

193

"A COMPUTABLE GENERAL EQUILIBRIUM
ANALYSIS OF MONEY, FINANCE AND
ECONOMIC ACTIVITY IN INDIA"

A THESIS SUBMITTED TO THE
UNIVERSITY OF PUNE
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ECONOMICS

BY
VEENA KESHAV PAILWAR

UNDER THE GUIDANCE OF
DR. V. S. CHITRE
PROFESSOR OF ECONOMICS,

COKHALE INSTITUTE OF POLITICS AND ECONOMICS,
(DEEMED TO BE A UNIVERSITY)
SHIVAJINAGAR,
PUNE - 411 004

★ [SEPTEMBER 1997] ★

SERVANTS OF INDIA SOCIETY'S LIBRARY

PUNE 411 004.

CN *X61.2.N9*

N7

AcN *249223*

Date of release for loan

This book should be returned on or before the last date stamped below.

An overdue charge of Re. 1/- will be levied for each day the book is kept beyond this date.

--	--	--

**"A COMPUTABLE GENERAL EQUILIBRIUM ANALYSIS OF MONEY,
FINANCE AND ECONOMIC ACTIVITY IN INDIA"**

**A THESIS SUBMITTED TO THE
UNIVERSITY OF PUNE**

**FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY IN ECONOMICS**

BY

VEENA KESHAV PAILWAR

UNDER THE GUIDANCE OF

DR. V.S. CHITRE

PROFESSOR OF ECONOMICS,

GOKHALE INSTITUTE OF POLITICS AND ECONOMICS,

(DEEMED TO BE A UNIVERSITY)

SHIVAJINAGAR,

PUNE - 411004

SEPTEMBER, 1997

Dr. V.S. Chitre
Professor of Economics,
Gokhale Institute of Politics
and Economics,
Pune 411004.

CERTIFICATE
(FORM 'A')

Certified that the work incorporated in the thesis entitled "**A COMPUTABLE GENERAL EQUILIBRIUM ANALYSIS OF MONEY, FINANCE AND ECONOMIC ACTIVITY IN INDIA**", submitted by **MISS VEENA KESHAV PAILWAR**, was carried out by the candidate under my guidance. Such material as has been obtained from other sources has been duly acknowledged in the thesis.

V. S. Chitre
(V. S. CHITRE)
Research Guide

Date: 27th September, 1997
Pune 411004.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my Ph.D guide, Professor V.S. Chitre, Gokhale Institute of Politics and Economics, for his valuable guidance. On several occasions, I was benefitted by his deep understanding of the theoretical issues as well as inter-linkages working in the economy. During my long association with him, he patiently went through several drafts of this thesis, pointed out logical weaknesses in it, posed thought provoking queries and provided constructive suggestions which definitely improved my understanding of the subject, sharpened my writing skills and enabled me to present this thesis in its present form.

I am highly indebted to Shri V. P. Ojha of Shri Ram College of Commerce, University of Delhi, for explaining me the process of carrying out simulation experiments using the mathematical package GAMS and also sparing his valuable time for discussions related to the issue of infeasibilities in solutions obtained using this package

I am thankful to Professor K. Parikh, Director, Indira Gandhi Institute Of Development Research (IGIDR), Bombay for permitting me to use the excellent computer facilities available at IGIDR. I am also thankful to Mr Satyanarayan, a Ph.D. student at IGIDR, for helping me with the GAMS Syntax.

I sincerely acknowledge the help received in proof-reading some of the chapters in this thesis from Ms Raji Rajan and Ms Priyanka Sood, friends and colleagues at National Council of Applied Economic Research.

I thank the University of Pune for granting me U.G.C. Junior and Senior Research Fellowship without which it would have been difficult for me to pursue this time consuming work.

I take this opportunity to express my profound gratitude to my parents who constantly gave me mental strength, encouragement, and inspiration to complete this work.

My thanks are also due to my brother, Pankaj, for helping me with the computers as well as for proof-reading some of these chapters.

Pailwar

(Veena Pailwar)

CONTENTS

CERTIFICATE	
ACKNOWLEDGEMENTS	
LIST OF TABLES	iv-vi
LIST OF FIGURES	vii
Chapter 1	
INTRODUCTION	1-7
1.1 Background	1
1.2 Chapter Scheme	4
Chapter 2	
CONCEPTS IN GENERAL EQUILIBRIUM ANALYSIS AND A SELECT REVIEW OF LITERATURE	8-106
2.1 Concepts in General Equilibrium Analysis	8
2.1.1 Definition of CGE Model	8
2.1.2 Types of Computable General Equilibrium Models	11
2.1.3 Major Weaknesses of the CGE Models	22
2.1.4 Integration of Money in General Equilibrium Framework	23
2.2 A Select Review of Literature	45
2.2.1 Modelling of the Financial Sector in the Reviewed Literature	45
2.2.2 A Select Review	60
2.2.3 Conclusions	103

Chapter 3	
A FINANCIAL SOCIAL ACCOUNTING MATRIX FOR INDIA	107-179
3.1 Introduction	107
3.2 Basic Structure of a SAM	108
3.3 The Disaggregated Financial Social Accounting Matrix for India	113
3.3.1 The Base Year	113
3.3.2 Sources of Data	113
3.3.3 The Level of Disaggregation	114
3.4 Construction of the FSAM- 1983-84 for India	120
3.4.1 Current Account of the FSAM	120
3.4.2 Capital Account of the FSAM	138
Chapter 4	
THE MODEL	180-243
4.1 Introduction	180
4.2 Description of the Model	182
4.2.1 Real Sector	182
4.2.2 Financial Sector	191
4.2.3 Interim Period Model: Dynamics	214
4.3 Inter-linkages and Conclusions	215
4.3.1 Interlinkages from the Financial Side to the Real Side	215
4.3.2 Interlinkages from the Real Side to the Financial Side	218
Chapter 5	
SIMULATION AND SENSITIVITY ANALYSIS	244-300
5.1 Parameter Values and Model Calibration	244
5.2 Policy Simulations	245
5.2.1 Monetary Policy Adjustments	248
5.2.2 Fiscal Policy Adjustments	259

5.2.3 Exogenous Change	266
5.2.4 Simulation in a Partially Liberalized Regime	268
5.3 Sensitivity Analysis	271
5.4 Summary and Highlights	272
 Chapter 6	
CONCLUSIONS AND FURTHER RESEARCH WORK	301-314
6.1 Contribution of the Study	301
6.2 Major Findings, Insights Gained and Policy Implications	305
6.2.1 Major Findings and Insights Gained	305
6.2.2 Policy Implications	308
6.3 Suggestions for Further Research	311
 REFERENCES	 315-329

LIST OF TABLES

3.1	Financial Social Accounting Matrix For India for the Year 1983-84	149
3.2	Description of Sectors for the 2x2 Commodity by Commodity Block in Table 3.1	150
3.3	Intermediate Input- Output Block	151
3.4	Comparision of Gross Domestic Product and its Components for 1983-84	152
3.5	Components of Gross Domestic Expenditure and Discrepancies between "Data for SAM and I-OTT" - 1983-84	153
3.6	Adjustment in Final Use Matrix	154
3.7	Adjusted Amounts of Gross Value Added	155
3.8	Factor Income by Broad Commodity Group- 1983-84	155
3.9	Distribution of Consumption of Fixed Capital, Gross Value Added Among Broad Categories Among Broad Categories	156
3.10	Distribution of Net Value Added Among Different Factor Payments	156
3.11	Net Value Added by Organized and Unorganized Sectors	157
3.12	Finance of Consumption of Fixed Capital from Operating Surplus and Mixed Income of Self Employed	157
3.13	Estimated Gross Operating Surplus and Gross Mixed Income of Self Employed	158
3.14	Distribution of Gross Value Added to Different Factor Payments	158

3.15	Gross Value Added and its Composition- Government Sector	159
3.16	Gross Value Added and its Composition- Public Sector Non-Departmental Enterprises	160
3.17	Gross Value Added and its Composition- Financial Sector (Private and Public)	161
3.18	Estimates and Distribution of Gross and Net Value Added to different Factor Payments for the Private Corporate Non-Financial Firms as Residual	162
3.19	Receipt/ Transfer of Non-Wage Income from/to the Rest of the World	163
3.20	Expenditure Account of the Government for the Year 1983-84	164
3.21	Distribution of Interest on Public Debt and Other Current Transfers from the Government to Different Institutions	165
3.22	Income Account of the Government for the Year 1983-84	166
3.23	Claims of the Government on Various Economic Agents	167
3.24	Pattern of Investment by Public Sector Non- Departmental Non Financial Enterprises	168
3.25	Estimates of Income and Expenditre Accounts of Public Sector Non -Departmental Non-Financial Enterprises	169
3.26	Estimates of Income and Expenditure Accounts of Financial Insitutions	170
3.27	Estimates of Income and Expenditure Accounts of Private Corporate Sector	171
3.28	Estimated Income and Expenditure Accounts of ROW	172

LIST OF FIGURES

3.1	Flow Diagram of Economic Activities	109
3.2	A Schematic Representation of a Social Accounting Matrix	111
3.3	Schematic Presentation of Current Account of the FSAM	118
3.4	Schematic Presentation of Capital Account of the FSAM	119
4.1	The Structure of the Real Sector of the Model	183
4.2	Structure of Household Hierarchical Portfolio Allocation	197
5.1	Flow Chart for a Ten Per Cent Reduction in the Interest Rate on Bank Deposits (rbd)	249
5.2	Flow Chart for a Ten Per Cent Reduction in the Statutory Liquidity Ratio (SLR)	252
5.3	Flow Chart for a Ten Per Cent Reduction in the Cash Reserve Ratio (CRR)	257
5.4	Flow Chart for a Ten Per Cent Reduction in the Indirect Tax Rates (tri)	260
5.5	Flow Chart for a Four Per Cent Reduction in the Real Government Investment Expenditure (Ig)	263
5.6	Flow Chart for a Two Per Cent Increase in the Agricultural Output (Xsa)	267

3.29	Estimated Income and Expenditure Accounts of Household Sector	173
3.30	Basic Flow of Funds Matrix for India for the Year 1983-84	174
3.31	Disaggregation of 'Deposits' in Flow of Funds Matrix for India for the year 1983-84	175
3.32	Capital Formation Matrix By Type of Assets and by Type of Institutions	176
3.33	Rearranged Capital Formation Matrix by Type of Assets and by Type of Institutions	177
3.34	Adjusted Flow of Funds Matrix For India	178
3.35	Financial Balance Sheet for India - as on 1983	179
4.1	Equations of the CGE Model	220
4.2	List of Endogenous Variables and Co-efficients	234
4.3	List of Exogenous Variables and Co-efficients	238
5.1	Values of Parameters	277
5.2	Simulation Results in Regulated Regime for Change in Various Exogenous Variables and Policy Variables	280
5.3	Differences between Values of Various Variables from Base Year Values	285
5.4	Percentage Change in Simulation Results in Regulated Regime from Base Year Values	290
5.5	Simulation and Sensitivity Results for a Four Percent Change in I_g Under Different Elasticity Values in Liberalized Scenario.	295

Chapter 1

INTRODUCTION

1.1 Background

India is passing through a phase of structural reforms with emphasis on privatization and liberalization. Reforms and policy changes in the financial and fiscal sector [for example, deregulation of interest rates, reduction in Statutory Liquidity Ratio (SLR), Cash Reserve Ratio (CRR) (providing more profitable opportunities in the portfolio management), placement of government bonds in the open market, reduction in tax rates, government expenditure, etc.] are some of the reforms which have implications for the changes in money supply, availability of bank and non-bank credit to the private sector and through them for the cost of credit to the private sector. These reforms would not only influence the level and the cost of credit but also influence the allocation of credit. These changes, in turn, have implications for the real sphere of the economy - affecting level of investment, its allocation in various types of activities, real wages, relative prices and, thus, the cost of production, level of production and derived demand for labour. In the next round, changes in the levels of employment and income and distribution of income among economic agents affects the demand for goods and services. And, if we assume that the demand determines the production, the level of production and the level of capacity utilization would get affected.

Ignoring general equilibrium linkages often misleads, especially when policy changes have substantial indirect effects on other groups or other markets. Indirect effects working through both production and factor markets can often modify, vitiate or reverse the effects of some policy changes. These economy wide changes cannot be captured meaningfully in a partial or a sectoral model

(which typically ignores feedback effects and fails to take into account inter-sectoral and inter-class resource shifts arising due to shift in relative prices, quantities or incomes) and economy wide macro-models (which do take into account interdependence among relevant aggregates including that due to the national income identity implied by Walras Law but typically ignore cross-equation restrictions implied by utility maximization by consumers and profit maximization by producers).

Structural adjustments, as mentioned above, involve shifts in the sectoral structure of demand, trade, resource allocation, production, portfolio allocation as well as in the magnitudes of macro-aggregates.

As we will discuss at length in the next chapter, Computable General Equilibrium (CGE) models, inspite of their difficulties, still provide the best framework available for analysing issues of structural adjustment. Unlike macro models, CGE models incorporate sectoral details, the behavioural specification of various economic agents and the various resource constraints faced by the economy, that permits a richer analysis of changes in the structure as well as the volume of production and trade. Incorporation of behavioural specification of various economic agents becomes particularly useful and in fact necessary when past trends based on data generated in the previous regulated regime cannot be extrapolated into a different, deregulated regime. In such models thus it becomes possible to examine the impact of liberalization policies such as deregulation of interest rates, exchange rate, removal of various restrictions on the financial sector in the form of SLR etc.

Thus, economy wide implications of any reform can be best studied in a general equilibrium framework. And, when the reforms are in the financial sector, introduction of financial block in a general equilibrium framework is needed as standard CGE models are neutral with respect to changes in the quantity of money and in these models only relative prices matter. There is no theoretically satisfactory way to study inflation, nominal wage rigidities or nominal exchange rate policies with standard CGE models. Financial CGE models attempt to integrate money and other financial assets in a multi-sector, multi-class structure of CGE. As pointed out by Thorbecke, Kim, Roland-Holst and Berrian (1992),

since many policy instruments, which are part and parcel of the structural reforms and adjustment package, are financial and monetary (for example deregulation of interest rates, decrease in SLR and CRR etc.) or have important financial or monetary repercussions, a financial sector model which could be integrated with the real side model had to be designed to capture the combined effects of these measures.

In the present thesis, efforts are made in this direction. To our knowledge, ours is the first study of its kind for India incorporating money and other financial assets in a CGE framework, looking at the interaction of financial and real sectors with a detailed disaggregation of financial institutions and financial assets.

From this analysis (as we will see in detail in chapter 5) following insights have been gained:

1. Changes in the relative returns or costs of the various financial assets or liabilities (and, consequently, the interest receipts and payments) do affect the levels of and the distribution of income among the various economic agents and their saving and do lead to substitution processes which influence the direction and intensity of the impacts of shocks. These effects become dominant and have substantial influence in the liberalized scenario, particularly, when higher interest response elasticities are assumed in demand and supply functions for various assets. The distributional shifts in income due to interest receipts and payments result in outcomes which can not be explained by conventional reasoning based on partial equilibrium analysis or even the CGE models which have only very aggregative treatment of the financial sector.
2. A reduction in the rate of interest on borrowing from the financial institutions (for example, due to decline in CRR and hence increase in supply of credit) not only increases the investment by the private corporate sector, thereby setting the economy on an expansionary path but also increases the saving of the private corporate sector by reducing the interest payment component of its current account expenditure. The increase in the availability of internal funds (as

a result of higher saving), can reduce the dependence of the private corporate sector on borrowed funds. The opposite situation can appear in case of an increase in the rate of interest on borrowing. In this case, the private corporate would borrow more so as to meet the increased cost of credit. Therefore, our analysis points out that the frequently discussed problem of the burden of interest payments on the public sector deficit (borrowing requirement) is also relevant for the private corporate sector deficit (borrowing requirement).

3. A related outcome is that in the event of reduction in the dependence on borrowed funds, excess reserves of the banking sector might increase and the economy can have an expansionary situation but also excess liquidity with the banking sector (as well as with other financial institutions).

4. The redistribution of income among economic agents because of change in interest income can result in an asymmetric impact on interest rates of various assets.

5. Given the easy availability of credit for the public sector from the non-bank sources and almost fixed nature of public sector borrowing requirement, a reduction in SLR only results in higher borrowing by the public sector from the other financial institutions. Therefore, contrary to expectation, the overall supply of credit to the private sector declines which increases the average cost of credit to the private sector.

1.2 Chapter Scheme

The structure of the thesis is as follows:

The next chapter i.e. chapter 2 on concepts in the CGE Models and a select review of literature is divided into two sections. In section 2.1 we have discussed the concepts involved in General Equilibrium (GE), CGE and Financial CGE models. The various micro and macro issues, limitations and the various theoretical and empirical problems encountered while integrating the financial sector block with the real sector block and the techniques used in the numerical specification of a GE model (for example, econometric techniques, Social

Accounting Matrix (SAM) approach, calibration, etc.) have also been highlighted in this part. Section 2.2 provides the select review of the literature. The review is not exhaustive. In recent years, several review articles¹ on CGE models have been published. Since most of these survey articles deal with the real sector specifications, we have not gone into an elaborate discussion of these aspects. As the incorporation of money, the other financial assets and the financial intermediaries in the CGE framework is of a very recent origin, in these survey articles relatively little attention has been given to the aspects of modelling of money and other assets and the financial intermediaries. Since the emphasis of our thesis is on the financial sector specification, in our survey of literature, we have emphasised these issues.

Chapter 3 is devoted to the construction of Financial Social Accounting Matrix (FSAM) for the year 1983-84. To our knowledge, ours is the first attempt, for India, to integrate the Flow of Funds (FOF) Accounts published by the Reserve Bank of India (RBI) with the real Social Accounting Matrix (SAM). The FSAM provides the base year data for the CGE model constructed by us. One of the important differentiating features of our FSAM, from the existing SAMs for India, is the integration of the Flow of Funds (FOF) with the real account SAM. Our FSAM has accounts not only for different financial intermediaries but also for different financial assets. Apart from disaggregation of the capital account, our FSAM has greater degree of classification of institutions (or economic agents) and, therefore, we are able to see the impact of any policy change on intra-institutional transfers. Such disaggregation would allow us to study the changes in income distribution due to changes in financial sector.

