	-.47552	-1.24441	-.15545	.06733
11. DD	.11081	-.00353	.04972	-.33587	.04311	-.04047	-.00490
12. RRATL	.00349	-.00189	.01777	-.02454	11.64936	.00533	-.00063
13. RRADL	.00606	-.00019	.00272	7.84064	.00236	.00221	-.00027
14. FR	.14272	-.04873	.45325	-5.06184	-11.08626	.13920	.04559
15. RPL	-.61936	.47054	.14114	6.86384	29.80672	1.62536	.97488

Here we have $\frac{\partial PL}{\partial YNA} = a_{11}$, $\frac{\partial RCM}{\partial rd} = a_{34}$, ...,

where aij is the element in the ith row and j th column of the matrix.

TABLE 5.4

Short-Run Multipliers
1960 Q II

Exogenous Variables / Endogenous variables	YNA (1)	YA (2)	HPMS (3)	$\bar{r}_d$ (4)	r_t (5)	RGBY (6)	RRBL (7)
(1) RL	- .25268	.13246	-.56097	7.26745	17.37886	.96215	.01603
(2) GS	.12710	- .05829	.30958	- 3.82243	-8.87108	.06426	- .07330
(3) RCM	- .08727	.03540	-.22775	2.71705	6.16300	-.06161	.90439
(4) BC	- .00318	.01951	.05160	- .26564	- .05846	-.01386	- .00438
(5) P	- .06401	- .01284	.11638	- .59924	- .13188	-.03128	- .00987
(6) RD_3	- .03169	.01409	-.10875	7.54013	-17.32221	1.06263	.09882
(7) RD_{12}	- .03308	.01621	-.08422	2.43922	- 2.60106	.74692	.02555
(8) TD	.17761	- .08929	.81774	-1.21399	- 8.41588	.22387	- .03089
(9) CUP	- .17181	.05336	.51207	-2.63666	- .58029	-.13761	- .04343
(10) ER	.02380	- .00918	.06368	- .75051	- 1.68806	-.16577	.06885
(11) DD	.11813	- .00284	.03135	- .23742	.06662	-.03587	- .00336
(12) RRATL	.00393	- .00197	.01807	- .02683	12.19791	.00495	- .00068
(13) RRADL	.00646	- .00016	.00171	7.97462	.00364	-.00196	- .00018
(14) FR	.16143	- .05123	.46814	-5.31114	-11.62126	.13463	.04430
(15) RPL	- .41809	.22952	-.89419	11.81786	28.59475	1.98591	- .87234

Here we have $\frac{\partial RL}{\partial YNA} = a_{11}$, $\frac{\partial RCM}{\partial \bar{r}_d} = a_{34}$, ...,

where a_{ij} is the element in the ith row and, jth column of the matrix.

TABLE 5.5

Short-Run Multipliers

1960 Q III

Endogenous Variables \ Exogenous Variables	YNA (1)	YA (2)	HPMS (3)	$\dot{r}_d$ (4)	$\dot{r}_t$ (5)	RGBY (6)	RRBL (7)
1. RL	-.19055	.16694	-.43046	5.8823	14.37224	.98781	.01043
2. GS	.10533	-.07479	.30432	-3.68116	-8.35767	.05450	-.07385
3. RCM	-.07081	.043110	-.23180	2.65100	5.78826	-.05225	.67377
4. BC	-.00734	.03270	.08315	-.41897	-.06735	-.02272	-.00709
5. P	-.07838	-.01490	.13182	-.66419	-.10676	-.03602	-.01124
6. RD_3	-.02360	.01686	-.11867	7.58998	-17.37987	1.06760	.09987
7. RD_{12}	-.02516	.02015	-.07595	2.33761	-2.87532	.75070	.02539
8. TD	.11477	-.10448	.93750	-1.75717	-8.17425	.18300	-.04185
9. CUP	-.14775	.06282	.43724	-2.20317	-.35414	-.11950	-.03728
10. ER	.02058	-.01165	.07070	-.79201	-1.70300	-.17085	-.06952
11. DD	.13097	-.00042	.01273	-.13979	.10337	-.03173	-.00182
12. RRATL	.00254	-.00231	.02072	-.03883	12.18975	.00404	-.00092
13. RRADL	.00716	-.00002	.00070	7.98906	.00565	-.00173	-.00010
14. FR	.13805	-.06048	.54134	-5.74706	-11.84126	.11718	.03830
15. RPL	-.31029	.29076	-.62911	9.11360	22.95622	2.02787	-.65290

Here we have $\frac{\partial RL}{\partial YNA} = a_{11}$, $\frac{\partial RCM}{\partial \dot{r}_d} = a_{34}$, ...,

where aij is the element in the ith row and jth column of the matrix.