With the aim to assess the effect on output, investment, employment income, consumption, personal asset holdings, etc., of money supply changes through policy adjustments, viz, fiscal policy and monetary policy, we have tried

1

For example, Bergman (1990), Chitre and Naik (1989), Devarajan, Lewis, Robinson (1986), Ginsburgh and Wealbroeck (1984), Gunning and Keyzer (1995), de Melo (1988), Piggott and Whalley (1985), Robinson (1989), Shoven and Whalley (1984), Taylor (1990), etc.

to model the Indian economy in the CGE framework. Chapter 4 outlines the Financial CGE model used for the empirical work in this thesis. This chapter outlines the theory used for the construction of the model. Our model draws heavily on the work of Adelman and Robinson (1978) and Bourguignon, Branson and de Melo (1988; also referred to as BBM model) and OECD projects on Adjustment and Equity in Developing Countries (1991, 1992). The model is specified in three parts. The first part deals with the specification of relationship of variables in the real sector while the second part with those in the financial sector. The third part specifies the expectations and dynamics. The model integrates a GE micro-model describing the real side of the economy with a macro model (determining the macro-aggregates such as price level, interest rates, etc.) incorporating the behaviour of the various institutions/economic agents relating to changes in their portfolio of asset holdings - in Tobin's (1969) tradition. However, we have also tried to incorporate various structural features of the Indian economy (such as the dualistic nature of the Indian economy with existence of market clearing prices in the agricultural sector and fixed prices (demand determined output) in the non-agricultural sector, existence of the captive market for government bonds, administered structure of interest rates during the period under consideration, existence of various types of financial intermediaries and financial assets, etc.). The specification of the model is flexible enough to take into account the changes in the structural features of the economy due to the liberalization policies followed by the government (such as deregulation of interest rates) over the past few years. Though a dynamic block has also been appended to the model, due to time limitation, the dynamic specification of the model has been left out while solving the model in this thesis. Full impact of some of the policy changes on the economy can only be seen in the medium run. Therefore, restricting the solution of the model to only one year does not provide the full impact of various policy changes.

Numerical specification, base year solution and policy experimentations are dealt with in chapter 5. This chapter has been divided into four sections. In section 5.1 we describe the calibration procedure. Values of parameters are

obtained by calibrating the model and treating the data available from the FSAM, for 1983-84, as the base year solution i.e. bench-mark solution. Various share, substitution and elasticity parameters are calibrated in such a way, from this benchmark equilibrium, that the base year model values are replicated. Policy experiments which we have conducted, treating the model as the policy laboratory, the results of which are presented in section 5.2 and section 5.3, include simulation and sensitivity experiments. The first set of simulations studies the impacts of changes in monetary and credit policy changes as well as financial sector reforms such as the reduction in SLR and CRR on the economy. The second set of simulations explores the effect of different measures of budgetary policy, all aiming at achieving a reduction in the public sector borrowing requirement. It consists of reduction in public consumption expenditure, investment expenditure and reduction in indirect taxes on production. Sensitivity analysis is conducted for examining the impact of plausible variations in the parameter values. Section 5.4 summarizes and highlights the main findings of our study.

The insights gained regarding the working of the economy and the policy implications emerging out of these insights, besides the other contributions of the study are highlighted in chapter 6. This chapter also points out the limitations of this study and by doing so it throws light on the direction in which further research can be carried out in a financial general equilibrium framework.

Chapter 2

CONCEPTS IN GENERAL EQUILIBRIUM ANALYSIS AND A SELECT REVIEW OF LITERATURE

2.1 Concepts in General Equilibrium Analysis

2.1.1 Definition of CGE Model

General Equilibrium (GE) models involve simultaneous equilibrium of demands and supplies of all goods, services and resources in the economy. General equilibrium theory takes into account not only the interactions among markets but also the functioning of the individual markets. As pointed out by Gunning and Keyzer (1995), the response of the model to imposed/ exogenous shocks satisfies the conditions of optimality of agents' behaviour, technical feasibility and resource constraints.

Computable General Equilibrium (CGE) models, on the other hand, are the numerical specification of GE models for policy evaluation. According to Robinson (1989), *"A CGE model works by simulating the interaction of various economic actors across markets. Optimizing behaviour of individual actors is assumed and is incorporated in equations describing their behaviour, which essentially describes various first-order conditions for profit and utility maximization. The CGE framework requires a complete specification of both the demand and supply sides of all markets, including all the nominal magnitudes in the circular flow. The models are thus structuralists in spirit, capturing market mechanism explicitly"*.

In order to apply general equilibrium theory for policy evaluation, CGE models divert from the standard Walrasian general equilibrium theory in various respects and, therefore, the class of CGE models includes several models

(approaches) without any precise definition. Although there is no precise definition of a CGE model, Lars Bergman (1990) has pointed out a set of common and distinct features of the class of numerical multi-sectoral economic models usually referred to as "CGE models". Briefly, these features are as follows:

- (1) Both quantities and relative prices are endogenously determined within these models and thus they differ sharply from input-output and programming models used for development planning purposes. (However, structuralist CGE models do take rigidities in price and quantity adjustment into account).
- (2) CGE models are generally focused on the real side of the economy, although financial instruments and financial markets are included in some models.
- (3) Most CGE models are aimed at elucidating equilibrium resource allocation patterns rather than business cycle phenomena, and they concentrate on the mechanisms by which policy measures affect the economy rather than the exact outcome of a certain government intervention. Most CGE models are intended for quantitative comparative statics analyses of the impact of the changes in exogenous variables on the modelled economy.
- (4) Though the design of CGE models typically has a strong flavour of Walrasian general equilibrium theory, CGE models generally provide a very aggregated representation of the economy.

In numerical specification of the GE models (i.e. using GE analysis for applied policy work), usually, the following steps are involved¹.

- (1) One has to specify, in the applied work, the set of commodities for which markets exist and are assumed to be clear (in the present and the future) and the types of economic agents. In theory this is not required as one only has to specify the index sets.
- (2) In theory, consumer and input demand functions are derived from explicit optimization problems of the consumers and producers. However, in empirical

¹

For a detailed discussion of these points see Gunning and Keyzer (1995).

work, price dependant demand functions are specified by applying duality theory. This is because it is difficult in econometrics to estimate directly the parameters of the maximization problem (for example the parameters of the utility function). Only for simple functional forms like Cobb Douglas and CES, can the analytical form of the demand function be readily obtained.

(3) As disaggregation of commodities and agents is limited by the cost of collecting data, parameter estimation and monitoring of simulation results, all applied general equilibrium models suffer from problems involved in the representative agent construction: though aggregation of individual net trades to determine the relationships at the macro level does provide analytically convenient tools in which the impact of any exogenous variable can be neatly traced, it does not preserve the property of heterogeneity in the behaviour of individuals that arises from the differences in an individual's level of income, wealth, skill, tastes etc. These differences make aggregates behave differently than individuals.

(4) In an applied model, the base year data set as available from SAM is assumed to be an equilibrium data set. Therefore, optimizing behaviour, budget balance (all expenses have to be covered) and clearing of markets is assumed to exist. Thus, the problem of existence of equilibrium does not arise in empirical work. In theory, on the other hand, equilibrium is only a possibility, though often, desirable state.

(5) In static applications, a model solution is obtained for a single period and in other applications, known as recursive dynamic simulation, a time sequence of single period equilibria is computed for periods $t= 1,2,\dots$. Periods are related through updating of some exogenous variables like the capital stock, population and labour supply. Recursive dynamic analysis, as compared to static analysis, has the important advantage that the simulation results can be compared with time series evidence. This contrasts with the static use where all available data have been used to construct the SAM for a particular year. However, recursive dynamics does not satisfy any inter-temporal optimality criterion.

2.1.2 Types of Computable General Equilibrium Models

As far as theoretical models are concerned, general equilibrium models are broadly classified as Walrasian general equilibrium models and non-Walrasian general equilibrium models.

By definition, in Walrasian equilibrium, all markets clear at each point of time, i.e. total demand equals total supply for each good². Two important characteristics of Walrasian models are that:

- (1) all private agents receive price signals and
- (2) they make rational quantity decisions with respect to price signals.

Though agents make rational decisions regarding quantities they do not make any use of the quantity signals sent to the market. Also, no agent actually sets prices, the determination of which is left to the "invisible hand" or to the implicit Walrasian auctioneer.

On the other hand, non-Walrasian theory builds a consistent theory of the functioning of decentralized economies when market clearing is not axiomatically assumed. As a result, rationing may appear. Therefore, quantity signals should be introduced with price signals. As defined by Benassy (1990), non-Walrasian equilibria, also often called equilibria with rationing, are a wide class of equilibrium concepts that generalize the traditional notion of Walrasian equilibrium by allowing markets not to clear (i.e. aggregate demand to differ from aggregate supply) and, therefore, quantity rationing to be experienced.

In such a framework, more general price formation schemes can be considered, ranging from full rigidity to full flexibility, with intermediate forms of imperfect competition. Moreover, different price determination schemes can be specified for different markets. Also, the concept of effective demand can be introduced in this framework.

Non-Walrasian theory is relevant not only for planned economies where

2

No rationing is experienced by any agent since demand and supply match in all markets and no trade takes place at disequilibrium prices.

prices are fixed for some length of time by a central planning authority, but is also quite relevant for free market economies because:

- (1) Except for a very limited number of markets, prices are determined by the interaction of decentralized agents.
- (2) Quite a few studies on industrial economies, labour economics and financial markets point out the possibility of non-market-clearing situations. Therefore, we need a theory that can accommodate, in a general equilibrium setting, the possibility of these non-market-clearing situations.
- (3) Also, the real world experience regarding massive unemployment or the idleness of productive capacity has to be reconciled with a general market clearing view of the world.

Usually, non-Walrasian general equilibrium models have used the framework of monetary economies where money plays its three traditional roles, viz., the unit of account, medium of exchange and store of value. However, equilibria with rationing can be modelled in non monetary economies as well.

As far as applied models are concerned, attempts can be distinguished not only on the basis of theoretical concepts of general equilibrium used in them (Walrasian and non-Walrasian general equilibrium) but also on the basis of the methodology of solution adopted in them. Using various criteria, Bergman (1990) has classified general equilibrium models into four approaches as follows:

(1) Multi-Sectoral Growth Models

These can be further classified into the following two categories:

(1a) Johansen's multi-sectoral growth (MSG) model (1960)

The origin³ of computable general equilibrium model can be traced back to Johansen's MSG model (1960) of a closed economy. The study analyses economic growth in Norway and throws light on some sectoral aspects of economic growth, i.e. phenomena such as the sectoral allocation of labour and capital, changes in sectoral terms of trade, etc. To make the model more realistic

³

For the details of the development of CGE modelling see Bergman (1990).

and useful for forecasting, the model formulation has diverted away from the standard Walrasian general equilibrium framework and therefore "*was not fully consistent with Walrasian general equilibrium theory*". This can be seen from the existence of different wage rates in various sectors inspite of only one kind of labour being identified in the model.

The specification of this MSG model was entirely non-stochastic/deterministic i.e. the structural relations implied by the model were simply assumed to be correct without providing any statistical validation of these relations. Most of the parameters of the model were estimated on the basis of a single observation of the allocation of resources across sectors covered by the model. For obtaining a numerical solution of the model, Johansen specified log-linear approximations of simultaneous equations and then solved the resulting linear equations for changes in the endogenous variables as functions of changes in the exogenous variables⁴. Thus, the solution provides only the relative rates of change of the endogenous variables from an initial, and known allocation of resources.

The ORANI model developed within the Australian IMPACT project is an MSG type model in the tradition of Johansen's MSG model. The model that is used as a pedagogical device is formulated for an open economy at a very disaggregated level.

(1b) Computable general equilibrium models of developing countries

With an emphasis on income distribution in developing countries, the computable general equilibrium models were initiated in the early 1970's following Johansen's MSG model. The modellers have diverted from the standard Walrasian general equilibrium theory and extended the models in a variety of directions in order to capture "structuralist" features of developing countries. Therefore, one finds in these models the different mixes of structuralist and neo-classical models. The first major study for developing

⁴

Thus he could compute the equilibrium prices and quantities by standard matrix inversion.

countries, in this tradition, is by Adelman and Robinson (1978). This study has both Walrasian and 'structuralist' features. The debate regarding the macroeconomic properties of CGE models also started with this distribution focussed model of Korea.

At this point it would be worthwhile to know the differentiating features of the various types of structuralist models, in the framework of CGE models, available in the literature.

Within the framework of CGE models, Robinson (1989) has identified three kinds of structuralist models as follows:

(a) *Elasticity structuralist*

Under this approach modellers stay within the theoretical structure of the neo-classical model but specify limited substitution elasticities in a variety of important relationships. Dervis, de Melo and Robinson (1982) describe in detail the features of these types of model.

(b) *Micro structuralist*

Though modellers following this approach hold the neo-classical view on resource allocation, they do not believe in the assumption of perfect markets. Imperfections/ incompleteness in markets, according to them, may arise either from institutional sources or from policy choices. Because of these imperfections, prices do not fully respond to the market forces and substitution possibilities are more limited, especially in foreign trade and production.

Although some relative prices are fixed in a micro structuralist CGE model, the system constraint equations are still a part of the model. Equilibrium is still well defined. However, since prices no longer serve as the equilibrating variables for these markets, another mechanism such as quantity rationing is specified. Also, as prices no longer perform their proper signalling function, it becomes necessary to reconsider the behavioural equations of the various actors. The constrained optimization problem has to be reformulated taking account of the above considerations. Such considerations impose new theoretical and expositional burdens on the modeller.

For example, the justification for fixing prices must come from theoretical considerations outside the Walrasian paradigm. Fixed nominal wages or fixed nominal exchange rates require justification in macro theory and must, in a CGE model, be viewed as fixed relative to the choice of the numeraire. As the numeraire defines the price index, the definition of the index matters in these models.

The use of the aggregate price index as numeraire, does not pose any theoretical problems concerning the functioning of the CGE model. It is now a less well behaved general equilibrium model with some fixed relative prices. However, one now has to provide a rationale for the choice of relative prices to be treated fixed. Also in these models, the clear dichotomy between the real and the nominal side is no longer sustainable.

(c) Macro-structuralist Models⁵

Though neo-classical modellers have tried to model the structuralist features of the economy they stick to the representative agent construct in which the representative agent optimizes its objective function. Thus neo-classical analysis is based on neat theoretical underpinnings in which impact of any policy change is clearly traceable. However, these models suffer from the problem which the representative agent construct poses: society as a whole might not behave in the same way as an individual. Individual behaviour is restricted by *ceteris paribus*, while for the society as a whole the situation is one of *mutatis mutandis*. In the representative agent construct all individuals are supposed to be homogeneous with homothetic preferences. Thus neo-classical models overlook the distributional aspects or even when they introduce them, it is secondary to them.

On the other hand, structuralist perspective is broader than the most neo-classical construct. The structuralist hold the view that the representative agent construct is not sufficient to understand the behaviour of groups or macro-economic relations. Institutions and various power/pressure groups such as state,

⁵

For details of these models see Robinson (1989) and Taylor (1990)

organized labour etc. have important influence on prices, quantities and hence the working of the economy. For them markets are incomplete and due to political and social conflict, there are rigidities in the structure of developing economies. Therefore, they strongly emphasize the incorporation of the structuralist characteristics/factors of the economy such as the distribution of income and wealth, ownership of means of production, degree of concentration in various markets, level and development of various institutions, type and degree of specialization in foreign trade etc. By doing so they come closer to economic reality than the neo-classicals who abstract from reality by following the representative agent construct for macro-economic relations. In these models the influence of economically powerful agents such as state organizations, organized labour etc. on prices and quantities is emphasized.

In neo-classical models, as in neo-classical structuralist models, the macro problem is basically one of achieving the proper composition or balance among aggregates. Neo-classical models are often set up in real terms, for them it is the relative price which is important. In these models, disturbances in nominal macro balance though affect the sectoral composition of demand and, hence production, they have little or no effect on aggregate output. On the other hand, structuralist macro models explicitly include prices and income flows in nominal or money terms. They focus on questions of achieving equilibrium among various macro aggregates (briefly referred in literature as the macro "closure" of economy wide models⁶) such as saving and investment, exports and imports and government expenditure and revenue. In these models, changes in the composition of the nominal macro aggregate not only affects the level of aggregate output and employment, but their sectoral structure⁷ as well. Two equilibrating mechanisms

6

See de Janvry and Sadoulet (1985) for a survey of macro structuralist CGE models of six countries : India, Peru, Mexico, Egypt Korea, and Srilanka

7

Thus, in contrast to neo-classical models, structuralist macro models postulate strong links between the real and macro sides of the models.

commonly specified in these models are as follows:

(i) Keynesian multiplier mechanism: in this specification, changes in product market equilibrium are brought about through changes in output in response to changes in autonomous expenditures.

(ii) Kaldorian distributional mechanism: in this specification, product market equilibrium, at full employment level of income or output is maintained/brought about through changes in the distribution of income, in response to changes in autonomous expenditure.

The functioning of financial intermediaries strongly influences the macro system in these models. Thus, portfolio shifts and changes in the rates of returns on assets are some of the important channels through which real and financial sides of the economy are interlinked.

Foreign exchange is often modelled as a binding constraint, as import substituting industrialization which requires intermediate and capital good is often assumed in these models.

Structuralist see strong complementarities between the public investment and the private investment and instead of 'crowded out' it may be 'crowded in' by public investment.

Though some degree of responsiveness to relative price/wage/interest shifts is incorporated by the structuralists, it is not done in an optimizing framework which is the hallmark of the neo- classical approach. They include the demand switch in parsimonious fashion and not on the basis of utility based optimization.

Structuralists, instead focus attention on macro-economic causality⁸. Macro-economic causality, often in these models runs from demand injection such as investment, exports and fiscal demand (taken as predetermined variables)

8

The word 'causality' is used in the structuralist literature to describe the relationship between the selected exogenous variables and endogenous variables in a model. The selection of exogenous variables in a system of equations, based on macro- economic identities, also determines the closure for the system. Thus, closure and causality determines the plausible signs of "effects" and thus become crucial in the absence of neat and clean theoretical foundations.

to income distribution, import and output flows which generate supplies under conditions of passive money supply. They treat the extended functional distribution and at least some sector's outputs as endogenous in their macro models subject to rules such as mark-up and fix-price/flex price distinctions regarding price adjustment. There is no reason that the redistribution of income and wealth will ensure macroeconomic equilibrium with full employment of labour or installed capacity. Neo-classicals, by contrast, typically presuppose full labour employment and capacity utilization under "active" money supply that fixes the overall price level. These differences in the maintained hypothesis result in different outcomes for the economy. Higher investment demand in the structuralist scenario will result in higher output. Income distribution, in these models, shifts to generate higher saving so that saving and investment are brought in to equilibrium. On the other hand, in neo-classical scenario, due to an assumption of full employment output, an upward jump in the investment is not possible.

Describing the problems related to structuralist macro models, Robinson pointed out that the Walrasian model provides an uneasy framework for macro models. As yet, there is no acceptable reconciliation of different underlying theories: the mixes of CGE and macro models all suffer from ad hoc specifications of economic relations. Though the macro-structuralist models place the greatest strain on the existing theory, micro-structuralist models are also not without theoretical problems. Often, structuralist rigidities are imposed on the models from outside and cannot be justified within the structure of these models.

Criticizing the macro-structuralist models, Robinson further points out that some of the structural rigidities in these models are often justified on the basis of short-run considerations, but are applied to analyze the impact of shocks over the medium run.

(2) The Harberger- Scarf- Shoven- Whalley (H.S.S.W.) Approach

Another approach, as identified in the survey article of Bergman (1990),

to CGE modelling is due to the contributions of Arnold Harberger (work on the incidence of taxation within the framework of a numerical two sector model, in the early 1960's), Herbert Scarf (computer algorithm for numerical determination of the equilibrium of a Walrasian system, 1967); and John Shoven and John Whalley (proof of the existence of and the computational procedure for finding, a general equilibrium with taxes, 1973). This approach, which to a large extent can be regarded as the numerical counterpart of Walrasian general equilibrium model, aims at evaluating policy changes in terms of both the efficiency and the income distribution effects. These effects are usually expressed in terms of one dimensional welfare measures such as Hicksian compensating or equivalent variations. Thus, these models have their roots in applied welfare economics. On the other hand, models in the MSG tradition, to a large extent, originate from the literature on economic planning and input-output analysis. Models in H.S.S.W. tradition are solved directly for the levels of endogenous variables. The development of fixed point method of computation of equilibrium by Scarf made possible the incorporation of more flexible forms of production and utility functions in the applied general equilibrium models.

The typical modelling strategy in most of these CGE approaches, in the tradition of MSG model and H.S.S.W. model, is to compile a SAM, carry out simple multiplier analyses and, finally, construct a CGE model aimed at identifying and measuring possible changes in the entries of the SAM when conditions exogenous to the economy change.

For the purpose of numerical specification of the models, SAMs are constructed. A SAM is a simple and systematic way of representing the fundamental law of economics, that is, for every income there is a corresponding outlay or expenditure (more about the structure of SAM in the next chapter).

SAM serves as a data base for the model. Simulation and sensitivity analysis is conducted on this data base.

Calibration procedure is used to select the parameter values of the utility and production functions (for example, expenditure shares, rate of time

preferences, elasticities of substitution). In the calibration approach the economy under consideration is assumed to be in equilibrium in some "benchmark" time period. The parameters of the model are chosen such that the model can reproduce the data set for the benchmark year as an equilibrium solution. The benchmark equilibrium is constructed using a SAM. The parameter values generated in this way are used to achieve the alternative equilibrium associated with any changed policy regime. The new equilibrium is known as a "counterfactual" or "policy replacement" equilibrium. Policy appraisal then proceeds on the basis of pair wise comparisons of counterfactual and benchmark equilibria.

This procedure is based on the assumption that the benchmark data represents an equilibrium for the economy under investigation. This deterministic approach is necessitated by the large size of models generally considered in computable general equilibrium studies. In such studies, econometric methods cannot be used with ease.

This deterministic approach amounts to setting all stochastic disturbance terms identically equal to zero and solving for the vector of m unknown parameters on the basis of single period observation of the values of the endogenous and exogenous variables. However, to the extent that the model has more unknown parameters (m) than the number of independent equations (n), extraneous information is needed in order to determine $m-n$ of the unknown parameters. This procedure implies the extremely strong assumption that the observed values of the endogenous variables are determined only by the factors specifically included in the model. In this procedure, no measure of the accuracy of the model and its prediction is obtained. Also, simple functional forms with a small number of parameters such as CES or Cobb Douglas are used to represent the preferences and technology in order to keep the number of parameters to be estimated sufficiently low. This implies that very restrictive assumptions about the underlying preferences and technological constraints have to be accepted.

(3) Econometric approaches to computable general equilibrium modelling

To avoid these problems econometric approaches to CGE have been suggested. The first example of this type is due to Hudson and Jorgenson (1975). Subsequent work is due to D.W. Jorgenson. In these approaches sub-models of production and consumption are specified stochastically. For example, in Hudson and Jorgenson, the nine sector production model was linked to the macro econometric model. *"However, the Hudson- Jorgenson model was not a complete general equilibrium model. For instance, there was no endogenous mechanism ensuring that the aggregated demand for capital services by the nine production sectors at the given prices did not exceed the supply of capital services determined within the macro- econometric model, and the same applies to the demand for labour services."* (Bergman (1990).

There are significant difficulties associated with the full integration of econometrically estimated production and consumption models within a consistent general equilibrium framework. These may be enumerated as follows:

- (i) Due to the lack of time series data, the large dimensionality of any reasonably disaggregated model causes serious degree of freedom problems, especially if restrictive assumptions about the structure of preferences and technologies are to be avoided.
- (ii) The simultaneous estimation of a general equilibrium model requires sophisticated econometric techniques.
- (iii) Full system econometric estimation of parameters is usually impossible because there are identification problems with the number of endogenous variables being very large. Though one could attempt to instrumentalize at least some of these endogenous variables, this is rarely done.

(4) Activity analysis approaches to computable general equilibrium modelling (AGE)

Another approach to the CGE model, basically originating from the critique of linear programming type of planning model, is "activity analysis

general equilibrium" (AGE). The main contributions in AGE are due to Victor Ginsburgh and Jean Waelbroeck (1981; 1984). They incorporated additional restrictions to the linear programme on the basis of economic theory rather than on the basis of ad hoc assumptions. For example, in an AGE model, the assumption about constant marginal utility of consumption implied by the linear utility function is given up and substituted by a conventional, but piecewise linearized, concave utility function.

2.1.3 Major Weaknesses of the CGE Models

Four major weaknesses and challenges of CGE models emerge out of the existing literature.

- (1) Key parameter values, such as elasticities, play a crucial role in all model calculations. However, literature on the estimates of the various elasticities involved in various CGE models is limited and even the available elasticity estimates in many areas differ in both size and sign. For a number of issues in which applied modellers are interested, no relevant elasticity estimates exist. Therefore, the choice of elasticity parameters sometimes becomes arbitrary and thus makes results more prone to criticism.
- (2) Problems are faced in model pre-selection, i.e. the need to adopt key assumptions underlying the particular applied model to be used before any model calculations can begin. Such assumptions are rarely empirically verified and statistically validated.

For example, as pointed by Lewis (1992), in a closed economy with no government sector, to get the saving - investment equality, one can drop either of the following four conditions:

- (i) full employment,
- (ii) independent investment function,
- (iii) independent consumption function, and

(iv) equality of real wage to marginal product of labour.

In the absence of enough empirical verification of the models, by dropping either of these conditions, the closure choice can vary depending on the focus of analysis, or one's perception of the institutional or structural features of the economy. As the complexity of the model increases, the number of assumptions which have to be made also increases. The closure rule⁹ has served as a tool to incorporate macro-economic mechanisms into general equilibrium models. Macro-economic equations are incorporated in these models by introducing for each new macro-economic variable a new equilibrating constraint. These need not necessarily relate to market clearing mechanism. This flexibility makes it possible to introduce many variables which are central to policy discussions, but it is obtained at the expense of theoretical rigour.

(3) Even the representation of the policies to be analyzed increases the arbitrariness of the model and influences conclusions.

(4) Most of the applied general equilibrium models are not statistically validated. In these empirical models, with greater economic complexities, concerns over the economic structure dominate concerns over the statistical structure. Mostly, parameter values are obtained by deterministic calibration process (often the data for one year) rather than econometric estimation and there is no statistical test of the model specification. Thus, equilibrium features in the data to which calibration is applied are emphasized.

2.1.4 Integration of Money in General Equilibrium Framework

2.1.4.1 Theoretical Issues

It is generally accepted that money has no role to play in a Walrasian

⁹

further details on closure rule are available from section 2.2 under the heading model closure.

system. The Walrasian system consists of two parts. The first part consists of the real side of the economy and describes the demand and supply equations and equilibrium conditions for commodities and services. The numeraire price and quantities can be determined from this specification. In the model, all exchange and production decisions are taken prior to the commencement of trade. The traders know the rate of exchange between all commodities so all problems associated with ordinary barter are avoided. In such an economy, it is therefore, difficult to justify a role for money. It is not clear whether even a unit of account is required in such a world. Money may always be added without altering any of the barter results. In the monetary part of the system, money is introduced by appending an equation of exchange which simply determines the absolute level of prices. So relative prices and quantities bought and sold are determined in the real sector while absolute prices are determined in the monetary sector. Therefore, in this system, the real part is invariant to changes in the quantity of money.

However, history has shown us that exchange operations have never been costless. The cost of such operations was lowered as money evolved. Lower costs of exchange operations permit markets to expand and increase the opportunity for exchange. Thus, money has affected the demand and supply functions for commodities by reducing time in trading, adding convenience and security and allowing greater specialization. With the changes in the demand and supply functions, the equilibrium values of relative prices and quantities produced, bought and sold must change too. Besides this historical observation, there are also some theoretical and empirical studies which point out the non-neutrality of money in the short run as well as in the long run. [for a brief survey of such studies, see Chitre and Naik (1989)].

Granted the existence of money and the monetization of the economy, it has been argued that the change in the actual size of the quantity of money does not affect the real economy in the long run. Extending the system simply by appending an equation of exchange to describe a monetized economy is meaningless. Extending the system in this way, the Walrasian system does not

fully reflect all the basic functions of money. As we all know that money serves as a standard of value (unit of account), as means of payment and as a store of value. Specification of money prices in the Walrasian system takes into account only the first function of money, i.e. money acts as only an unit of account.

As regards the second function, which is the most important function of money and which distinguishes money from other goods and assets, neoclassicists are not explicit about the process of exchange. As far as the third function of money is concerned, Say's law rules out, by assumption, the possibility that sales proceeds are used to increase cash holdings, or that cash holdings are utilised to finance purchases. However, the addition of the exchange equation implies existence of money and cash. Thus, there is internal inconsistency in the Walrasian system. Also, the system does not explain how individuals obtain the cash and why they hold it. The system is unable to explain the economic mechanism through which changes in the quantity of money cause the price level to change, and its stability around the price level determined by the equation of exchange.

In most of the Walrasian general equilibrium models, utility was assumed to depend only on quantities consumed and worked. Money was introduced through certain separate and ad hoc considerations about the determinants of the household's demand for money for purposes of transactions and unforeseen future contingencies. A common argument for excluding money from the utility function was that money has no direct utility since its utility is derived from the commodities purchased. Another argument is concerned with a possible circularity in the theory. It has been pointed out that the utility of money depends upon the prices of commodities. Prices of commodities, in turn, determined by a system whereby the utility of money belongs to the nominal value of commodities, i.e. prices. It was thus impossible to ascribe utility to money. This argument, however, has a logical flaw. If utility is attached to money, it must be the real value of money, real cash balances that give utility. Moreover, money in real terms is useful not only because it can be exchanged for useful commodities, but because it facilitates the process of transactions, bridges

gap between payments and receipts, makes unforeseen purchases/ payments possible and so forth. The latter kinds of usefulness justify the incorporation of money (real cash balances) into the utility function.

Patinkin criticized the Walrasian system for its internal inconsistencies and over-determinedness. He was also skeptical of the dichotomy in the classical system. He rehabilitated the basic feature of the classical monetary theory and particularly the invariance of the real equilibrium of the economy (relative prices and the rate of interest) with respect to changes in the quantity of money by putting money (real balances) in the utility function and making the demand and supply functions dependent on real balances as well as relative prices. In Patinkin's system, the real balance effect is an essential element of the mechanism which work to produce equilibrium in the money market. Suppose, for example, that for some reason prices fall below their equilibrium level - this will increase the real wealth in the form of the cash balances - and lead economic agents to spend more money - and that in turn will drive prices back towards equilibrium.

Patinkin's approach has been a subject of criticism by many economists.

Hahn (1965), criticizing Patinkin's system, posed two basic problems. First, does the system with money has an equilibrium. Second, does this equilibrium has positive value for money. He indicated towards a possibility in which inspite of existence of positive nominal balances in the portfolio of individuals, the real balances may be zero because the price of commodities in terms of money may be infinite. Thus there is a monetary equilibrium when money is worthless.

Some economists have even criticized the approach of introducing money via utility function. It has been pointed out that the transaction role of money is not well approximated by simply putting money into the utility function. This is because the utility function and the marginal rate of substitution between real money balances and other commodities remains the same whether or not the individual decides to trade.

Clower (1967) pointed out that monetary exchange represents the asymmetric relation of exchange among commodities. In a monetary economy,

money buys goods, goods buy money, but goods do not buy goods. The asymmetric relation among commodities can not be captured by the standard budget constraint used by Patinkin, which is simply the accounting identity stating that the total value of all purchases must equal the total value of all sales. To capture the above mentioned asymmetry, Clower proposed the now well known "Cash-In-Advance" (C-I-A) constraint. This constraint makes it possible for money to perform its function as a medium of exchange. The constraint is a simple rule that no transaction can take place unless the money needed for the transaction is held for some time in advance.

However, this constraint imposed additional difficulties. Ostroy and Starr (1990) pointed out that rather than being a relation among commodities, exchange is a relation among individuals. To understand the function of an asymmetric relation among commodities involving a medium of exchange, it is essential to incorporate this relation among individuals.

Also, as an additional constraint, it cuts down on the exchange opportunities available with the standard budget constraint [Gale, 1984; Ostroy, 1990]. This implies that the equilibrium of such an economy is Pareto inferior to some other reallocation of resources that obeys only the aggregate constraints on resources but not necessarily any monetary exchange constraints. Thus, there is a need for a more comprehensive approach from which a conclusion resembling the cash-in-advance constraint as a solution to the problem of economizing on transaction costs can be derived.

Although the addition of C-I-A constraint in the model allows money to perform its function as a medium of exchange it does not provide an explanation of why the common medium of exchange (with lower costs of exchange) that has already been adopted came into the existence.

Another problem which arises due to the use of C-I-A constraint is that in the absence of the costs of transferring wealth to and from assets providing higher yields, money would only be held for infinitesimal time intervals and would be of no economic significance. A simple solution suggested to this problem is to assume that money must be held for a fixed period of time before

a transaction takes place. However, this does not allow economic agents to economize on their holding of cash balances, i.e. reducing the average time money is held before it is spent - increasing the velocity of money. Also, C-I-A constraint places a strict upper limit on purchase during the period. *"Thus, the demand for money will tend to be less sensitive to interest rate changes with the Cash-in-Advance specification than with one that ties consumption and money holding together less rigidly."*(McCallum and Goodfriend (1989)).

Criticizing the neutrality assumption of Patinkin's system, Hansen (1970) points out that introducing credit market (in the form of government bonds) makes money non-neutral. This happens because of the following reason. In this system one could derive demand functions as homogeneous of degree zero in all money prices, the number of bonds and the quantity of money and as function of the rate of interest. Therefore, an isolated change in the quantity of money, given the number of bonds, *does not* imply that prices in the equilibrium would change in proportion to the quantity of money or that the equilibrium rate of interest would remain unchanged.

Gurley and Shaw (1960) bring back into the analysis, the overall liquidity of the monetary and financial structure and differing liquidity characteristics of different assets, which were excluded by the assumptions made in Patinkin's analysis. They show that money cannot be neutral in a system containing both inside and outside money. Inside money provides a substitute for outside money and thus economize its supplies. Therefore a change in the proportion between inside and outside money brought about by open market operations or some other monetary policy changes will not be neutral in its effect.

Patinkin's analysis assumes perfect interest and price certainty. Shackle (1966) points out that once the "Pandora Box" of expectations and interest and price uncertainty is opened on the world of economic analysis, anything may happen.

However, it has been shown that uncertainty does not by itself necessarily imply a need for holding cash. Models have been presented (Arrow, 1964; Debreu, 1959) in which there is uncertainty about future events but where

markets are so perfect that future disbursement and receipts can be planned and fixed today through contract about forward delivery and payment. With perfect futures markets everywhere there can be no incentive to keep money.

In Arrow-Debreu (A-D) economy goods are defined by their characteristics, location and date of delivery. In this economy:

- (i) Complete set of futures markets exists for all time dated commodities.
- (ii) The existence of contingent commodities (contingent contracts are made which promise delivery of goods at a particular time, and place, in case of realization of certain events) avoids the problem associated with expectations and uncertainty. The full set of A-D contingent contracts requires active markets in a variety of distinct instruments, many more than are generally available and actively traded in actual economies. A partial reduction in the large number of contracts needed can be achieved by the use of Arrow securities (Arrow insurance contracts) which specify a credit to the holder in numeraire on realization of a specified event.
- (iii) State of the nature in A-D economy is the complete specification of everything that might affect the usefulness or availability of commodities to any one, such states being defined in such a way that exactly one must occur.

In this economy, households acquire a portfolio of present goods and contracts for future delivery of its desired consumption plan sufficient to exhaust its lifetime budget constraint.

Firms buy contracts for present and future inputs and sell contracts for present and future outputs to maximize the present discounted value of profits.

In such a setting, there is a single date at which active trade takes place in current goods and futures contracts for future delivery of goods. There is no need for markets to reopen in the future - all desirable trades have already been arranged. But, because of absence of reopening of markets, there is no function for money.

Money has no job to perform here because its job is being done by futures markets. The futures markets allow sales of current output to finance acquisition, and sales of future output to finance current purchases. The equilibrium

allocation is Pareto efficient.

So, we see that the best developed neo-Walrasian model of the economy has no role for money. However, the problem is not unique to money. In any A-D model, there is no role for most of the social institutions that we observe. Models which explain utility and demand for money on the basis of uncertainty [for example Tobin (1958)] assumes explicitly or implicitly that markets are not perfect. Other studies such as Hahn (1965), Radner (1968) also argued that only imperfections of the market can readily explain why individuals and entrepreneurs hold cash.

In order to explain why role for money and other financial assets and financial institution arise and persist, we must relax the assumption of full information, complete markets and zero transaction costs. Hahn (1975) in this context pointed out that informational deficiencies, lacking markets and uncertainty seem intrinsic to the enterprise when we want to study money. Therefore, meaningful introduction of money requires formulation of these processes in the model explicitly.