TABLE 5 . 6

Short-Run Multipliers

1960 Q IV

Endogenous variables \ Exogenous Variables	YNA (1)	YA (2)	HPMS (3)	rd (4)	rt (5)	RGBY (6)	RRBL (7)
1. RL	-.47464	.23839	.27619	2.60973	14.89753	.75846	-.05305
2. GS	.20357	-.09603	.03454	-2.33330	- 8.10022	.13484	-.05276
3. RCM	-.11739	.05161	-.11252	2.08016	5.70609	-.09039	.77981
4. BC	-.09341	.05831	.33486	-1.71204	- .20439	-.09263	-.02864
5. P	-.06655	-.01327	.11759	- .60122	- .07128	-.03253	-.01006
6 RD_3	-.03694	.01764	-.08600	7.41861	-17.39029	1.05701	.09694
7. RD_{12}	-.05445	.02674	-.00310	1.99132	- 2.83449	.72708	.01884
8. TD	.16245	-.09092	.83627	-1.24393	- 8.08781	.21750	-.03261
9. CUP	-.16429	.05613	.48648	-2.48727	- .29695	-.13458	-.04161
10. ER	.02992	-.01272	.03930	- .61448	- 1.57312	-.16120	.07143
11. DD	.11201	-.00293	.04665	- .31414	.08014	-.04071	-.00470
12. RRATL	.00359	-.00201	.01848	- .02749	11.65636	.00481	-.00072
13. RRADL	.00612	-.00016	.00255	7.98603	.00438	-.00223	-.00026
14. FR	.15458	-.05396	.49249	-5.47127	-11.36379	.13200	.04258
15. RPL	-.83189	.42517	.66491	3.13930	24.08897	1.60732	-.88590

Here we have $\frac{\partial RL}{\partial YNA} = a_{11}$, $\frac{\partial RCM}{\partial r_d} = a_{34}$, ...,

where aij is the element in the ith row and jth column of the matrix.

TABLE 5.7

Long-Run Multipliers

1960 QI

Endogenous variables \ Exogenous Variables	YNA (1)	YA (2)	HPMS (3)	r_d (4)	r_t (5)	RGBY (6)	RRBL (7)
1. RL	-2.43125	1.18210	-.51671	-17.85526	95.00163	-2.41755	- .31632
2. GS	2.54735	-1.89557	.93653	17.01084	-109.86270	3.90925	.15569
3. RCM	- .54648	2.07725	-1.20565	.66597	49.82008	-1.43560	1.02881
4. BC	- .42037	-1.85183	1.14732	- 8.39857	- 15.88514	.09834	- .15463
5. P	- .07025	- .16650	.07722	- .56526	- 1.06914	.00662	- .01041
6. RD_3	- .22486	- .15022	- .05965	6.66460	- 14.37242	.97959	.08681
7. RD_{12}	- .70640	.33993	- .14101	- .78521	13.48915	.91526	- .02674
8. TD	- .95830	.44445	.25310	27.55676	- 75.27450	4.67169	.33785
9. CUP	- .20503	- .31404	1.20008	- 8.78481	- 16.61567	.10286	- .16174
10. ER	.21470	- .23432	.11845	3.41001	- 16.20849	.23321	.23355
11. DD	3.29031	-2.98891	1.63067	-10.15969	- 33.85769	- .76697	- .17504
12. RRATL	- .00081	.00038	.00022	.02342	11.77552	.00397	.00029
13. RRADL	.17985	- .16337	.08913	7.30367	- 1.85066	.04192	- .00957
14. FR	.02599	.47779	- .28943	1.45771	6.69082	- .06491	.17102
15. RPL	-4.31602	.28695	.17224	-36.37648	140.18320	-3.39950	-1.66145

Here we have $\frac{\partial RL}{\partial YNA} = a_{11}$, $\frac{\partial RCM}{\partial r_d} = a_{34}$, ...,

where a_{ij} is the element in the i^{th} row and j^{th} column of the matrix.

TABLE 5.8

Long-Run Multipliers

1960 QII

Endogenous variables \ Exogenous Variables	YNA (1)	YA (2)	HPMS (3)	r_d (4)	r_t (5)	RGBY (6)	RRBL (7)
1. RL	-2.27435	1.06407	-.45219	-14.53783	82.16931	-1.81164	- .266
2. GS	2.62121	-1.34342	.60528	16.13921	-96.05277	3.36596	.152
3. RCM	- .90162	.39743	-.16173	- 5.89161	32.29279	-1.17596	.895
4. BC	- .04347	- .29045	.21471	- 1.91255	- 2.01853	- .03194	- .033
5. P	- .06948	- .14124	.06238	- .55569	- .58648	- .00928	- .009
6. RD_3	- .21655	.18097	-.07696	7.15039	-15.09229	1.03159	.094
7. RD_{12}	- .66348	.35221	-.14898	.31339	10.45901	1.07616	-.010
8. TD	- .83631	- .22260	.11185	28.44177	-73.07008	4.62864	.355
9. CUP	- .21472	.03960	.99543	- 8.86710	- 9.35846	- .14810	- .157
10. ER	.33809	- .17847	.08181	2.05432	-12.44909	- .04687	.229
11. DD	3.62877	-1.45086	.71271	- 5.34801	-15.64277	-1.14652	- .079
12. RRATL	- .01848	- .00492	.00247	.62856	10.76905	.10229	.007
13. RRADL	.19835	- .07930	.03896	7.69536	- .85503	- .06267	- .004
14. FR	.03485	.044623	-.03686	.54326	- .55557	.10848	.153
15. RPL	-3.64707	1.73071	-.74265	-23.18405	132.04580	2.44732	-1.429