For the transaction role of money to play a part in the model, as suggested by Hahn (1971), it is vital that trade be sequential. Sequentiality in trade can not be achieved just by time indexing of commodities. There are various sources of "sequentiality".

- (i) Cost of making forward contracts creates a need for markets to reopen over time.
- (ii) In most instances individuals trade with each other for the current period rather than for all future time periods.

The basic idea of a sequence economy as pointed out by Ostroy and Starr (1990) in their survey article is that markets reopen over time. Fulfilment of budget or balancing of budget at each trading date rather than only in the life time (life time budget constraint) is the only single essential revision of the A-D model that creates a role for money.

Differential transaction costs on spot and futures markets (in particular higher costs on futures) are required for markets to reopen over time and

existence of budget constraint at each date. In the presence of sequence of budget constraints in order to make the plans of economic agents (for example the value of consumption at different points of time) consistent with their endowment, futures markets may be used and/or any real assets may be held inter-temporally as a store of value. However, transaction costs and storage costs associated with some of these instruments may be very high. On the other hand, use of fiat money, which is assumed to be transaction costless, results in an allocation closer to Pareto efficient¹⁰. Thus, introduction of money restores allocative efficiency by allowing both fulfilment of the sequential budget constraints and use of only spot goods transactions, without distortions of the lifetime consumption plan.

However, sequential formulation of the economy is not without problems. For example, as pointed out by Hahn (1975), in a sequence economy there is a difficulty arising from the possibility of unbounded actions (for example: borrowing and lending, as well as difficulties with bankruptcy). It can be argued that no one can borrow more than a certain amount at any price. But this has to be modelled as a matter of rational choice.

With a sequential formulation of an economy, one must distinguish between two equilibrium concepts.

- (1) Temporary Equilibrium: i.e. equilibrium at a point of time or short run equilibrium.
- (2) Inter-Temporal Equilibrium: i.e. equilibrium through time or long run equilibrium.

For the formulation of inter-temporal equilibrium models one needs to introduce expectations because complete array of contingent futures markets does not exist and, therefore, plans are influenced by expectations of future prices and states of nature.

10

In this context Niehans (1971, 1989) pointed out that resources are used up in the process of exchange. Transaction costs even reduce the volume of transactions. Hence, there is an overall reduction in the welfare of individuals.

Expectations in these models have been tackled in the following four ways:

(1) Exogenous Expectations: Expectation formation is taken as entirely exogenous to the model. It is assumed that expectations are unit elastic in these exercises. Such a treatment is entirely ad hoc and, hence, unsatisfactory.

(2) Adaptive Expectations: In this type of formulation, expectations are not exogenously given but formed on the basis of present and past observations. However, in such a formulation, agents have no knowledge or do not apply their knowledge of the future structure of the model. Hence, announcement concerning the future values of key variables, such as money supply, are precluded from having any effect on expectations. The adaptive expectation hypothesis is also often referred to as the error learning model.

(3) Rational Expectations: Lucas (1972) started the rational expectation revolution. According to the rational expectation hypothesis the agents form expectations in a rational way. It is assumed that they predict correctly (subject to the information and decision making costs confronted by them), on an average, the equilibrium prices associated with the future states of nature. The individual economic agents correctly perceive the true relationship between the non-price information received by the market participants and the resulting equilibrium market prices.

The hypothesis has become controversial because of the often made assumption of perfect foresight. Radner (1990), pointed out that although it is capable of describing a richer set of institutions and behaviour than in the A-D model, the perfect foresight approach is contrary to the spirit of much of competitive market theory postulate. It requires individual traders to forecast, in some sense, the equilibrium prices that will prevail in the future under all alternative states of the environment. So this approach seems to assume on part of traders a capacity for imagination and computation far beyond what is realistic.

Rational expectation hypothesis reduces the temporary equilibrium structure to what Hahn calls an inessential sequence economy i.e. to say, a

sequence economy which produces results similar to the A-D model- a moneyless world.

Imposing the rational expectation hypothesis has the effect of removing the need for sequential learning. It produces stochastic knowledge of all prices at all dates such that price expectations are on an average correct as each agent knows the model that generate these prices, i.e. employs the relevant economic theory and finally the tatonnement assumption of non-Walrasian theory ensures that the transaction costs are zero.

Another problem which arises from the use of rational expectation hypothesis in inter-temporal general equilibrium model is that the application of infinite time horizon is required. If the time horizon is finite, the exchange value of money is zero after the last period, T. But with rational expectations, agents expect this in period T-1 itself and will not hold money in period T-1. By back-ward induction, we can find that no rational individual will hold money in any time period and the Hahn problem (basic existence problem- i.e. equilibrium of the economy in which price of money is not zero) will still be there. To over-come this problem, in finite horizon models, sometimes, unsatisfactory terminal conditions are put forward in the model. For example, sometimes it is assumed that monetary markets are operated by an authority set up for the common good. This authority is willing to collect money left at the market after terminal trading and disposes it of. This assumption ensures the positive value for money in the current period. However, this assumption makes the total value of purchases to exceed the total value of sales. To avoid this problem, modellers have tried to accommodate value for money in the bid-ask price. The difference between bid-ask price then gives the value of trading services provided by the use of money [see Duffie (1990) for further details of such type of formulation].

(4) Bounded Rationality: To avoid the problems related to the assumption of perfect foresight the concept of bounded rationality has been introduced. Under this approach each agent's expectations are revised in the light of new information about the environment and about current prices. It is usually assumed that the agent's planning horizon is limited to few time periods and/or

their expectation formation follows some simple rules of thumb. Thus, under this approach, the evolution of the economy depends upon the rules or processes of expectation formulation and revision used by the agents. An application of the bounded-rationality concept results in temporary equilibrium.

(5) Asymptotically Rational Expectations: Stein (1982) suggested an alternative assumption to the perfect foresight assumption which he referred to as asymptotically rational expectation. Stein argues that the agents are risk averse and they live in the world of uncertainty. Hence, the crucial variable for supply and demand decisions is not the expected price per se but the expected price adjusted for risk and risk aversion. Under this hypothesis, the economic agents form an estimate of the equilibrium rate of inflation on the basis of current monetary input. Since they are not certain whether the current rate of monetary expansion is permanent or temporary they adjust their anticipated rate of inflation slowly towards the current rate of monetary expansion per capita. In the presence of uncertainty and risk aversion there are unexploited profit opportunities. However, as the economy reaches towards the steady state, uncertainty and risk also gets eliminated and the expected price adjusted for risk converges asymptotically to the expected price.

Most of the existing inter-temporal models [prominent examples are Samuelson(1958) and Wallace (1980)] use money as a store of value. This type of introduction of money provides a role for money as a transfer mechanism between generations but there is no role for money as a medium of exchange. Also, it is not clear whether individuals will hold money when it is return dominated by other assets.

Thus, summarizing the above discussion, we can say that any useful integration of monetary and real sectors requires introduction of the transaction role of money. Only the store of value function is not able to provide a place for money (or positive value for money). As a store of value, money is dominated by other assets with tangible return on them. Transaction role for money cannot be

allowed to play a part in A-D type of economy where perfect futures markets exist for all the commodities and, therefore, trade takes place only at the beginning of the period for all current goods and all future contingent contracts. Hence, a sequential formulation of the economy is required - which assumes that markets are not perfect and, therefore, trade takes place at each point of time. Imperfect futures markets lead to uncertainty and need for formulation of expectations in the model. However, just uncertainty without explicit formulation of incomplete markets does not justify the role for money.

Till now we have dealt with micro-economic or inward looking questions such as need for medium of exchange and existence of equilibrium in a monetary economy. Such questions also arise in case of other financial assets and financial institutions. Existence of money implies that there is some saving, i.e. individuals do not spend all of their income for consumption. Money is just one asset in which individuals can keep their savings. In reality there are many more financial assets - issued by the government and the financial institutions. We have to justify the existence of not only various other financial assets but also various financial institutions as theory of money and financial assets cannot be fruitfully constructed in an institutional vacuum.

Some economists argue that like money, financial activities are also veils and do not affect the real activities in the economy. However, they might obscure the underlying activities from the observers. But there is a group of economists who value the existence of financial markets and financial institutions. For them the availability of certain markets alters the outcome prevailing in their absence. Citing Fisher (1930), Tobin (1989) elaborates this point as follows: each household has an inter-temporal utility function with consumption today and at future times. He also has a production function by which consumption less than endowment at any one date can be transformed into consumption above endowment at another date. In the absence of inter-temporal trade with others, each household has to *"equate its marginal rate of substitution in utility between any two dates with its marginal rate of transformation in production"*

between the same dates". However, introduction of the financial market alters the outcome by enabling individuals to shift purchasing power forward or backward in time. It frees the timing pattern of consumption streams from the corresponding timing pattern of earnings from production. This results in more efficient resource allocation because it is now possible to obtain greater production from given available inputs as well as higher utility from given available consumption.

Economies of scale and specialization in financial transactions enable financial intermediaries to tailor assets and liabilities to the needs and preferences of both lenders and borrowers.

The macro-economic consequences of inside markets and financial intermediaries are generally to provide substitutes for outside assets and thus economize on their supplies.

Thus, the standard rationales underlying financial intermediation include the minimization of information and transaction costs, and the diversification of risks in a world in which assets are imperfectly divisible and both asset-returns and wealth holders' cash-flow positions are imperfectly correlated.

2.1.4.2 Empirical Issues

Besides these existence or micro-economic problems in any formulation of financial CGE model, we also face macro-economic or outward looking questions and problems at the empirical and policy formulation levels.

The foremost question which always arises in any empirical study is what should be included in the definition of money. Should it be just commodity money or fiat money? If the definition of money is equivalent to the concept of fiat money, then should it be just cash holdings or should it include other financial assets as well. In the real world we find many financial assets, some of these financial assets are very close substitutes of money (or cash holdings, as narrowly defined money). For example, current account deposits with the

between the same dates". However, introduction of the financial market alters the outcome by enabling individuals to shift purchasing power forward or backward in time. It frees the timing pattern of consumption streams from the corresponding timing pattern of earnings from production. This results in more efficient resource allocation because it is now possible to obtain greater production from given available inputs as well as higher utility from given available consumption.

Economies of scale and specialization in financial transactions enable financial intermediaries to tailor assets and liabilities to the needs and preferences of both lenders and borrowers.

The macro-economic consequences of inside markets and financial intermediaries are generally to provide substitutes for outside assets and thus economize on their supplies.

Thus, the standard rationales underlying financial intermediation include the minimization of information and transaction costs, and the diversification of risks in a world in which assets are imperfectly divisible and both asset-returns and wealth holders' cash-flow positions are imperfectly correlated.

2.1.4.2 Empirical Issues

Besides these existence or micro-economic problems in any formulation of financial CGE model, we also face macro-economic or outward looking questions and problems at the empirical and policy formulation levels.

The foremost question which always arises in any empirical study is what should be included in the definition of money. Should it be just commodity money or fiat money? If the definition of money is equivalent to the concept of fiat money, then should it be just cash holdings or should it include other financial assets as well. In the real world we find many financial assets, some of these financial assets are very close substitutes of money (or cash holdings, as narrowly defined money). For example, current account deposits with the

banking sector are freely used for transaction purposes. With the development of transfer technology and financial innovations, more and more financial assets are becoming close substitutes of money. However, an estimate of money demand function obtained by adding together quantities of different assets cannot be justified because these different assets have differing degrees of moneyness. Consequently, in the recent years, in empirical work, the various components of a broad measure of money are weighted by the degree of "moneyness" or "liquidity" of each component. To make the weighing pattern more systematic, index number theory is applied to this issue (Barnett, 1982). This is sometimes called Divisia indexes¹¹. Survey article by Goldfeld (1989) points out that so far, empirical research indicate that only the broadest of such monetary measures appears to yield a stable demand function. Referring to the difficulties with this result, they state: *"For one, a complete understanding of this result requires an economic explanation of the behaviour of the weights used to construct the measures (Especially, where the weights are based on relative velocity or turnover data, there appears to be some circularity in the construction of the measures that will give the appearance of stability). Second, it is important for the results to be useful in formulating policy that these weights be forecastable."*

11

Francois Divisia devised a continuous time index number formula which has been widely used in the theoretical discussion of data aggregation and measurement of technical change and referred to as Divisia index in the literature.

Suppose total expenditure on a set of commodities, $[X_1(t), \dots, X_N(t)]$ given the set of prices $[P_1(t) \dots P_N(t)]$ is given by

$$Y(t) = P_1(t)X_1(t) + \dots + P_N(t)X_N(t)$$

Letting cap over variables indicate derivatives with respect to time, total differentiation of this equation gives

$$\frac{\dot{Y}(t)}{Y(t)} = \sum_{i=1}^N \left[\frac{\dot{P}_i(t)X_i(t)}{P_i(t)X_i(t)} \right] \left[\frac{P_i(t)}{P_i(t)} \right] + \sum_{i=1}^N \left[\frac{\dot{P}_i(t)X_i(t)}{P_i(t)X_i(t)} \right] \left[\frac{X_i(t)}{X_i(t)} \right]$$

The first summation of the right hand side of this equation defines the Divisia index of prices; the second summation defines the Divisia quantity index.

The Divisia price and quantity indexes are weighted averages of the growth rates of the individual $P_i(t)$ and $X_i(t)$, where the weights are the components shares in total expenditure. The summation in the above equation thus defines the rate of change in the aggregate price and quantity indexes.

Demand for Money¹²:

There are various theories that give various views on the variables explaining the demand for money. For example, the quantity theory of money starts with the equation of exchange where demand for real balances is proportional to the volume of transactions. Keynes (1936) introduced the speculative motive along with the transactions and the precautionary motives. The speculative motive views money and bonds as alternative assets with bond holding, in turn, viewed as dependent on the rate of return on bonds. On the other hand, Friedman's (1956) restatement of the quantity theory treated money like any other asset yielding a flow of services and emphasized the level of wealth (both physical as well as human) as one of the major determinants of money demand. He also emphasized a quite broad range of opportunity cost variables including the expected rate of inflation as theoretically relevant variables in explaining demand for money. This approach, however, sidestepped the explicit role of money in the transaction process. Other influential post-Keynesian developments such as Baumol (1952) and Tobin (1956) reconsidered and expanded on the transactions motive by applying inventory-theoretic considerations to the transactions demand for money. In their real transactions demand for money depends on the interest rate, real brokerage charges and the level of real transactions.

Incorporating uncertainty in cash flows, Miller and Orr (1966) further extended this analysis. In their approach a firm's average money holding depends on the variance of its cash flow, which is viewed as a measure of the uncertainty of the flow of receipts and expenditures. Tobin's (1958) portfolio theory reformulated Keynes's speculative motive.

Theories based on the transaction motive lead to a so-called narrow definition of money that includes currency and deposits transferable by cheque. However, even for this narrow definition of money, questions have been raised. It has been pointed out that currency and checkable deposits may differ in

¹²

For further details of various issues involved in demand for money see Goldfeld (1989).

transactions costs, risk of loss and ease of concealment of illegal or tax evading activities. And, therefore, it has been suggested that separate function for currency and checkable deposits be estimated.

As one moves away from the transaction view of the money, new problems creep into the picture.

Alternative theories suggest different set of explanatory variables for the money demand function. Most of the theories suggest the level of transactions, wealth, opportunity cost of holding money and transaction costs as the relevant explanatory variables. However, each of these involves measurement problems, even under certainty.

For example, because of non existence of reliable data on transactions the level of transactions (T) is typically approximated by the level of income or the gross national product (GNP). However, the term GNP is less inclusive than T as it excludes all sales of intermediate goods, purchases of existing goods and financial transactions, all of which may contribute to a demand for money.

Another problem which arises with the issue of 'measures of transactions' is the issue of aggregation. Though at the theoretical level the demand functions for money are derived at the individual level they are generally estimated with aggregate data. While aggregating, however, little attention is paid on the details of aggregation (for example, issues such as distribution of income are neglected).

Estimates of money demand functions are found to be unstable. Financial innovations are one of the source for such instability (Judd and Scadding (1982)). However, as pointed out by Goldfeld (1989) it is extremely difficult to explicitly consider the financial innovations in an econometric specification of money demand function because of non existence of reliable direct data on transactions costs. He points out that to overcome this difficulty indirectly, time trends or previous peak interest rates are used as a proxy for endogenous reductions in transactions costs. *"The idea behind the latter variable is that high interest rates create an incentive to incur the fixed costs necessary to introduce a new technology but that once interest rates decline the technology remains in*

place. The use of a previous peak variable is meant to capture this irreversibility. Researchers using such a variable have found that it improves the fit of money demand function. Unfortunately, however, the resulting estimates do not appear very robust, either to small changes in specification or to the use of additional data."

It is important to view the specification of the money demand function as part of a complete system, rather than in isolation(Tobin (1982), Tsiang(1988)). However, to date, this has not been empirically done in a satisfactory way. Part of the problem stems from the need to specify the money supply process in some detail; a task made difficult by changing policy strategies and deregulation. Moreover, there is a question of the time limit of the analysis. Practitioners of the monetary policy tend to have a relatively short decision making horizon so that capturing the money supply process may require weekly or monthly data. In contrast, most money demand estimations have used quarterly or annual data.

Supply of Money¹³:

Even on the supply of money economists hold diverse views. Those who hold the exogeneity view emphasize that the movements in the stock of money determine the variables like - price level, interest rate or real output. On the other hand, diagrammatically opposite view is held by the researchers who consider money supply basically an endogenous variable. For them supply of money is primarily determined by one or all of the variables mentioned above. So the direction of causality - money to other variables or other variables to money-changes as our perception about the money supply changes. Even exogeneity is further differentiated as weak exogeneity and strong exogeneity. Weak exogeneity allows for feedback from the endogenous to the exogenous variables over time whereas strong exogeneity does not allow such a feedback. However, the issue of exogeneity or endogeneity of money crucially depends on the type of

13

For the survey of literature on "Supply of Money" see Brunner (1989) and Brunner and Meltzer (1990).

money economy that one is considering- commodity money, paper money, credit money. It also depends on the sophistication of the banking and financial system within which such money is issued. In the case of commodity money regime, money supply can be broadly treated as exogenous. In the world where only outside fiat money - printed as the state's liability - is used, the stock of money could be exogenously determined¹⁴. The question of exogeneity and endogeneity becomes even more complex in a world with inside and outside money and a whole range of financial intermediaries from banking system to non-banking financial sector. Existence of government debt instruments treasury bills, bonds etc. in the bank's reserve base and the profit maximizing behaviour of the banks make a greater part of the money stock endogenous. Even the optimizing behaviour of the non-banking public reduces the control of regulating authorities on the money supply in the presence of a number of close substitutes of money such as credit cards, charge cards, money market funds, interest bearing demand deposits, electronic cash transfer. The velocity of circulation of cash increases very sharply in such a world and liquidity, a broader concept than even broad money, becomes endogenous. The control over money supply by monetary authority becomes less strict.