Here we have $\frac{\partial RL}{\partial YNA} = a_{11}, \frac{\partial RCM}{\partial rd} a_{34}, \ldots\ldots\ldots,$

where aij is the element in the ith row and jth column of the matrix.

TABLE 5.9

Long-Run Multipliers

1960 Q III

Endogenous Variables \ Exogenous Variables	YNA (1)	YA (2)	HPMS (3)	rd (4)	rt (5)	RGBY (6)	RRBL (7)
1. RL	-1.92353	.80222	-.29872	-12.56738	66.47474	-1.26667	-.22960
2. GS	2.49370	-1.27575	.56445	14.89050	-88.58727	3.08053	.12914
3. RCM	-.86159	.35168	-.12805	-5.67471	29.69723	-1.08670	-.64047
4. BC	-.07786	-.40702	.31825	-3.12275	-1.79894	-.09293	-.05538
5. P	-.08264	-.14985	.06498	-.63762	-.36732	-.01897	-.01131
6. RD_3	-.20304	.17853	-.07215	7.28230	-15.74632	1.05717	.09607
7. RD_{12}	-.58338	.29505	-.11285	.80477	6.78270	1.20593	-.00134
8. TD	-.83038	-.31895	.16231	28.34414	-74.47656	4.67059	.35203
9. CUP	-.32861	.09100	.97639	-9.58060	-5.51916	-.28510	-.16991
10. ER	.32214	-.17171	.078109	1.88249	-11.51439	-.09188	.22934
11. DD	3.57483	-1.45481	.74400	-6.99580	-10.39050	-1.39789	-.10836
12. RRATL	-.01835	-.00705	.00359	.62641	10.72447	.10322	.00778
13. RRADL	.19540	-.07952	.04067	7.61431	-.56794	-.07641	-.00592
14. FR	.15157	-.00443	-.02065	1.33988	4.63736	.25829	.16806
15. RPL	-2.98547	1.25277	-.46939	-19.46006	103.25220	1.44664	-1.09967

Here we have $\frac{\partial RL}{\partial YNA} = a_{11}$, $\frac{\partial RCM}{\partial rd} = a_{34}$, ...,

where a_{ij} is the element in the i^{th} row and j^{th} column of the matrix.

TABLE 5.10

Long-Run Multipliers

1960 Q IV

Endogenous Variables \ Exogenous Variables	YNA (1)	YA (2)	HPMS (3)	rd (4)	rt (5)	RGBY (6)	RRBL (7)
1. RL	- 2.29941	.39527	- .08540	-16.45429	72.02904	-1.63353	-.29865
2. GS	2.31219	- 1.74833	.81999	13.27941	-92.55190	3.16768	-.10029
3. RCM	- 1.02035	.02109	.04596	- 7.67459	29.66395	-1.19070	.73586
4. BC	- 1.13266	- 2.87862	- 1.62812	-15.53632	-10.29968	.40486	.27503
5. P	- .08498	.16395	.07364	- .70272	- .46587	- .01831	-.01244
6. RD_3	- .23076	.11531	- .03996	6.82734	-15.55581	1.02664	.08852
7. RD_{12}	- .68894	.14670	- .03555	- .42401	7.99386	1.10593	-.02271
8. TD	- 1.02825	.68755	.36368	26.41555	-75.59522	4.62335	.31768
9. CUP	- .41187	- .21959	1.14018	-10.88014	- 7.21290	- .28352	-.19260
10. ER	.27944	- .26764	.12972	1.46867	-12.02480	- .08556	.22029
11. DD	2.61965	- 3.71981	1.94426	-17.79233	-20.04346	-1.57701	-.29981
12. RRATL	- .02272	- .01519	.00804	.58378	10.16445	.10218	.00702
13. RRADL	.14319	- .20332	.10627	7.03067	- 1.09558	- .08620	-.01639
14. FR	.29140	.43811	- .25449	- 3.26568	- 1.85598	.26755	.20197
15. RPL	- 3.57847	.76944	- .21676	-25.23398	114.39410	-2.07636	-1.33316