Presence of inside money not only makes the money supply endogenous but also creates problems in aggregation. Aggregated over the private sector, outside money (defined as a non-interest bearing government debt) is part of net wealth of the private sector, whereas inside money is not. Part of inside money is in the form of loans used to finance the purchase of capital goods. Therefore, unlike outside money, inside money is not an alternative to holding capital. On the contrary an increase in inside money may well result in an increase in claims to capital holdings (i.e. money is a complement to capital rather than substitute for capital). Because of this, results of a model that also includes inside money would be different from a model that only includes outside money. For example,

14

But here too printing of money may be the result of budget deficit caused by the changes in the price level or reserve inflows caused by relative price, inflation etc.

Tobin's portfolio effect holds unambiguously when all money in the economy is of the outside variety. [In Tobin's, (1965) formulation money is an alternative to capital for holding wealth. The opportunity cost of holding money instead of capital is $r+\pi$, i.e. the real rate of return on capital (r) plus the rate of inflation(π). By increasing the rate of inflation the central bank can shift the composition of financial holdings towards capital].

Financial Intermediaries :

Changes in regime make the econometric estimates, using time series, of portfolio behaviour of financial intermediaries difficult. As illustrated by Tobin (1989), financial intermediaries are quantity takers when interest rate ceilings are effective. On the other hand, both the interest rate and quantities are determined jointly by the behaviour of public and financial intermediaries when such ceilings are non-constraining or non-existent. These problems persist even when credit markets are unregulated but interest rates are administered by financial intermediaries themselves and move sluggishly. In such cases markets are not cleared and quantity rationing appears. *"Either the financial intermediaries or the borrowers are quantity takers, or perhaps both in some proportions."*

Monetary Policy And The Economy: The Channels

This is also one of the widely debated issues. The differing views on this issue reflect the complexity of linkages between the modern financial system and economic activity and the alternative simplifications various schools have adopted in an effort to capture the essential elements.

For Keynesians, the variations in market interest rate is the primary linkage between monetary policy actions and economic activity. For them impact on prices is sluggish and only in a lagged response of interest rate changes because as an empirical matter prices, especially nominal wages, can be regarded as fixed in the short run. An easy monetary policy, for example, results in a fall in the market interest rates. Lowered borrowing cost stimulates not only

consumption and production but also results in capital gain on financial assets. The resultant gain further enhances consumption and investment spending. Higher production increases capacity utilization and reduces unemployment below the natural level of unemployment. This puts an upward pressure, though delayed, on wages and prices.

Not only the domestic market but also the international market is affected by the interest rate changes. Lower level of domestic interest rate leads to capital outflight by diminishing the demand for assets denominated in the home currency. Under flexible exchange rates, the resulting depreciation of the exchange value of the currency will lower export prices in world markets and raise import prices. Higher import prices feed through the domestic price structure and set in the inflationary situation.

Monetarists take a different view of the process. Though they accept the Keynesian view that changes in money supply have predictable effect on interest rate they argue that there are few good substitutes for money and, hence, the demand for money is an inelastic function of the rates of return on competing assets. Hence, changes in monetary policy would primarily be reflected in money income rather than in the rates of return. An easy monetary policy increases money supply than what public desires at the given prevailing level of real income, prices and interest rates and stimulates spending on goods and services as well as financial assets. Though short-term market interest rates fall initially, the major impact is on prices which stimulates demand for and production of investment and consumer goods.

The difference in the view-points of these major schools of thoughts is basically for the short term. In the long run, according to both monetarists and Keynesians, the impact on real activity dissipate because economic agents would need the extra money just to carry out normal transactions at inflated prices and there would be no more extra stimulus to real spending.

Thus, we see that in the long run there is a linkage between money growth and inflation. So, while adjusting policy actions in response to shorter term financial and economic development, the central bank has to keep in mind the

longer term price objective.

In this context, it has been debated whether the central bank use rule or its discretionary powers while changing the money supply to meet its longer term price objectives. Highlighting the difficulties in forecasting - both economic development and the impact of policy actions on the behaviour of economic agents - monetarists conclude that, given the lags and uncertainties, the attempts of central bank to stabilize the economy even in the short run, would destabilize the economy. For them excessive money growth is the root cause of inflation. On the other hand, with constant money growth, self correcting mechanism would prevent macroeconomic shock from having major, sustained impact on economic activity. Therefore, monetary policy should be based on fixed rules rather than discretion.

The rational expectations school has added a new dimension to this debate. Followers of this school point out that any temptation of policy makers to divert from the announced policy measure of price stability in order to give a boost to output and employment will be anticipated by the rational individuals and will be taken into account while taking economic decisions. Thus, the expectations of inflation would emerge in anticipation of the monetary stimulus, leaving only price increase but no output gains as the policy is implemented. On the other hand, if the central bank did not undertake the anticipated policy action it would depress output demand. To avoid such a situation, central banks would end up providing the monetary stimulus, even though it only validates ongoing inflation and has no output effects. According to the advocates of rational expectations, by making an anti-inflationary policy credible to the public this problem could be avoided. Hence, this school favours policies based on rules, defined in terms of a fixed target for either money growth or the price level.

2.2 A Select Review of Literature

The aim of this part is to review the studies dealing with the effects of money and other financial assets on the real variables of the economy and vice versa, i.e. interactions in real and financial sectors in a CGE framework. As there are a large number of review articles available which survey CGE models dealing only with real sectors of the economy, we do not consider them here. As far as financial CGE models are concerned, development and use of these models is of recent years. We could get hold of only two review articles i.e. Chitre and Naik (1989) and Gunning and Keyzer(1995) which do discuss the various issues involved in integrating the real and financial sides in a general equilibrium framework. However, in view of the recent developments in this area, we see a need for another review of such attempts.

In our review, emphasis is mainly on the financial sector specification and integration of this with the real sector of the model. Keeping with our emphasis, real side of the model will be reviewed in minimum.

2.2.1 Modelling of the Financial Sector in the Reviewed Literature

As far as the specification of the financial sector is concerned, the surveyed papers differ in the following respects:

- (1) Introduction of money in the model.
- (2) Introduction of other financial assets/portfolio modelling.
- (3) Money supply function specification.
- (4) Introduction of financial intermediaries.
- (5) Saving function specification.
- (6) Investment function specification.
- (7) Model closures.
- (8) Expectations and Dynamics.
- (9) Specification of inter-linkages between the real and the financial sectors/transmission mechanism.

Before going into the details of each of the surveyed paper, we will briefly summarize the specification of each of these important issues :

Introduction of Money

Money is introduced in the surveyed models in the following different ways :

- (i) Some of the studies have adopted "utility approach" to monetary theory [for example, Clement (1980)]. In this approach money is incorporated into the general equilibrium framework on par with any other commodity with "utility" being attributed to the services provided by real money balances. In this approach, the concept of money as a medium of exchange is lost.
- (ii) With the assumption that money serves no asset function and that there is only transaction demand for it, some of the studies introduce money in the model by simply appending a Cambridge equation with money demand being proportional to expenditure. For example, in Feltenstein's (1984) model, money holdings are just a constant fraction of the value of their consumption. For a given money supply, equilibrium between money demand and money supply is brought about by price level changes. However, in the absence of non-homogeneities in any of the equations in the model, the real sphere of the economy remains unaffected.
- (iii) Even more drastic shortcut is used and demand for money function is directly specified in the model as a function of interest rate along with other variables. As pointed out by Gunning and Keyzer (1995), because of this specification money is non neutral even if there are no other non-homogeneities in the system. To emphasize the asset demand for money, along with the transaction demand for money, in most of the micro and macro structuralist models (for example models in the BBM tradition and Lance Taylor tradition) the initial transaction holdings along with other assets form part of the budget constraint.

Introduction of Other Financial Institutions

Models dealing with monetary phenomena sometimes do not have any other asset in the model except money. For them money, as mentioned earlier, is just a medium of exchange and it does not perform any asset function. These are static one period models.

When money serves not only as a medium of exchange but also as a store of value, then the question arises, as to how other assets are introduced in the model. First of all, is there only one alternative asset in the model or is there an array of assets? Sometimes only bond is introduced as an alternative asset to money [for example Feltenstein (1984)]. On the other hand, in some models a whole range of assets such as physical capital, equities, loans, time deposits, contractual assets are also introduced. As far as the specification of portfolios is concerned, three types of representations are found in the surveyed literature. But all these specifications are some variant of the Tobin's (1969) formulation.

(i) *Tobin's Portfolio Approach.*

Following this approach, modellers allocate individual's saving or total wealth over all available assets simultaneously. Demand for each asset, in this approach, is specified as a function of the own return and the returns on all other assets. Income and wealth are the other explanatory variables. Thus, every asset is made substitutable for every other asset. Suppose there are three assets in the model - Money (M), Bonds (S; Short term government securities) and physical capital (K). Total wealth has to be allocated among these three assets.

Let P be the price of currently produced goods, both consumer goods and capital goods. However, it has been assumed that the value of existing capital goods may diverge from their current reproduction cost. Let ' qp ' be the market price of existing capital goods, π be the expected rate of change in commodity prices and R be the marginal efficiency of capital. We assume that the nominal rate of return on money is zero while that on the government securities it is r_b' . Suppose real rate of return on capital, money and the government securities are r_p , r_m and r_b respectively. Let r stand for the vector of real rates of return (r_p , r_m , r_b). The equations for real rates of return are:

$$\begin{array}{ll}
 r_p q = R & \text{Capital} \\
 r_m = -\pi & \text{Money} \\
 r_b = r_b' - \pi & \text{Government securities}
 \end{array}$$

Total wealth (W), on the other hand, is

$$W = qk + (M + S)/p$$

The portfolio equations then according to Tobin's (1969) approach are as follows:

1. $f_1(r, Y/W)W = qk$ Capital
2. $f_2(r, Y/W)W = M/P$ Money
3. $f_3(r, Y/W)W = S/P$ Government securities

Where income (Y) is another explanatory variable.

In this specification assets are assumed to be gross substitutes i.e. the demand for each asset varies directly with its own rate and inversely with other rates.

The system of demand equations satisfies the total wealth constraint specified as above.

Though this system provides a consistent framework, it treats all the assets symmetrically. For example, money is treated on par with other assets and the special function of money, as a medium of exchange, is lost.

As an example of the use of this approach see Easterly (1990). In this model, net position in each asset is a linear function of net financial wealth and a logistic function of the rates of return on different assets.

(ii) Roseinweig and Taylor (1990) Approach

This is also a variant of Tobin (1969) specification in the sense that all the variables are symmetrically treated and satisfy the total wealth constraint. This specification is adopted in many structuralist models [for example Vongpradhip

(1987), Jemio and Jansen (1993)].

Asset demand equations, under this approach, are specified through CES type stock-adjustment functions. For example asset demand equation for asset A_{jk} is specified as follows :

$$A_{jk} = \alpha_{jk} (r_{jk}/r_k)^{\sigma_k} A_k$$

Where α_{jk} is the share of financial asset j in agent k 's total asset portfolio, r_{jk} is the rate of return on the asset j and r_k is the average rate of return on agent k 's assets, σ_k is the elasticity of substitution for the agent's portfolio and A_k is the size of the total portfolio of assets.

As presented above, this approach reduces the number of elasticity parameters drastically (only one elasticity parameter, σ_k , has to be specified). However, we are not able to incorporate explanatory variables other than various interest rates or rates of return without increasing the number of elasticity parameters and complexity of the model.

(iii) Hierarchical Portfolio Models: (BBM Approach)

This approach starts with Tobin's (1969) portfolio specification. However, under this approach, agents allocate their wealth among various assets according to a multi-stage budgeting process. The specification is based on the assumption that individuals do not consider all available assets as substitutes and therefore demand for a particular asset can be independent of the rate of return on some assets. Thus, all the assets are not treated symmetrically.

Bourguignon, Branson and de Melo (1989) first introduced this approach and therefore it is also referred to as BBM approach. This approach is described below:

Suppose there are four assets, Money (M), Bonds (B), Foreign Assets (eF) and Capital (K). Let π be the expected inflation rate, e be the expected rate of nominal depreciation and r_r be nominal interest rates on the above

specified assets, with nominal return on money equal to zero. Let real profit rate be R which is determined from the supply side of the model and given by the rate of return on capital over the cost of capital minus one. P_e is the price of equities. If we further assume that the expected rate of inflation is exogenous to the financial sector then the determination of nominal and real returns amount to the same thing. With the above notations, the real rates of return can be specified as follows :

1. $r_m = -\pi$ (Money)
2. $r_b = r_b' - \pi$ (Bonds)
3. $r_f = r_f' + e - \pi$ (Foreign assets)
4. $r_p = R/P_e$ (Capital)

Suppose $r = (r_m, r_b, r_f, r_p)$ is the vector of real returns on the four assets.

Agents allocate total wealth (W) [$W = M + P_e K + B/r_b' + eF'/r_f'$] on all the four assets specified above. In the hierarchical portfolio specification, first, the demand for money function is specified using a traditional money demand function. In this specification, demand for money responds to income and interest rate. Money is assumed to be held for transaction purposes. Remaining of the wealth (i.e. $W - M$) is then allocated among remaining of the three assets (i.e. K , B and F). Agents further divide this in two stages. They first, for example decide about the capital holding and total of the remaining of the assets (i.e. B and F). The allocation at this stage responds to the rate of return on capital relative to the average rate of return on bonds and foreign assets. In the next stage, remaining of the wealth (i.e. $W - M - K$) is further divided between bonds and foreign capital. Again the allocation depends on the relative rates of return on two assets.

Thus, we have the system of portfolio equation as :

1. $M = p_h^d(r, y)$
2. $P_e K = g_1 [W - M]$
3. $B/r_b' = g_2 (1 - g_1) [W - M]$
4. $eF'/r_f' = (1 - g_2) (1 - g_1) [W - M]$

$$\text{or } eF^*/r_f = (1-g_2) [W-M-PeK]$$

Where,

$$g_1 = \phi_1(r_k/r_s)^{\epsilon_1}$$

and

$$g_2 = \phi_2(r_b/r_f)^{\epsilon_2}$$

$$\text{and } r_s = W_1 r_b + W_2 r_f$$

with $W_1+W_2=1$ (weights are equal to the share of particular asset in total asset).

This system of equations automatically satisfies the total wealth constraint.

This approach simplifies the matter by restricting the number of parameters and makes the empirical work easier. The model does not treat all the assets symmetrically and therefore is more realistic. It allows for introduction of other important explanatory variables besides relative rates of return without increasing the complexities in modelling. However, the simplicity and usefulness of the model is at the cost of theoretical rigour.

Money Supply Function Specification

In some models (example Clement (1980)) money supply is given exogenously, while in others money supply is endogenously specified. For the endogenous specification of money supply, one has to specify government and the monetary authority. In some models money supply is made endogenous by linking it to the government budget deficit (for example Feltenstein (1984)).¹⁵ In the presence of inside money, commercial banks are also explicitly introduced

15

This way money supply is made endogenous when there is only outside money in the economy.

in the models. The process of credit creation makes the supply of money endogenous.

Introduction of Supply of Other Assets and Introduction of Other Financial Institutions

The models differ on the level of disaggregation of financial assets. As the number of assets increases the modelling effort to introduce financial intermediaries also increases so as to make the supply of these assets endogenous to the model. Some models, like Clement (1980), which specify the supply of these assets as exogenously given do not have explicit specification of these financial intermediaries in the model. However, as the number of financial assets or instruments increases, the number of financial intermediaries also increases. Some modellers, like modellers in the BBM tradition, just introduce commercial banks in the model. Monetary authority i.e. central bank is combined with the government and one is unable to take into account the crowding out effect of the public expenditure, specifically the government investment. However, to take into account the crowding in or crowding out effect, some modellers have differentiated central banks from the government as well as from the commercial banks [for example de Janvry, Sadoulet and Fargeix (1991), Kim, Berrian, Roland Holst and Thorbecke (1992)]. Though in most of the models level of disaggregation of financial intermediaries stops here, in recent years there are some attempts [such as Jemio and Jansen (1993)] which further disaggregate these financial intermediaries. In these approaches, "other financial intermediaries" (i.e. non-bank financial intermediaries) are separately identified and introduced in the models in order to take into account the different nature of liabilities of these institutions. For example, liabilities of commercial banks (especially demand deposits) are treated as money while liabilities of other financial institutions are not considered money by the public. Similarly, loans issued by the commercial banks are usually used for short term purpose, i.e. for working capital requirement. On the other hand, loans issued by the other financial intermediaries are long term and development loans. This distinction is

important if our emphasis is on the output vis-a-vis growth.

Saving Function Specification

In most of the models surveyed saving and consumption decisions are separated. They are not derived simultaneously [As an exception see Feltenstein (1984). In this model, the consumer maximizes a two period separable utility function to derive demands for current and future consumption (saving) as a function of discount rate and rate of return on government bonds]. Most of the models examined assume that the households first decide their saving as a fraction of income. This fraction may be constant [Adelman and Robinson (1978)] or may depend on the average real rate of return available to the households on their asset holdings (For example studies in the series Adjustments and Equity in Developing countries i.e. OECD models). Therefore, in these latter models financial changes would have greater impact through interest rate changes on saving and via it, on the real sphere of the economy. In some of the models, it is a function of both income and wealth [For example Jemio and Jansen (1993)].

Some have specified a classical saving function in which saving ratio (s) is a function of the profit rate. If the reason for saving (and investment which is equal to saving in full employment equilibrium) is to increase future consumption possibilities, one might expect that as the rate of return on investment falls with a rising K/E (capital to labour ratio), the rate of saving would fall since the future consumption payoff would be reduced. This assumes that the substitution effect of a lower return on saving outweighs the income effect which would tend to increase saving to maintain a given future consumption stream.