Here we have $\frac{\partial RL}{\partial YNA} = a_{11}$, $\frac{\partial RCM}{\partial Y_d} = a_{34}$.....,

where a_{ij} is the element in the i^{th} row and j^{th} column of the matrix

TABLE 5.11

The Short-Run and the Long-Run Elasticities

Computed at 1960 Q II and 1960 Q IV Values of the Variables

Elasticity of → With Respect to ↓		(T + D) Short-Run (1)	(T + D) Long-Run (2)	BC Short-Run (3)	BC Long-Run (4)	GS Short-Run (5)	GS Long-Run (6)	P Short-Run (7)	P Long-Run (8)
HPMS	Q II	1.067	1.036	.095	.397	1.361	2.661	1.955	1.048
	Q IV	1.090	2.852	.616	2.695	.154	3.652	1.936	1.212
rd	Q II	-.004	.070	-.001	-.008	-.041	.158	-.024	-.023
	Q IV	-.005	.026	-.008	-.069	-.025	.144	-.024	-.028
rt	Q II	-.010	-.108	-.0001	-.004	-.038	-.409	-.002	-.009
	Q IV	-.010	-.115	-.0004	-.019	-.035	-.403	-.001	-.007
RRBL	Q II	-.008	.067	-.0016	-.012	-.062	.130	-.032	-.032
	Q IV	-.009	.004	-.010	-.099	-.044	.087	-.032	-.040

CHAPTER VI

SUMMARY AND CONCLUSIONS

6.1 Summary of Findings

Chapter I of the present study was primarily designed to provide the institutional background for the econometric estimation carried out in Chapter III. The quarterly series on agricultural and non-agricultural national income were estimated in Chapter II. The estimates of quarterly national income presented in Chapter II bring in to light clearly the division of a year in terms of the "busy" and "slack" seasons, since these estimates show a heavy concentration of economic activity in quarters IV and I, which roughly span the "busy" season.

The OLS estimates for the twelve stochastic equations in the model are presented in Chapter III. The BC^s and GS equations estimated in this Chapter have the expected opposing seasonal patterns. The seasonality in both of these equations was found to be multiplicative, with the exact magnitude (of seasonality) depending on the level of total disposable deposits. BC^s has been found to be more sensitive to the variations in (T+D)* during the "busy" season as opposed to the "slack" season. The reverse is true in the case of GS. In the case of the BC^d equation, both the additive and multiplicative seasonal dummies were found to be significant.

The volatile nature of RMC is reflected in the estimated call money rate equation. The lagged value of the rate is not statistically significant in the equation. Besides the additive seasonality, there is also the seasonality in the call money rate's dependence on RRBL. The RCM is more sensitive to RRBL during the "busy" season as opposed to the "slack" season.

Non-agricultural national income has been found to be superior to total national income as a proxy for the wealth constraint facing the non-bank public holding the commercial bank deposits. Time deposit rates have not been found statistically significant in explaining the demand for demand deposits. As indicated in Chapter III, a significant (and variable over time) portion of savings deposits is classified as demand deposits. The commercial banks offer varying rates of interest on these deposits. If an increase in time deposit rates is accompanied by a similar increase in the rates offered on savings deposits, then the negative impact on demand deposits of such an increase in time deposit rates is likely to be weak. An increase in time deposit rates may also be accompanied by an improvement in the non-price terms offered on demand deposits. This would also tend to weaken the negative impact of such an increase.

The specification of the demand for currency equation estimated in Chapter III is unique and reflects - more than any

other equation in the model - the underdeveloped nature of the Indian money market. The seasonality in the currency holdings of the non-bank public has been explained largely by the seasonality in the marketing of agricultural produce. The rate or change of prices has also been found significant in explaining the demand for currency by the non-bank public.

The TSLS estimates for selected equations in the model are presented in Chapter IV. The complete model of the monetary sector, including both the stochastic and non-stochastic equations is also presented in this chapter. The principal short-run and long-run multipliers associated with the model are calculated and analyzed in Chapter V. As pointed out in Chapter V, the price level in this model would seem to be highly sensitive to changes in HPMS, particularly if no allowance is made for the interest rate and the real sector leakages.

6.2 The Concluding Remarks

A long and arduous path had to be traversed in completing the work reported in this dissertation. We believe that the present study has come a long way towards building a realistic quarterly econometric model of the monetary sector of India. The national income estimates presented in Chapter II are not beyond improvement. However, if the fitted equations are any indication, these estimates would seem to be

quite satisfactory. The specification and estimation of the model's behavioural equations, as carried out in the present study, represent significant improvements over the two earlier studies by Mammen and Gupta. The currency with the public equation estimated in Chapter III stands out as one of the most significant improvements over the two earlier annual models. The present study is the first one in which econometric methods have been used in analyzing the seasonal variations in the Indian monetary aggregates. Our findings corroborate, to some extent, the commonly held view that the seasonal variations in most of the monetary aggregates could be traced back, directly or indirectly, to seasonal variations in agricultural income and output.