Following the Kaldorian saving function, some modellers have specified different propensities to save out of wage (W) and profit income (P). i.e. $S = s_w W + s_p P$. Where S is total saving; s_w and s_p are propensities to save out of wage and profit incomes respectively. It has been assumed, in such formulations that the saving ratio out of profits, s_p is greater than that out of wages, s_w i.e. $1 > s_p > s_w > 0$.

For example in Lewis (1992), the rate of saving is fixed for wage earners while it is an increasing function of the rate on bank deposits for profit earners. Similarly, in Sarkar and Panda (1986), different saving propensities are assumed. In other structuralist models, also, saving rates are assumed to be fixed but different for different income classes within each period.

Another formulation is in the Pigouvian tradition. For example in Morrisson (1991), any increase in the real wealth of the household, over time either because of the appreciation of the value of the asset or because of the accumulation of wealth is assumed to increase consumption and hence reduce the current saving. In this way, the changes in financial markets not only influence the composition but also the level of households' wealth.

Investment Function Specification

In models following the classical tradition, there is no different investment function and saving determines the total amount of investment in the economy. So, investment is saving led in these models. This assumption seems to be satisfactory only for those economies where there is no financial asset i.e. not even commodity money. For example if there is existence of hoarded money, saving is not automatically converted into investment. So, in a monetary economy investment function has to be specified explicitly.

In some of the CGE models investment is assumed to be given exogenously or is directly controlled by the policy authorities. For example, in Sarkar and Panda (1986), public investment is exogenously specified in the model [also see Clement (1980)]. In these models, investment determines saving. To make this specification of the investment consistent with the model, the saving function is usually specified in the Kaldorian fashion by assuming differential propensities to consume out of wage income and profit income. Forced saving then brings about the saving- investment equality.

Some studies follow the Jorgensonian neo-Classical theory of investment. This theory explicitly treats the demand for capital as a derived demand by starting with the firm's production and demand functions. The demand and the

production functions are used to obtain a relation between a firm's cash flow and its contemporaneous stock of fixed capital (plant and equipment). The firm's demand for fixed capital is set at a level that equates the marginal product of capital with the user cost of capital in production over a certain period of time. The neo-classical theory of investment predicts that a firm's demand for capital will be positively related to the the level of firm's output and will be negatively related to the user cost of capital. [for example Lewis (1992)].

For the attempts following accelerator model, the demand for capital is proportional to the level of capital but is independent of the user cost. User cost effects on investment are harder to estimate in the data than are accelerator or output effects. Perhaps one reason for the difficulty of finding user cost effect is the problem of simultaneity. For example, if data contains both exogenous increase in the real interest rate and exogenous shift in the investment function, then the predicted negative relation between user cost and investment might be masked by the positive relation between user cost and investment in-response to the exogenous shift in the investment function. An additional complication in estimating the effect of the user cost is the question of whether to use a short term or long term interest rate in measuring the cost of capital. Sarkar and Panda (1986) have used this type of function by specifying aggregate nominal private fixed investment as a function of gross domestic product and commercial credit advanced by the banking system. Another example is Easterly (1990).

Some modellers follow Tobin's 'q' theory for the investment function specification. Tobin (1969) defined 'q' to be the ratio of the market value of a firm (as a proxy for the value of capital) to the replacement cost of the firm. The greater is this ratio the greater would be the incentive to acquire capital and hence the greater would be the rate of investment. As the value of the firms is measured using data from equity and bond markets, the link between asset markets and investment expenditure is quite explicit. A variant of Tobin's 'q' specification has been used by quite a few studies. For example studies by Morrisson (1991), Schnieder (1992), de Janvry, Sadoulet and Fargeix (1991), Easterly (1990), Rosensweig and Taylor (1990) have used this variant. In these

studies investment is positively related to the real rate of return on capital (assuming that in the developing countries equity market is not highly developed, this reflects the market value of a firm) and negatively related to the cost of financing (or the real cost of borrowing reflecting the replacement cost of the firm).

Model Closure

In order to incorporate macroeconomic mechanism into general equilibrium models macroeconomic equations are grafted onto the microeconomic structure of the models by introducing for each new macroeconomic variable a new equilibrating constraint. This association of a particular endogenous variable to an exogenous demand component is commonly referred to in the literature as a closure rule [Sen (1963), Taylor and Lysy (1979)]. Though this does not necessarily relate to markets it provides operational flexibility which makes it possible to introduce many variables which are central to policy discussions. However, this flexibility is obtained at the expense of theoretical rigour.

On the non-financial side, of any model, the possible adjusting variables to close the model are total output, investment, the exchange rate, the price level, the interest rate, and the current account balance (capital inflow). At least two of these variables must adjust so that external and internal balance obtains. On the financial side, the possible endogenous variables are the various interest rates, high powered money, foreign exchange reserves, foreign debt and the exchange rate. Quantity adjustment on the real side implies quantity adjustment on the financial side of the model. For example, if output and the current account deficit vary to ensure equilibrium, then the quantity of foreign debt and foreign exchange reserves should be endogenous in the financial model. The fixing of interest rates and exchange rates means both real and financial flows adjust in quantity terms. This corresponds to the Keynesian type of the closure of the model. It was found that more neo-classically oriented economists choose the classical closure where as 'structuralist' choose the Keynesian option

[Dewatripoint and Michel (1987)].

Expectations and Dynamics

Once the concept of saving (which is equal to future consumption) is introduced in the model, introducing expectations and dynamics in the model acquires utmost importance. Saving is held in the form of physical and financial assets which are stock variables and affect the economy over a long period of time.

The CGE models which we have surveyed also differ widely in respect of expectations and dynamic formulation.

There are models, however unrealistic they may be, which follow the static approach. These models do not have any role for future expectations. Individual decisions in these models are functions of current and past variables with no role for the future. These models can not meaningfully incorporate money and other financial assets. As an example, see Feltenstein (1984).

However, most of the surveyed models follow the adaptive expectation approach. Expectations of economic agents in these models are based on past and present values of the variables in question. Dynamics in these models is introduced by updating the stock variables by simply adding the flow amount of the current period to the stock at the beginning of the period. For example capital stock at the end of the period is equal, in these models, to the stock of capital at the beginning of the period plus the investment during the given period. Concept of equilibrium used in these models is that of 'Temporary Equilibrium'. This approach allows for the analysis of short-run macro-dynamics. Adelman and Robinson (1978); Lewis (1992); OECD models and some of the structuralist models have followed this approach. However adaptive expectation formulation is not useful for analysing the effect of major policy changes such as regime switches on expectations. To study issues such as capital flight and investment decisions one needs to explicitly model the forward looking expectation formation and the way policy influences these expectations.

Rational expectation formulation can be useful for studying regime

switches. But none of the financial CGE models (CGE models incorporating money and other financial assets) we have studied incorporate this type of expectation formulation in the model. Some of the CGE models which have incorporated this type of expectation formulation have not studied monetary phenomena. For example the models of Auerbach and Kotlikoff (1987); Fullerton, Shoven and Whalley (1983) were designed to analyze the impact of tax, subsidy and interest rate policies on capital accumulation, savings and welfare over a medium/long run. However, they have avoided the issue of modelling expectations by assuming perfect foresight.

As we have seen earlier, the assumption of perfect foresight is very unrealistic and requires a lot of imaginative power on the part of economic agents. Therefore, perhaps, some bounded rationality assumption or asymptotically rational expectations have to be incorporated in the model so as to deal with expectation formulation in the model more realistically. This is one of the promising lines which the future financial CGE model should find worth considering.

Interlinkages between Real and Financial Sectors and Transmission Mechanism

(i) Linkages from financial side to real side

While specifying interlinkages in the model some models have emphasized the real balance effect; for example Lewis (1992).

Some modellers point out portfolio reallocation effect. In these models, increase in money, for instance, increases the credit availability and thus lowers the interest rates in the economy. As a result, the economic agents divert their savings from financial assets to physical assets. Not only will there be a portfolio reallocation but also overall reduction in saving (and increase in consumption) as a result of lowering of the overall interest rate. On the other hand, due to fixity of supply in a given period of time, an increase in consumption expenditure would result in an increase in the overall price level. Since expectations are

formulated in the adaptive style, expectations of inflation would be higher. This would lead further portfolio adjustment as people divert their savings from financial assets to physical assets [See, for example, various OECD models].

Changes in the financial sphere also affect the real sphere by changing the investment demand by the producers. An increase in money supply, for example, results in a decrease in interest rate and hence the cost of borrowing and therefore, encourages the producers to invest more. Again see, for example, OECD models.

A change in the inflation rate directly leads to reallocation of income. For example, in an inflationary environment, a higher expected inflation would reduce real wages and result in higher employment and output in those sectors where wages are only partially indexed.

In an inflationary situation reallocation of income also takes place as it affects different components of income differently. The profit component of the income would increase while the wage component would decrease.

Interest received on all assets and interest payments on all liabilities also enter into the income and expenditure flows of institutions on the real side and, thus, changes in the interest rate as a result of monetary policy lead to reallocation of income among various agents.

In some models [for example Clement (1980)] money directly affects the income identity. In these models, money enters the economy via government spending. An increase in the rate of growth of high powered domestic credit raises disposable income directly in the model. Therefore monetary policy has real effects in the short run.

(ii) *Linkages from the Real Side to the Financial Side*

Various types of saving flows such as household saving, firm's saving, government deficit (government surplus) and foreign saving feed into the financial side of the economy.

2.2.2 A Select Review

The surveyed literature/studies can be discussed in various ways. First of all, and as is usually done, we may deal with them chronologically i.e. in the order of their date of publication. However, this is unsatisfactory because various approaches have been developed simultaneously and they move in different directions. It is more satisfactory to classify them according to some criteria and then to discuss them in groups. However in each category we survey them chronologically. We could broadly classify these studies into two categories.

(1) Financial CGE Models for Developed Countries

The studies by Clement (1980) and Feltenstein (1984; 1986) can be classified in this category. These models are basically formulated in the neo-classical tradition.

(2) Financial CGE Models For Developing Countries

Fixed nominal wages, prices and interest rates seem to be the features of most of the developing countries. Since in the presence of these rigidities money is non-neutral, money and other financial institutions are introduced along with such rigidities in quite a few of CGE models developed for underdeveloped or developing countries. These models, can be further classified into the following two categories.

(2a) Neo-Classical Models with Structuralist Features

Under this category we classify the model by Adelman and Robinson (1978); BBM (1989) and most of the models developed under the OECD project on Adjustment and Equity in Developing Countries. As discussed earlier in section 2.1.2, models in this category are based on the theoretical underpinnings of Walrasian general equilibrium models although with limited substitution possibilities. Micro- structuralist features like presence of rigidities due to absence of certain markets are also focus of their analysis.

(2b) Structuralist CGE Models

These models follow the macro- structuralist approach developed by Lance Taylor. Under this category we can classify the model by Vongpradhip (1987), Easterly (1990), Rosinsweig and Taylor (1990), Lewis (1992), and Jemio and Jansen (1993).

To compare our study with other studies for India we have classified the financial CGE models developed for India in a separate category, though even these models are in the structuralist tradition.

(2c) CGE Models for India

For India we could get hold of only two models which have introduced money and other financial assets. These models are by Taylor (1983) and Sarkar and Panda (1986).

We will now briefly survey the studies in each of these categories chronologically.

2.2.2.1 Financial CGE Models for Developed Countries

Clement (1980) constructs a small scale multi-sector econometric model of an open economy, formulated with the ultimate aim of assessing empirically the effects of rate of growth of the stock of domestic credit, commercial policy and the exchange rate on trade flows, domestic prices and the trade balances.

The model is divided into three blocks. The first block consists of a system of demand equations represented by Stone's linear expenditure system. The system of demand equations is generated by the solution of inter-temporal utility maximization problems where the utility function has as its arguments the consumption vector and scalar real wealth holdings. The consumption function used in the model implies that total expenditure equals income plus a constant fraction of the gap between the actual stock of wealth and the long run desired stock. With a negative gap, for example, saving will exceed investment and the

economy will accumulate wealth by purchasing foreign assets and run a current account surplus. Money stock at the beginning of the period influences consumption via the wealth effect and flow increase in the high powered money influences the consumption via the income effect (as expansion in the stock of domestic credit leads to a direct increase in income¹⁶).

The trade flow in each commodity is identically the domestic supply of that good. The traded goods prices are taken as exogenous and, given a fixed exchange rate, the nominal prices of the traded goods are determined parametrically by the world market. On the other hand, the prices of the non-traded goods are endogenous to the model, since they serve to equate the domestic demand and supply of these goods.

Although the model has consolidated the government and the private sector, there is an explicit monetary authority which acts independently of the private sector. This formulation allows the author to see the implications of the domestic credit expansion.

To implement the model empirically, U.S. annual data for postwar period has been used. The estimated equations are non-linear in the parameters, and there are restrictions both within and across equations. All the parameters of the model are estimated simultaneously by full information maximum likelihood.

In the model simulation, an expansion in the stock of domestic credit leads to a direct increase in income and a rise in spending on each good according to the marginal budget shares. As a result, exports fall and imports increase, giving rise to an unambiguous deterioration of the trade balance on this account. Expansionary monetary policy has the further effect of increasing the price of non-traded good due to the upward shift in the non-traded good demand curve. However, the effect on the price of non-traded good was surprisingly less. Possible explanation for this, as pointed out by Chitre and Naik (1989), may be

16

It is assumed that the government borrows from the monetary authority and then spends the proceedings. Thus, increase in the stock of high powered money gets in to the system via direct transfers and raises income directly.

the increase in the output of non- tradeable good due to an increase in the domestic high powered money.

Though this model has allowed the theoretical possibility of disaggregated commodity prices, for empirical work it considers only a single good. There is no factor mobility. Also, as the government is clubbed with the private sector, the model is unable to analyze fiscal policies. The domestic credit expansion is purely exogenous and is not dependent upon the government behaviour. Because of the consolidation of the government and the private sector any benefits from the government deficit financing are the same as private spending and borrowing. Therefore, the government behaviour cannot affect the inter-temporal choice between present and future consumption and hence overall saving rate. Also, the assumption of a price-taking behaviour for all traded goods is of doubtful validity for the U.S. economy. This restricts the scope of the exchange rate policy and leaves no room for the effect of domestic monetary policy. Similarly, the concept of wealth includes only money and the physical capital and there is no provision for including financial assets in it.

Feltenstein (1984) attempts to overcome these obvious limitations and drawbacks of Clement (1980) by incorporating mobile factors of production, many commodities, explicit tax structure and the government and the explicit link between the government budget policies and the domestic credit expansion and monetary and financial assets held by the consumers.

The private firms, with linear technologies in intermediate and final goods but with the possibility for substitution among the scarce factors that enter their value added, maximize profits at given market prices subject to taxes on profits. The government also engages itself in the production of public goods and levies income, profit and sales tax and tariff to pay for its purchases of factor inputs. The government deficit is financed by a combination (in fixed proportion) of money and bonds. This treatment makes the rate of change of both the nominal money supply and the level of public indebtedness endogenous variables.

The consumers, with a constant elasticity of substitution utility functions,

maintain a constant proportion of their value of consumption in terms of money holdings in order to finance their transactions. Though transaction costs are recognized by assuming that their existence is reflected in consumer's demand for money, (a good that yields them no direct utility) they are not explicitly modeled. Similarly, addition of bonds in the model is also adhoc. Consumers demand both foreign and domestic bonds in a fixed proportion. Relative weights given to each type of bond reflect the underlying uncertainties concerning the risk factors of the two types of bonds. This procedure of assigning relative weights (in fixed proportion) does not explicitly reflect the effect of change in the rate of return on their demand.

The home country influences world price for its export but is a price-taker for its imports. The model is restricted to fixed exchange rate by assuming that there is only a single type of world currency. An implication of this assumption is that the trade does not change the total money supply. Change in the money supply, in the model is caused by only the government deficit. The model has an equilibrium at which there may be deficits in both the balance of payments and the budget of the government.

The model has been solved under two different assumptions concerning the level of government production of public good ($Q=0.1$ and $Q=0.4$, where Q is the real government expenditure on goods and services as a percentage of GNP). In the second case (i.e when $Q=0.4$) deficit occurs which is covered by the emission of money and domestic bonds. Compared to the first experiment (i.e. when $Q=0.1$), there is a decrease of 20% in the balance of payment (current account almost in deficit). This reflects the fact that the competitive position of domestic industry has been weakened by the inflation induced by the government deficit. As a result of higher inflation, relative price shifts in favour of imports and increases consumer demand for the imported goods. On the contrary, since there is a deficit induced increase in the supply of domestic bonds, interest rate increases and prices of domestic bonds fall. This results in an improvement in the capital account because of the large capital inflows.

Though the model is able to demonstrate non-neutrality of money and

financial assets, the changes in the money stock affect the real sector through external sector effect and not via affecting the demand and supply equations since excess demand functions are homogeneous of degree zero.

In this model the private sector does not invest and, therefore, bond financing (as diverting resources from the private sector) would not affect private sector. Thus, the model is unable to capture the possible crowding out effect of financing of the government budget deficit.

Fel'tenstein (1986) model for Australia is an extension of Fel'tenstein (1984) model and takes into account the investment by the private sector. Both the government and the private sector compete for the private saving by issuing identical bonds. In this setting, any increase in the government investment/deficit financed bonds would lead to a fall in the prices of bonds and a rise in the rate of interest (on public bonds), which in turn would induce people to hold more of public bonds leading to a fall in the supply of funds available for private investment.

2.2.2.2 Financial CGE Models For Developing Countries

2.2.2.2.1 Neo-Classical Models with Structuralist Features

Modellers working on developing countries have diverted from the neo-classical models by extending the models in a variety of directions so as to capture the structuralist features of developing countries. The first such model developed for Korea, a developing country, is that of Adelman and Robinson (A-R; 1978). This model focused on the income distribution policy. The A-R study was detailed one: 20 producing sectors with 4 firm size categories, 6 labour categories and 15 household types and a number of policy instruments.

The model is broadly in the neo-classical tradition though it has a number of disequilibrium non-neoclassical features. The overall model consists of a

static, within-period adjustment model linked to a dynamic, inter-temporal adjustment model. Within each period, the degree of adjustment is constrained by the existence of capital stock of specific types, by the immobility of the self-employed in both agricultural and urban production, by rigidities in wage structure and by government constraints on firm behaviour, especially in the foreign trade sector. Between periods some flexibility for adjustment is provided by capital accumulation, population growth, migration, changes in the amount of self employment, and changes in the size of structure of production.