The operational usefulness of the monetary sector model developed in the present study is limited primarily due to the lack of any feedback to and from the real sector. In our view, even a nominal 6-8 equation real sector, if appended to the present monetary sector model, would greatly enhance its potential usefulness. Significant improvements could also be made in the demand for bank credit equation; in particular an index of profit expectations could perhaps be introduced in this equation, along with a better measure of the cost of bank credit. These improvements would involve the estimation of quarterly time series for some of the additional variables with the help of fragmentary raw data. In our judgement, an

individual research worker would be unwise to undertake such a task. All in all, the monetary sector model developed and analyzed in this dissertation, despite its limited operational usefulness, represents a useful tool for the analysis of the behaviour of principal actors in the Indian money market. It is hoped that it will prove to be a stepping stone for future research in the field.

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TABLE 1 A1

BANK CREDIT (BC)

Quarters / Years	II	III	IV	I
1952-53	5.6502	5.0640	4.8409	5.3402
1953-54	5.4900	5.0317	4.8299	5.4527
1954-55	5.7745	5.3782	5.3674	5.9632
1955-56	6.2420	6.0282	6.0550	7.0480
1956-57	7.6241	7.4607	7.6831	8.5417
1957-58	9.2002	8.6790	8.5244	9.2758
1958-59	9.2736	8.6215	8.4156	9.5563
1959-60	10.0269	9.3581	9.3539	10.5606
1960-61	11.1878	11.0485	11.1267	12.5785
1961-62	12.7837	12.3144	12.6487	13.7948
1962-63	14.4779	14.1134	14.1591	15.5021
1963-64	15.7683	14.8540	15.3030	17.7467
1964-65	18.3338	17.4145	17.5939	19.7821
1965-66	21.0829	20.2483	20.6317	22.1948
1966-67	23.1596	22.5319	23.3120	25.9940

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TABLE 2

A2

CURRENCY WITH THE PUBLIC (CUP)

Quarters / Years	II	III	IV	I
1952-53	12.4367	11.9181	11.7380	12.1416
1953-54	12.7228	11,9313	12.0190	12.7299
1954-55	12,9896	12.3709	12.6404	13.4146
1955-56	14.1066	13.8174	14.2147	15.1557
1956-57	15.9504	15.2073	15.2932	15.9842
1957-58	16.4996	15.6897	15.7474	16.4347
1958-59	16.8663	16.1591	16.4486	17.4921
1959-60	18.2641	17.4377	17.9170	18.9529
1960-61	19.6232	18.8828	19.2397	20.4956
1961-62	20.7485	19.9391	20.2604	21.5388
1962-63	22.3943	21.5316	22.1208	23.3618
1963-64	24.2013	23.3819	24.2431	25.6881
1964-65	26.6890	25.4321	25.9544	27.2824
1965-66	28.5198	27.2154	28.1386	29.7603
1966-67	30.9457	29.1576	29.5156	31.4786

TABLE 3

A3

DEMAND DEPOSITS (DD)

Quarters / Years	II	III	IV	I
1952-53	5.3061	5.2548	5.1030	5.0015
1953-54	5.0340	5.0089	5.0598	5.1005
1954-55	5.2478	5.3708	5.4871	5.5844
1955-56	5.6727	5.7910	5.9150	6.1378
1956-57	6.1946	6.1547	6.2432	6.7268
1957-58	6.9850	6.8203	6.8432	6.9319
1958-59	6.9666	6.9956	6.6496	6.8355
1959-60	7.0534	6.8229	6.7857	7.1890
1960-61	7.3066	7.3150	7.3209	7.5679
1961-62	7.6919	7.5606	7.4239	7.5785
1962-63	7.9201	8.1059	8.0902	8.5126
1963-64	9.0274	9.6136	9.9461	10.5864
1964-65	10.9490	11.3937	11.9921	12.3740
1965-66	12.6590	13.2323	13.4613	14.0347
1966-67	14.5983	15.3177	15.5273	16.0431

TABLE 4

EXCESS RESERVES (ER)

Quarters / Years	II	III	IV	I
1952-53	.5237	.6619	.5801	.4664
1953-54	.4374	.4867	.5943	.4142
1954-55	.4346	.5556	.7269	.4982
1955-56	.4933	.5164	.6105	.5387
1956-57	.5226	.4947	.5040	.4567
1957-58	.6488	.8782	.8601	.5814
1958-59	.7872	.8878	.8041	.5983
1959-60	.7422	.6244	.5898	.5204
1960-61	.8660	.9745	.8851	.5981
1961-62	.6786	.6551	.7900	.6228
1962-63	.7046	.5905	.5942	.5808
1963-64	.7121	.6255	.7468	.6540
1964-65	.7733	.7637	.7709	.8135
1965-66	.8141	.7456	.9235	.8197
1966-67	.9197	.8775	1.161	.9749

TABLE 5

A5

FREE RESERVES (FR)

Quarters / Years	II	III	IV	I
1952-53	.2211	.6217	.5584	.3814
1953-54	.2541	.4609	.5771	.2161
1954-55	.0825	.4987	.6856	.3418
1955-56	.2313	.3789	.4999	.1173
1956-57	-.0691	.0182	-.1310	-.3849
1957-58	-.1318	.4569	.6131	.2528
1958-59	.5813	.8160	.7598	.2006
1959-60	.5163	.5789	.5176	.0751
1960-61	.4104	.6151	.6085	-.0081
1961-62	.4808	.6059	.6928	.2778
1962-63	.6415	.5202	.4767	.1292
1963-64	.5456	.6154	.7114	.0281
1964-65	.5113	.7418	.6447	-.1843
1965-66	-.1616	.2530	.6821	.3917
1966-67	.6468	.8602	1.1214	.2120

TABLE 6 A6

GOVERNMENT SECURITIES (Q.S.)

Quarters / Years	II	III	IV	I
1952-53	3.129	3.2026	3.3873	3.2357
1953-54	3.2419	3.4519	3.5507	3.4032
1954-55	3.4499	3.6060	3.6984	3.7040
1955-56	3.6636	3.9729	4.1490	3.9644
1956-57	3.7309	3.7737	3.7109	3.4175
1957-58	2.8353	2.8036	2.8390	2.8318
1958-59	3.2174	3.9981	4.4405	4.0847
1959-60	3.8371	4.6857	5.0281	4.6587
1960-61	4.7001	4.8459	4.5961	4.1308
1961-62	4.1599	4.6167	4.6942	4.4756
1962-63	4.6016	5.4411	5.6239	5.2357
1963-64	5.3525	6.4514	6.5369	5.8399
1964-65	5.5600	7.2279	7.5785	6.8751
1965-66	6.7902	8.0150	8.1144	7.9429
1966-67	8.7414	10.6415	10.6926	9.1619

TABLE 7

PRICE LEVEL (P)

Quarters / Years	II	III	IV	I
1952-53	1.0472	1.0671	1.0597	1.0497
1953-54	1.0633	1.1067	1.0567	1.0233
1954-55	1.0167	1.0100	.9833	.9533
1955-56	.9267	.9633	.9767	.9800
1956-57	1.0433	1.0700	1.0933	1.0700
1957-58	1.1000	1.1300	1.1333	1.1033
1958-59	1.1333	1.2000	1.2133	1.1733
1959-60	1.1933	1.2433	1.2467	1.2200
1960-61	1.2300	1.2567	1.2433	1.2333
1961-62	1.2433	1.2767	1.2800	1.2700
1962-63	1.2900	1.3267	1.3267	1.2967
1963-64	1.3233	1.3600	1.3867	1.4167
1964-65	1.4700	1.5633	1.6333	1.6200
1965-66	1.6133	1.7000	1.7267	1.7367
1966-67	1.8033	1.8967	1.9433	1.9833

TABLE 8 A8

RRADL

Quarters / Years	II	III	IV	I
1952-53	0.2787	0.2755	0.2687	0.2639
1953-54	0.2699	0.2630	0.2649	0.2665
1954-55	0.2753	0.2811	0.2883	0.2939
1955-56	0.2992	0.3051	0.3115	0.3216
1956-57	0.3265	0.3230	0.3276	0.3523
1957-58	0.3693	0.3605	0.3601	0.3650
1958-59	0.3732	0.3715	0.3525	0.3605
1959-60	0.3743	0.3626	0.3605	0.3810
1960-61	0.3875	0.3881	0.3899	0.4037
1961-62	0.4145	0.4032	0.3973	0.4041
1962-63	0.4666	0.4654	0.2836	0.2938
1963-64	0.3152	0.3304	0.3417	0.3661
1964-65	0.3824	0.3927	0.4049	0.4247
1965-66	0.4354	0.4492	0.4574	0.4790
1966-67	0.4998	0.5192	0.5358	0.5452

TABLE 9

BAZZAR BILL RATE (RBB)

Quarters / Years	II	III	IV	I
1952-53	9.000	9.50	9.75	9.25
1953-54	9.000	8.88	9.25	9.75
1954-55	9.750	9.75	9.75	9.75
1955-56	9.750	9.75	9.75	9.88
1956-57	9.750	9.50	10.00	10.88
1957-58	11.250	10.38	10.88	10.75
1958-59	9.750	9.25	9.25	9.38
1959-60	9.620	9.59	9.59	9.77
1960-61	10.130	10.13	11.50	12.00
1961-62	12.000	11.50	12.00	12.00
1962-63	12.000	11.50	12.00	12.00
1963-64	12.000	12.00	12.00	12.00
1964-65	12.000	12.00	12.00	12.00
1965-66	12.000	12.00	12.00	13.50
1966-67	15.000	15.00	15.00	15.00