Each period in the model consists of three stages. Stage I models the loanable funds market and describes the contracts made between firms and the financial markets to spend funds on investment goods. On the basis of expected sales and expected prices of inputs, producers form their demand for loanable funds. Credit is rationed either by setting an interest rate and allowing the market to clear at that rate (If the formal credit market is not cleared at the fixed interest rate then the curb market takes up some of the slack by offering to lend at a specified interest rate to those firms that were unable to borrow as much as they wished to, from the formal financial sector) or by setting a target rate of expansion for credit and allowing the rate of interest to adjust in order to clear the loanable funds market. In the first case if the markets are not cleared at the specified rates then credit is rationed on the basis of "self- financing ratio". The output of stage I is the allocation of loanable funds among firms and sectors and an overall injection of credit into the economy.

In stage II of the model, prices or supplies (or both) are assumed to adjust so as to clear all markets, subject to various constraints such as investment commitments undertaken in stage I, various institutional rigidities imposed by foreign trade, and by the operation of product and labour markets. The output of this stage is 'actual' production, employment, wages and income distribution for the period.

In stage II, the model reaches its solution by means of a tatonnement process that stimulates market behaviour. However, in both stage I and II, actual transaction takes place until the solution of each stage is reached.

Stage III serves to generate the expectation on which the next period stage I decisions will be based, to select some of the rules of its operations (for example the credit regime), and to "age" the model economy.

Stage II is the core of the model and represents the basic static portion of the model, used for comparative static experiments. Stages I and III are used only in the dynamic analysis.

In each period the three stages are solved serially. Variables that are assumed as fixed in stage I are allowed to vary in stage II. Thus the overall model distinguishes between expectations and realizations. In the third stage, the differences between expectations and realizations are incorporated into the forecast functions for the expectational variables with which calculations are made in subsequent periods.

Holding of money balances is specified in the form of the Cambridge equation. Recipients of factor incomes in the model desire to hold money balances as a function of their income and price level. After deciding on their holdings of money balances, the remainder of the income is spent on goods. Because of this specification, the real sector is affected by money.

Equilibrium in the money market occurs when exogenously specified money supply equals money demand¹⁷. The total demand for new cash balances is an endogenous variable in stage II. The real money supply in stage II adjusts so as to accommodate the injection of new credit that was specified exogenously in nominal terms (from stage I). Thus, in the model, inflation or deflation is endogenous in stage II and largely determined by both the credit policy pursued in stage I and the "cash balance" that is endogenous to stage II. Inflation performs a significant function in the model by affecting the real variables of the modelled economy. The structure of the demand for transaction balances and also the demand for real goods is affected by the changes in price level. Unanticipated inflation affects the demand for capital goods in second stage as

17

The nominal supply or injection of new money is partly endogenously determined, since various sectors can hoard or dishoard money balances.

nominal expenditure on investment is fixed from stage I. Similarly, the real interest payments and real exchange rate are affected as the nominal amount for these variables is specified in nominal terms in stage II.

However, the process of domestic money/credit creation is primarily exogenous and is independent of government budget policies. The model also has only one financial asset and does not incorporate financial intermediaries explicitly in the model.

The following linkages are specified in the model:

- (1) As we have seen above, the excess demand for money is not unrelated to the other excess demand equations in the system, i.e. average price level will have certain real effects even if there are no other non-homogenities in the system in the form of fixed money wages, interest rates etc. Excess supply of new money balances (on aggregate excess demand for goods) leads to a general rise in the commodity prices. This not only increases the demand for nominal money balances (as they are directly related to prices) but also causes a reduction in the demand for goods. The process continues until the economy reaches an equilibrium.
- (2) As the total investment in stage II is assumed to be fixed in nominal terms from stage I, the unanticipated increase in the general price level lowers the amount of capital goods demanded in stage II.
- (3) Interest payments in stage II are specified in nominal terms.
- (4) The exchange rate is usually specified in nominal terms.

Using the basic income distribution model of Adelman and Robinson (1978), Bourguignin, Branson and de Melo (BBM) (1989) have developed a model in which a multi-sector computable general equilibrium (CGE) model, (where distributional shifts mostly occur through changes in relative prices) is combined with the standard IS-LM macro framework for an open economy (where asset prices are endogenously determined). The concept of equilibrium is that of 'period equilibrium'. The emphasis of the model is on the income

distribution effect of structural shifts and adjustment programs.

The financial sector specification of the model is in the tradition of Tobin (1969), and Branson (1979). The real sector is in the Dervis et. al. (1982) tradition of CGE modelling and income distribution is modelled as in Adelman and Robinson (1978) but in less detail.

Since quite a few empirical studies have been conducted using the BBM model, we briefly describe the structure of this model.

Real sector specification of the BBM model is in the neoclassical tradition.

Output decisions of the representative firm are derived from the maximization of short run profits subject to a technology given by a constant returns to scale production function with short - run diminishing returns to labour. Labour demand is derived from profit maximization. Capital is fixed in a given period and can be varied over a period of time only by capacity increase or through depreciation.

Leontief production function has been used between value added and intermediate demand. Though there is no substitution between the various components of intermediate demand, within a given sector, domestically and foreign produced goods are imperfect substitutes and are combined according to a CES aggregation function between the domestically and foreign produced components.

The price block in this model defines the tax and tariff inclusive domestic prices and the value added and composite prices which result from cost minimization. Two alternatives are specified for factor demand and wage determination.

- (i) Neo-Classical wage determination and
- (ii) Wage indexation.

Price (and exchange rate) expectations are taken to be adaptive with a one period lag. That is, price expectations are some weighted average of the current years price level and the previous years price level.

Consumption demand by each household class is postulated to result from

the familiar LES after household savings have been deducted from disposable income. Government expenditure is fixed in nominal terms and the composition of a unit of capital is assumed to be identical across sectors. The domestic use ratio results from cost minimization under the CES functional form and export demand has a constant foreign price elasticity of demand.

Investment demand is specified as a function of the profit rate. It is a modified version of Tobin's 'q' theory of investment and takes into account the adjustment costs.

The following market clearing mechanisms have been used for commodity markets.

(i) Walrasian price adjustment and

(ii) Keynesian mark up pricing with endogenous capacity utilization.

When there is full capacity utilization then prices adjust as under (i).

The household's income includes labour income and the share of capital income after accounting for the firms' retained earnings, besides, income from their asset holdings. A wealth effect is included in the aggregate consumption/saving decisions. The household's saving rate adjusts to changes in wealth so the marginal propensity to consume is endogenous. The saving rates are not assumed to be responsive to interest rates.

Financial sector specification adds a foreign asset to the Money - Securities - Capital Model of Tobin (1969). However, their specification - described as multi-level budgeting or tree approach varies slightly from Tobin (1969) as pointed out earlier. Briefly, the allocation of household savings is in two stages. First, households allocate savings to money and then to non-monetary assets depending on their expected relative real rates of returns. The allocation satisfies the financial wealth constraint.

The firms' financial requirements are for investment expenditures, working capital and interest payment on their stock of debt. In the absence of foreign exchange controls and in the presence of a domestic bond market the firms' borrowing decisions are made in an analogous manner to household asset holdings. When there is credit rationing, investment is residually determined from

the national income identity, for a given shadow interest rate.

The government's expenditure decisions are exogenously determined while the government's revenue depends on activity and tax levels. The government deficit is assumed to be met by borrowing from the central bank and the rest of the world.

Equilibrium in the money market has been specified under different financial market closures (for example, foreign exchange control - no foreign asset holdings are then allowed by firms or households; credit rationing- interest rate is fixed); and varying degrees of sterilization are accommodated in the money supply definition.

The foreign exchange market includes the net demand for foreign exchange resulting from demand for goods and assets. Two alternatives, a fixed and a floating exchange rate are specified for closure in the foreign exchange market.

The links between macro and micro components enter primarily through four channels:

(i) Investment demand

As the demand for investment is a negative function of the real opportunity cost of funds, rising inflation encourages investment by producers.

(ii) Wage Indexation

The wage rate is usually indexed for modern sector employment with the degree of indexation depending on inflationary expectations. Thus, in a rising inflationary situation, real wages decline and promote employment and output in those sectors where wages are partially indexed.

(iii) Portfolio Decisions

This channel comes from the interaction of the capital and current accounts when the exchange rate is flexible. Higher expected inflation raises exchange rate (depreciates the currency) and results in capital outflow.

(iv) Mark up pricing

This channel operates when firms are price setters due to some market imperfections. Usually fixed mark up rate is imposed over variable costs. In a

rising inflationary situation, the share of profit, due to increased markup, increases. This affects not only income distribution but also investment.

The dynamics are decomposable in time and consist of capital accumulation and exogenous labour force growth. There is also migration across labour categories in response to wage differentials and the updating of exogenous variables (for example, technological progress). The dynamics of the financial sector are driven over time by asset accumulation. The government deficit moves the debt stock. The current account balance less government borrowing abroad determines the sum of reserve accumulation and net foreign lending by the private sector. Firms' investment moves the capital stock and saving determines the wealth.

This basic structure has been extended and modified and applied by many studies under OECD project on Adjustment and Equity in developing countries. Two major studies which see the interlinkages of monetary and financial sector with emphasis on income distribution are by de Janvry, Sadoulet and Fargeix (1991) and by Berrian, Kim, Roland Holst and Thorbecke (1992). There are also other studies which integrate money with the real sector: for example Model for Malaysia (1992) by Demery and Demery. However, this model does not have any other financial asset. The Lambert and Suwa (1992) model also follows the BBM approach. In this study for Cote D'Ivoire, the capitalists are the only group to hold foreign securities; other households hold only money.

We review, here, only the first two studies mentioned above as these studies have a greater disaggregation of financial assets and financial intermediaries compared to the other studies following the BBM approach.

de Janvry, Sadoulet and Fargeix's (1991) study on Ecuador assessed all stabilization and structural policy alternatives (such as exchange rate adjustment, monetary policy, fiscal policy) according to three criteria:

- (1) their political feasibility,
- (2) their impact on the rate of growth of gross domestic product (GDP), and

(3) their welfare effects.

The standard neo-classical specification of the CGE model in this study has been extended to capture:

- (1) the role of current government expenditure in creating utility, and
- (2) the role of public and private investment in creating productivity gains.

To capture the first effect, the level of utility for the households has been made to depend on both their real disposable income and on imputed benefits from the use of public goods. As far as the second effect is concerned, public investment enhances private investment productivity and profitability by providing basic infrastructure, electricity and telecommunication. This is captured by making total factor productivity in each sector a function of both total private investment and public investment. So, the model is able to capture the "crowding in" effect of public investment.

The financial side of the model is an extended version of the BBM financial side. Here the households' savings rate is a function of income and responds to the average real return on all the assets which the households hold. The wealth variable is dropped from this equation. Thus the model neglects the real wealth/real balance effect (if any). Then, following the BBM hierarchical financial specification, savings is allocated among money in domestic currency, domestic bonds, foreign assets and productive physical assets and housing. Demand for money is given by a traditional money demand function and depends on the real income, the price level and the average return on all the other assets. Money holding is further assumed to be divided, in constant proportion, between currency and demand deposits. Investment in housing is a fixed proportion of the remainder savings. These residual savings are then allocated between financial assets and direct productive investment (modelled as equity participation in firms) and the financial assets are further distributed between domestic bonds and foreign assets. At each level, the allocation decision is based on the relative expected real returns of the two competing assets. The model captures the effect of inflation on capital outflight as expected inflation directly induces an increase in foreign asset holdings over domestic bonds and physical assets, since the risk

of investing in domestic assets increases with inflation. The authors argue that inflation and devaluation are closely related and in the regime of a floating exchange rate, the real exchange rate remains fairly constant over time. Therefore, foreign currency is a fairly safe investment. On the other hand, the real value of domestic currency inversely depends on the inflation rate. In the case of a volatile inflation rate, the risk of holding domestic currency increases and therefore a higher level of inflation (assuming that the level of inflation is a good indicator of the variance of inflation) induces agents to allocate their portfolio in favour of foreign assets.

The investment function as specified in the BBM model has been extended to capture the effect of inflation. Besides the rate of return on capital relative to the cost of domestic borrowing, investment negatively depends on inflation as higher inflation creates unpredictability and risks which deter investment. One explanation is that agents see inflation as a signal of economic problems and thus of expected low future growth. This reduces their expectations about the return on investment, which depends on future demand for output. On the positive side, inflation reduces the real interest rate and stimulates investment, partially compensating for the negative effect of inflation. The net effect of these two opposite influences depends on the assumed interest rate elasticity and inflation elasticity.

Another important extension of the BBM model in this study is the disaggregation of the banking sector between the central bank and the commercial banking sector. Thus, the model can also address the process of creating "inside money" and the "crowding out" effect on private investment of government borrowing from the commercial banking sector.

However, the model does not specify the behavioural equations for the central bank and the commercial banking sector as the equations for the central bank and the commercial banking sector essentially restate the equality of their assets and liabilities from their balance sheets. Direct credit to the private sector from the central bank is specified as an exogenous variable. On the other hand, credit to the government is determined by the government deficit financing policy

and the foreign exchange reserves are determined from the balance of payment equations. Thus, the only way the central bank affect the money supply, in the model, is by setting the reserve requirement for commercial banks.

Commercial banks' savings are defined in the same way as savings of the firms (income - profit tax - distributed profits). The availability of loans on the domestic market is derived from the equality of assets and liabilities.

Equilibrium in the money market is defined both in terms of currency and demand deposits. In the foreign exchange market with a fixed exchange rate, a change in reserves accommodates any excess supply of or excess demand for foreign exchange. With a floating exchange rate, the central bank sets a given change in the reserves (generally zero) as a target and the exchange rate adjusts until excess supply or demand disappears. Equilibrium in the domestic bond market determines the cost of borrowing or the lending rate. Infinite elastic supply is assumed for foreign credit and therefore it matches the demand for foreign borrowing.

The formation of expectations is assumed to follow an adaptive framework, thus the expected inflation for the next year is a weighted average of inflation for this year and inflation for the last year.

The dynamic part of the model essentially consists of updating exogenous variables and stocks of assets. The stocks of financial assets are computed, with end of the current period financial assets stock equal to the stocks at the end of the previous period plus flows of assets during the current period. Capital stocks are updated by augmenting the last period's net capital stock by last period's investment.

The wage adjustment mechanism, is however an exception to this simple updating mechanism. In the model, wages are partially indexed. In this procedure, nominal wage for each category of labour is first fully compensated for the past year's inflation and then this new level of wage is partially adjusted to the change in inflation rate. It is finally adjusted following Phillips curve type adjustment whereby the change in wage is negatively correlated with the unemployment rate (unemployment level for a given level of natural level of

unemployment). This leads to a loss in real wage in periods of increasing inflation but an increase in real wage in the first period of lower inflation.

We see that in the model, real and financial sectors are linked through three channels :

(1) Partial wage indexation effect: inflation affects real wages and thus other real aggregates and income distribution.

(2) Investment effect: direct and indirect effects of inflation, and

(3) Portfolio adjustment effect: effect of inflation on capital outflight.

Kim, Berrian, Roland Holst and Thorbecke (1992) study for Indonesia modifies and adapts a number of behavioural relationships and closure rules to conform better to the underlying reality and institutions of the Indonesian socio-economic system during the adjustment period from 1983 onward although it follows general lines of the BBM theoretical specification.

This model also captures the effect of government investment on sectoral productivity through a shift parameter.

The sectoral wage rates are specified as functions of the rate of inflation, the price of the sectoral output and the growth rate of labour productivity. It is assumed that the real wage rate is more sticky in the short run than in the medium to long run. Hence, a lower elasticity of wage response to inflation is used while solving the model for short run than to medium and long run.

Labour supply of each skill type is assumed to be fixed in the short term. However it is allowed to vary in the long term. Some labour slack prevails (in the form of unemployment or under-employment) in the base year which brings equilibrium in the labour market.

Household consumption is derived in two stages. First, household aggregate consumption for each socio-economic group is assumed to be a function of that group's permanent income and transitory income as this specification fitted best the Indonesian case. As a result of this specification saving function also becomes directly related to household income; and the

interest rates on various financial assets do not appear in the saving function. For obtaining per capita demand of the household group, for each consumption good, a two-level utility maximization specification is used. For the higher level of aggregation (food, manufacturing, electricity, services, paper) a restricted form of the ideal demand system (AIDS) is postulated and for the lower (more disaggregated) level, a conventional LES specification is chosen.

The investment by a firm is specified as a function of previous period output and current output (chosen as an indicator of firm's decisions relating to the level of its investment since changes in output directly affect the firm's marginal revenues if it has some monopolistic power) and the interest rate (reflecting the financing cost of capital for the firm).

The financial sector of the model, like the study in the BBM tradition surveyed earlier, differentiates between commercial banks and the central bank. The model also differentiates among six financial assets, namely money, time deposits in domestic currency, time deposits in foreign currency, bank loans to firms, foreign bonds and equity. Wealth (physical capital and land) is specified to be held by all agents except firms. A firm's equity represents claims of households, government and foreign borrowing.

In deriving the behavioural equations of the financial transactors, it is assumed that the demand for and the supply of the various financial assets depend on real interest rates, as long as the supply is not exogenously given.

In a hierarchical decision making process, the first step consists of the determination of the household money demand which depends on real income and the average interest rate on interest-bearing assets, in addition to the rate of inflation. In Indonesia, under managed floating system, foreign exchange transactions are free. In this system inflation rate affects the household demand for money by affecting expected value of the domestic currency. If the exchange rate is over valued under a managed floating system and the domestic inflation rate is greater than the world inflation rate, official foreign exchange reserves will tend to be depleted leading the public to expect a devaluation. Expectations of devaluation induce a shift in asset-holding by household from money to

inflation-protected assets or financial assets denominated in foreign currency such as foreign currency deposits in domestic banks and household overseas deposits.

Remaining wealth is allocated among interest bearing assets in such a way that, at each successive step, the household decides between two types of relatively substitutable assets. Thus in the first step, interest bearing assets are divided between equities and "other financial assets" according to a proportion which is endogenously determined in the model as a function of the ratio of the rate of return on equity to the average rate of return on "other financial assets".

In the next step, "other financial assets" are allocated between "time deposits in Rupiah" and "financial assets denominated in foreign currency", the shares of which are again endogenously determined. The final step consists of the household deciding between time deposits in "foreign currency" and "foreign bonds".

Two alternative specifications of monetary equilibrium are used: one relating to high powered money and another relating to narrow money. In the former case, money supply is endogenously determined as a function of the various policy instruments (such as reserve requirements on demand deposits and time deposits and the discount rate) in contrast with the latter specification where money supply is exogenous.