TABLE 10

CALL MONEY RATE (RCM)

Quarters / Years	II	III	IV	I
1952-53	2.54	1.58	1.53	2.77
1953-54	2.73	1.63	1.61	2.91
1954-55	2.90	2.10	2.07	3.00
1955-56	2.78	2.65	2.43	3.08
1956-57	3.23	3.13	3.25	3.39
1957-58	3.50	3.12	2.79	3.03
1958-59	2.98	2.39	1.89	3.34
1959-60	3.33	1.87	2.38	3.51
1960-61	3.50	3.51	4.16	5.23
1961-62	5.23	3.19	4.11	4.72
1962-63	3.56	2.72	3.75	5.64
1963-64	4.46	2.01	2.93	5.67
1964-65	5.01	2.29	3.04	5.87
1965-66	7.87	5.64	5.67	4.71
1966-67	4.51	3.83	4.56	7.30

TABLE 11 A11

RATE ON FIXED DEPOSITS FOR 3 MONTHS (RD3)

Quarters / Years	II	III	IV	I
1952-53	3.07	2,82	2.91	2.97
1953-54	2.86	2.47	2.67	2.94
1954-55	2.93	2.83	2.99	3.00
1955-56	2.99	2.91	2.99	3.13
1956-57	3.38	3.37	3.63	4.06
1957-58	4.18	4.22	4.37	4.43
1958-59	4.40	4.07	3.95	3.98
1959-60	3.99	3.69	3.50	3.50
1960-61	3.50	3.50	3.50	3.50
1961-62	3.50	3.50	3.50	3.50
1962-63	3.33	3.50	3.50	3.50
1963-64	3.50	3.50	3.50	3.50
1964-65	3.50	3.50	3.99	4.38
1965-66	5.00	5.00	5.00	5.00
1966-67	5.00	5.00	5.00	4.50

TABLE 12

A12

RATE ON FIXED DEPOSITS FOR 12 MONTHS (RD12)

Quarters / Years	II	III	IV	I
1952-53	2.09	2.34	2.32	2.25
1953-54	2.27	2.24	2.21	2.24
1954-55	2.34	2.39	2.34	2.64
1955-56	2.47	2.36	2.50	2.27
1956-57	2.74	2.88	3.01	3.28
1957-58	3.56	3.56	3.60	3.78
1958-59	3.73	3.77	3.68	3.58
1959-60	3.64	3.60	3.42	3.43
1960-61	3.41	3.32	3.37	3.59
1961-62	4.00	4.00	4.00	3.97
1962-63	4.00	4.00	4.00	3.97
1963-64	4.00	4.00	4.00	4.00
1964-65	4.00	4.00	4.99	5.47
1965-66	6.00	6.00	6.00	6.00
1966-67	6.00	6.00	6.00	6.00

TABLE 13

GOVERNMENT BOND YIELD (RGBY)

Quarters / Years	II	III	IV	I
1952-53	3.64	3.74	3.64	3.62
1953-54	3.64	3.65	3.65	3.63
1954-55	3.65	3.62	3.71	3.70
1955-56	3.72	3.73	3.73	3.79
1956-57	3.89	3.96	4.06	4.06
1957-58	4.07	4.18	4.23	4.23
1958-59	4.22	4.16	4.09	4.05
1959-60	4.06	4.05	4.04	4.06
1960-61	4.09	4.06	4.05	4.04
1961-62	4.08	4.11	4.12	4.23
1962-63	4.23	4.37	4.76	4.81
1963-64	4.79	4.74	4.68	4.75
1964-65	4.71	4.72	4.84	5.13
1965-66	5.33	5.53	5.53	5.49
1966-67	5.55	5.58	5.85	5.56

TABLE 14 A14

PRIME LENDING RATE - (RPL)

Quarters / Years	II	III	IV	I
1952-53	4.0	4.0	4.0	4.0
1953-54	4.0	4.0	4.0	4.0
1954-55	4.0	4.0	4.0	4.0
1955-56	4.0	4.0	4.0	4.0
1956-57	4.0	4.0	4.0	4.17
1957-58	4.5	4.5	4.5	4.5
1958-59	4.5	4.5	4.5	4.5
1959-60	4.5	4.5	4.5	4.5
1960-61	4.5	4.5	5.0	5.0
1961-62	5.0	5.0	5.0	5.0
1962-63	5.0	5.0	5.0	5.0
1963-64	5.84	6.00	6.00	6.0
1964-65	6.00	6.00	6.25	6.62
1965-66	7.00	7.00	7.00	7.50
1966-67	7.50	7.50	7.50	7.50

TABLE 15

PLD

Quarters / Years	II	III	IV	I
1952-53				
1953-54				
1954-55				
1955-56				
1956-57	0.0234	0.0936	0.2028	0.3602
1957-58	0.7910	1.0620	1.4240	1.6430
1958-59	1.6120	1.7910	2.0090	2.2280
1959-60	2.5580	2.8700	3.0580	2.9940
1960-61	2.8400	2.5400	2.1800	1.8200
1961-62	1.4600	1.4600	1.4600	1.4600
1962-63	1.4600	1.4600	1.3600	1.0600
1963-64	1.0600	1.0600	1.0000	0.8200
1964-65	0.8200	0.8200	0.7400	0.5000
1965-66	0.5000	0.5000	0.4500	0.3300
1966-67				

The annual data on PL deposits for years 1956-57 to 1963-64 was obtained from Mammen, An Econo-metric Study of the Money Market in India. The quarterly data on PL deposits with the State Bank of India for years 1964-65 and 1965-66 was obtained from various issues of the Report on Currency and Finance. For earlier years no quarterly data was available. The quarterly series reported above for years 1956-57 to 1963-64 was obtained by using the technique of graphic interpolation. By the end of the year 1965-66 all the PL (Public Law) deposits had been transferred from the State Bank of India (a commercial bank) to the Reserve Bank of India.

TABLE 16 A16

RRATL*

Quarters / Years	II	III	IV	I
1952-53	.0654	.0695	.0701	.0704
1953-54	.0716	.0730	.0734	.0726
1954-55	.0734	.0771	.0796	.0814
1955-56	.0848	.0892	.0911	.0901
1956-57	.0941	.0976	.0957	.0941
1957-58	.0975	.1065	.1094	.1140
1958-59	.1284	.1355	.1453	.1433
1959-60	.1526	.1651	.1700	.1736
1960-61	.1877	.1926	.1866	.1860
1961-62	.1964	.2018	.1983	.2088
1962-63	.2260	.2345	.3531	.3529
1963-64	.3585	.3694	.3734	.3660
1964-65	.3767	.4091	.4036	.4107
1965-66	.4397	.4691	.4722	.4791
1966-67	.5205	.5588	.5765	.5642

TABLE 17

RESERVE BANK OF INDIA LENDING RATE (RRBL)

Quarters / Years	II	III	IV	I
1952-53	3.50	3.50	3.50	3.50
1953-54	3.50	3.50	3.50	3.50
1954-55	3.50	3.50	3.50	3.50
1955-56	3.50	3.50	3.50	3.50
1956-57	3.50	3.50	3.50	3.50
1957-58	4.00	4.00	4.00	4.00
1958-59	4.00	4.00	4.00	4.00
1959-60	4.00	4.00	4.00	4.00
1960-61	4.00	4.00	4.00	4.00
1961-62	4.00	4.00	4.00	4.00
1962-63	4.00	4.00	4.00	4.50
1963-64	5.30	4.50	4.60	5.10
1964-65	5.20	4.60	5.10	6.20
1965-66	7.30	6.0	6.40	6.20
1966-67	6.20	6.00	6.00	6.30

TABLE 18 A18

YIELD ON VARIABLE DIVIDEND INDUSTRIAL SECURITIES (RYIS)

Quarters / Years	II	III	IV	I
1952-53				
1953-54	6.41	6.28	5.99	5.60
1954-55	5.43	4.94	4.95	5.06
1955-56	4.96	4.92	4.87	5.28
1956-57	5.60	5.59	5.60	5.95
1957-58	6.49	6.67	7.10	7.22
1958-59	6.92	6.31	5.95	5.92
1959-60	5.60	5.47	5.29	5.13
1960-61	4.92	4.72	4.97	4.90
1961-62	4.68	4.77	4.64	4.59
1962-63	4.62	4.74	4.98	5.08
1963-64	5.04	4.93	4.75	4.59
1964-65	6.11	6.22	6.26	6.63
1965-66	6.85	7.01	7.29	7.17
1966-67	7.67	7.75	7.88	7.54

TABLE 19

TIME DEPOSITS (TD)

Quarters / Years	II	III	IV	I
1952-53	3.2168	3.3927	3.4327	3.4769
1953-54	3.5367	3.5984	3.6169	3.5933
1954-55	3.6241	3.7920	3.9149	4.0106
1955-56	4.1662	4.3843	4.4829	4.4488
1956-57	4.6257	4.8076	4.7201	4.6438
1957-58	4.7836	5.1281	5.1976	5.5023
1958-59	6.1357	6.5101	7.0146	6.9848
1959-60	7.3879	8.0027	8.2302	8.4695
1960-61	9.1382	9.4125	9.2446	9.1026
1961-62	9.5617	9.7731	9.7101	10.2658
1962-63	10.841	11.1948	11.0391	11.6269
1963-64	11.7295	11.4832	11.8213	12.9629
1964-65	12.7383	12.9629	12.8183	13.1207
1965-66	13.8182	14.5636	14.7474	15.1242
1966-67	16.3365	17.3314	17.9828	17.9773