The supply of foreign bonds to domestic buyers is infinitely elastic at the prevailing world price. And, therefore, the domestic demand for foreign bonds will always be met at that price.

Similarly, interest rate on time deposits is assumed to be institutionally fixed and therefore, given the perfectly elastic demand, the amount of time deposits is supply determined in the system.

A similar specification is used to describe the portfolio balance equations and monetary balance sheet of the other institutions.

One special feature of this study is that the supply function for equities of the firms is also specified in the model. The firms meet their financing requirements by borrowing from the commercial banks and issuing securities.

The decision on these two aspects of financing depends on the relative cost of the two types of financing.

Though only accounting equations have been specified for the central bank (central bank financial accounting constraint) the model has behavioural equations for the commercial banks [and not simply accounting identities as has been done in de Janvry et. al. (1991) model]. For example, commercial bank's decision regarding using their resources for lending and/ or keeping them in the form of foreign reserves is assumed to depend on the relative rates of return on these two types of assets.

One of the experiments conducted using this model is the monetary contraction (money supply decreased by 15% compared to the base run). Monetary contraction turned out to be very deflationary. GDP growth is practically not affected in the short term but is reduced by over 1% p.a. in the long term compared to the base run. The current account of the balance of payment improves substantially, mainly, because of the slow down in import demand. The distributional consequences are generally quite neutral.

A counterfactual policy of monetary expansion (money supply increased by 15% compared to the base run in this experiment), on the other hand, would have boosted real GDP growth slightly in the short run and marginally in the long run. Again, its distributional impact appears to be quite neutral. However, this policy generates a substantially higher rate of inflation compared to the base run and a worsening in the current account of the balance of payment and the appearance of a net flow of private borrowing abroad instead of the traditional flow of net private lending abroad.

Thus, we see that the specification of financial behaviour, in these models, using the hierarchical process, is quite ad hoc as it is not derived from the optimization of the objective function of various economic agents. However, it is convenient to work with because it is capable of capturing the effects of changes in the various rates on household financial portfolios. With financial liberalization taking place in many developing countries, interest rates are

assumed to be flexible in future. With a flexible interest rate system, the portfolio adjustment channel of transmission seems to be quite promising and dominating. The above models, in the BBM tradition, emphasize this channel.

2.2.2.2.2 Structuralist CGE Models

This approach has been advanced by Lance Taylor. The approach emphasizes structuralist or institutional features of the economy and points out that the power groups in the economy and various market imperfections play an important role in determining the outcome of any policy action (For further details of these types of models refer to Section 1 of this chapter). Therefore, in these models, we find a greater disaggregation of agents and existence of various types of rigidities.

One of the important study in structuralist CGE tradition is that of Resensweig and Taylor (1990). Though this study appeared in the book published in 1990 the study was done in 1984. Since many CGE modellers have used this approach, we will review this study before other studies.

Resensweig and Taylor (1990) study for Thailand focuses on short-term macro-economic adjustment process. With this focus, it studies the potential crowding out or crowding in of private investment by expansionary fiscal and monetary policies; potential offset of monetary policy initiatives to an extent by the capital movements and real and financial effects of devaluation.

In the specification of the model, real and financial sub-models are linked by flows of funds and the interest rate on bank loans.

The real sector specification follows the standard structuralist specification. The domestic producing sectors have constant elasticity of substitution among intermediate inputs. Cost indices for sectoral intermediate uses and input-output co-efficients follow from the algebra of the CES specification.

Saving of the household is specified as household income net of consumption spending. Consumption in turn is a function of income and wealth (so real balance effect has been included in the model). Household's final demand for different goods follows a linear expenditure system.

Investment by the firm depends positively on profit rate and negatively on the interest rate on loans. Investment by the household is a function of the interest rate and household real income. Allocation of household's financial wealth among the available menu of assets (i.e. currency, bank deposits, shares of private firms, securities of the government) is based on the algebra of the well-known CES production function (as described earlier). In this specification, money is treated symmetrically with other assets and therefore an associated problem, namely that of money being dominated by other assets, may arise.

As far as the portfolio behaviour of the corporate firm is concerned, a combination of stock and flow equations is adopted. Firm finances its deficit (i.e. excess of net investment over saving) by issuing equities and borrowing from banks and the rest of the world (ROW). Equity is specified as an elastic function of the deflated deficit (i.e. corporate firm's deficit deflated by the price of capital goods). Total borrowing (in stock term) is split between bank loans and foreign loans on the basis of the CES specification described above. Here, firm minimizes a utility function based on the capitalized borrowing costs on two types of loans instead of maximizing the utility of expected returns as is done by the households (described above).

In the model, to meet its credit needs, the government borrows from the commercial banks, the Bank of Thailand (BOT) and the ROW. To capture the "crowding out" effect, bank credit to the government is specified as a function of deposits and depends on statutory liquidity ratio (SLR). On the other hand, government borrowing from the BOT is residually determined.

Behavioural equations are also specified for the commercial banks and the BOT.

Commercial banks supply loans on the basis of their available resources (deposits from households plus advances from the BOT less enforced loans to the

government and required reserves.)

A loan supply function of banks is positively related to the interest rates which they receive on their loans and negatively to the rates which they have to pay for foreign loans and the rediscount rate. The interest rate is assumed to clear the loan market. On the other hand, excess reserves of the banks respond negatively to the loan rate. The residual item in the banks' balance sheet is the total of their foreign loans. At the margin, the banks adjust their foreign exposure in response to changes in domestic conditions.

The role of the central bank in the model is to set the reserve ratio and the volume of rediscount and to accommodate the market. For setting the volume of rediscount by the central bank a behavioural rule is specified- according to which central bank cut back on advances to commercial banks when they have taken a large volume of foreign loans or "mop up liquidity" when excess reserves are high. Central bank reserves balance the foreign accounts.

In the model, foreign loan supply automatically meets the demand from firms, the government and the commercial banks.

In this setting it was found that changes in the real sector affect the financial sector and vice-versa.

For example, a 5% increase in public consumption financed by borrowing from the central bank resulted in an increase in real GDP as well as price indices and real exchange rate. As a consequence, real value of exports fell down. This increase affected not only the real variables but also the financial variables of the economy. As a result of higher commodity and share prices, nominal household net worth rises with augmented saving flows and capital gains. Increased wealth partly results in higher deposits with the banks and shifts the banks loan supply schedule upward. The resulting reduction in interest rate with higher profit rate (as a result of higher output) stimulates investment. Thus there is a "crowding in" of private investment.

At the same time, imports rise and firms reduce their borrowing from abroad as the internal interest rate falls. These current and capital account changes cause the BOT to lose almost equal reserves.

However, when government spending is financed, principally, by borrowing from commercial banks, the capital inflow contraction is not sufficient to offset all the credit creation to domestic firms and the interest rate rises; real investment falls. Thus, there is a modest crowding out of private capital formation.

Changes in monetary and financial spheres also affect the real variables in the economy in this model. The model was simulated for different kinds of restrictive monetary policies. For example, a reduction in central bank advances by half resulted in an increase in interest rate and decrease in GDP. As the economy contracted, the price index fell down.

However, the central bank gains in reserves partly due to a lower current account gap and partly from capital inflows. Firms add to their foreign borrowings as the domestic loan rate rises and banks go abroad to compensate for a reduction in deposits.

Another policy simulation was carried out with 10% nominal devaluation. In this simulation, capital losses on foreign loans after devaluation, crowd out domestic capital formation and cancel expansionary export and import changes.

Overall, the conclusion reached in the model is that in an economy, open to capital flows, monetary expansion/contraction is partly offset by foreign lending/borrowing and effects on investment demand are correspondingly moderated.

The Easterly (1990) model in the tradition of structuralist CGE model also analyzes the effect of devaluation on a highly indebted economy, Mexico, both through the usual real channels and via the real level of financial stocks.

With emphasis on short run stabilization, the model is a Leontief type (as regards the production technology) clearing model. To capture the real balance effect, total consumption by an economic agent is specified by a standard LES consumption function (linear in disposable income) with a real balance term

added.

Investment by economic agents is a function of the cash flow and the replacement cost of capital. Nominal cash flow consists of gross profits less taxes, interest payments and capital losses on debt.

Portfolio behaviour of economic agents (with three types of assets - Peso assets, Mexdollar assets and Dollar assets) presented in the model is a modified form of Tobin's system. In this formulation, net position in each asset is a linear function of net financial wealth and a logistic function of rate of return on that asset.

In this setting, devaluation affects real balances, cash flow (and thus investment) of producers, portfolio demand equations and the government deficit in the following ways.

1. Real Balances: If the share of dollar assets in total financial holding exceeds the elasticity of the aggregate consumer price deflator to the exchange rate then there would be an increase in "real balances".

2. Investment: Because of cash flow specification, financial flows enter into the investment function. Effect of devaluation on cash flow depends on the relative shares of exports in total sales, of dollar denominated loans in total debt, and of imported goods in total investment. The non-financial effect of devaluation depends on the ratio of export revenues to gross profits vis-a-vis the import share of investment expenditure. The "debt burden" effect of devaluation on the other hand, depends on the domestic price response and on the extent of "financial dollarization".

3. Portfolio Demand Equations: For rentiers, devaluation will raise both the share of dollar denominated assets in the portfolio and the total net financial wealth. The increase in wealth will lead them to hold a higher nominal value of all assets. The increase in the value of dollar assets will be shared out among both dollar and pesos assets by converting dollars into pesos.

Similarly, for debtors devaluation causes an unwanted increase in the share of dollar debt in the total, so some dollar loans are retired and replaced by peso debt.

4. Fiscal Response to Devaluation: Fall in the real value of the government's external debt due to devaluation, will improve its position .

The model closure is short run and Keynesian i.e. quantity adjustment in all sectors is assumed and, therefore, both the overall level of output and the level of current account balance are determined endogenously. On the financial side of the model, all interest rates and the exchange rate are assumed to be fixed. Therefore, equilibrating variables are the level of foreign exchange reserves and the foreign debt of the non- financial public sector.

Simulation result for a 50% devaluation in this model shows a 4% decrease in GDP. GDP declines because of the redistribution of income from wage earners who have high propensity to consume, to export earners who have high propensity to save; increase in the foreign saving due to increase in the initial dollar current- account deficit in peso terms and increase in the government saving because of higher peso income from oil exports and taxes on foreign trade.

Besides the overall decline in the output, there is a sectoral reallocation of investment, sectoral reallocation of the decline in consumption and portfolio reallocation as described below:

- 1) There is an overall fall in investment induced by the increased debt burden on corporations. However, sectoral shifts in investment take place since rentiers increase their investment because of improvement in their net asset position in dollars. Rentier capital spending is concentrated in construction and real estate.
2. Devaluation affects the distribution of the decline in consumption. Although consumption by rentiers and propertiers does fall due to a fall in output, the asset holdings of these classes, especially their dollar denominated components, limit the consumption impact for them. However, for wage earners, the impact would not be moderated because there is no asset cushion for them.
3. Portfolio effects were also substantial in this simulation. The increase in dollar holdings induces rentiers to reallocate the wealth from dollar assets to peso assets and hence they reduce the actual dollar amounts by 24% compared to the base. Similarly, corporations retire some of their dollar debt because of the

lowering of the level of investment and higher valuation of dollar debt.

The CGE model developed for Turkey by Lewis (1992) incorporates two asset markets in order to capture the structural features of developing countries (such as working capital financing needs by firms, the existence of segmented credit markets and wide variations in the sectoral cost of borrowing). The model is used to explore the consequences of financial liberalization under different structuralist assumptions about saving- investment determination. With favourable saving and investment elasticities financial liberalization produces favourable results but with less optimistic circumstances the results are mixed.

Labour households save a fixed fraction of their current income while capitalist households save at a rate that depends on the real return available to funds deposited in the banking system. Demand for investment by firms is determined along neo-classical lines but imperfections and rigidities have been incorporated.

In neo-classical specification (taken from Jorgenson (1963)) the marginal revenue product of capital equals the cost of acquiring an additional unit, i.e.

$$PVi (\partial V_i / \partial K_i) = PK_i (r + \delta_i - \partial PK_i / \partial t)$$

Where PVi and PK_i are the prices of the output and capital stock respectively, δ_i is the depreciation rate and r represents the relevant real opportunity cost to the investors.

In the absence of well-developed equity markets in the developing countries, the capital gains term $(\partial PK_i / \partial t)$ is less relevant to investors evaluating investment opportunities. Therefore, in this application capital gains term is dropped. Also, since persistent differentials in capital productivity are observed, which imply divergent rates of return to investment in various activities, real opportunity cost is replaced by sectoral parameters (r_i) that reflect existing

differentials in sectoral rates of return and the price of the capital good is augmented by the real cost of borrowing ($I_i - \text{PINF}$; I_i =sectoral average borrowing rate, PINF =inflation rate) since these costs differ substantially by sector and clearly influence investment demand. Thus we get

$$PVi (\partial V_i / \partial K_i) = PK_i (1 + I_i - \text{PINF})(r_i + \delta_i)$$

In the model, investment demand by firms in each period is, thus, specified as a function of

- 1) The ratio of desired to actual capital stock. However, adjustment lags, uncertainty and pessimism about the future are taken in to account by imposing incomplete adjustment.
- 2) The possibility of direct crowding out of private investment by public investment is incorporated.

Foreign borrowing, in the model, is neither determined endogenously nor is it a policy instrument of the government. Instead, it is an exogenous variable. This assumption is based on the belief that, in countries with capital controls, the willingness of foreign banks to lend determines the availability of external funds.

Foreign exchange market equilibrium is brought about, primarily, by changes in commodity flows rather than changes in asset flows.

Flexible exchange rate is assumed. However, a premium rationing scheme for imports exists, whereby importers obtain foreign currency by paying a fixed premium over official exchange rate.

Firms demand funds to finance the acquisition of new capital stock when purchase price faced by them exceeds the retained profits and to finance a fraction of the advance purchases of working capital.

Credit market segmentation (organized and curb markets) exists in the model. In the organized sector, up to a certain level, credit is subsidized by the government. However, credit is rationed as only preferred groups, like exporters, have excess to unlimited supply of subsidized credits. Unpreferred groups obtain

credit from the banks at competitive rates or from the unofficial "curb" market. Thus, the borrowing rate facing each sector is an average of the subsidized and unsubsidized rates.

Households allocate their wealth between currency and time deposits through a simple Keynesian money demand function. Nominal currency demand is the sum of transaction demand which is positively related to nominal income and liquidity preference, which responds negatively to increases in the nominal deposit interest rate. Remaining of the wealth is held in the form of time deposits.

To finance the government deficit or accommodate increase in foreign reserves; the central bank responds with increase in the supply of currency, required reserves in the banking system or foreign borrowing. However, aggregate foreign capital inflow is exogenous to the model. In the absence of a private market for government debt instrument, the central bank is limited in its ability to sterilize reserve changes. The central bank can control the monetary system only by manipulating the reserve requirements.

No behaviour rule is prescribed to the banking sector in the model. It serves only as a financial intermediary to insure that interest payments are channeled from borrowers to savers and demand for loans equals supply.

In the model, the capitalist savings rate is linked positively to the real deposit rate and private investment is related negatively to the real cost of borrowing. Thus, changes in the real interest rate on deposit and lending bring about equilibrium between saving and investment.

In the market for currency a major adjustment mechanism is the changes in the price level.

Simulation exercises were carried out by increasing the base period deposit rate first from the base of 20% to 25% and then further to 30% and finally allowing it to adjust freely so as to eliminate all quantity rationing of investment.

The liberalization of deposit rate appears to be quite successful. For example, increasing the deposit rate to 25% (to 30%) permits the ratio of actual

to desired investment to increase to 86.9% (to 94.7%) from the base period value of 80%.

However, the author points out that, on closer examination, the results are not very impressive. The interest rate reform does result in an increase in capitalist savings of 13% in the case of freely determined interest rates. However, since saving by the labour households is the fixed proportion of the income, and is independent of the real interest rate the remaining saving components rise only with inflation. Hence, aggregate saving increases only by 5% or 1-2% in real terms. Real investment increases only by 2%. This effect arises because a rise in real borrowing costs (as a result of assumption of zero profits in the banking sector banks increase the lending rate in response to the increase in the deposit rate) results in a decrease in the desired real investment.

Financial reforms also change the distribution of GDP. The share of private investment in GDP rises from 12.5% in the base period to 15.3% in the most successful liberalization scenario. With the government investment constant at 10.8% of GDP the aggregate investment rises from 23.3% to 26.1%.

The government benefits from the liberalization as the flow of the time deposits into the banking system increases, the government's borrowing from the public through reserve requirements also increases correspondingly. This reduced the government's dependence on the printing press to finance its deficit.

Another model developed for Thailand is that of Vongpradhip (1987). In this model, the link from the real side to the financial side is through saving, while the linkage from the financial side to the real side is through interest rate. Firstly, the interest rate on loans feeds back into the production decisions on the real side. This is a linkage between credit and the supply side of the economy. Secondly, interest received on all assets and interest payments on all liabilities also enter into the income and expenditure flows of institutions on the real side.

The paper looks into the effects of interest rates differentials in the domestic and foreign markets on capital movements. The effect on the total

output as a whole, together with the distribution of output to various sectors, is also looked upon at. The model also looks into the effects on other macro-variables such as the general price level within the economy and the terms of trade. Another simulation exercise investigates the effects of credit allocation in a certain sector.

In the model, the production functions of both the agricultural and the non-agricultural sectors follow the CES technology, while intermediate inputs are given by the Leontief fixed co- efficient rules. One of the important features of the model is that the credit availability enters the production function directly. The demand for both labour and intermediate inputs are declining functions of the average interest rates on loans required for working capital. With the change in the derived demand for inputs, outputs are also affected.

Non-agricultural producers can resort to both domestic and foreign loans and they are not credit constrained. On the other hand, for agricultural producers credit is constrained from formal sources. However, producers can always take recourse to the informal market.

Portfolio behavioural equations are specified for all the agents in the economy as follows.

For households portfolio specification, it is postulated that household borrowing is supply determined from formal financial institutions (sector). These personal consumption loans and liabilities are assumed to follow trend growth and are determined exogenously. Portfolio decisions are made in regard of three variables, namely, currency, deposits and government securities. For corporations and financial institutions, portfolio choices are in respect of liabilities. For example, corporations make portfolio decisions on the mix of domestic and foreign loans.

The government sets the ceiling on the amount it wants to borrow from abroad. For the shortfalls on the need for financing its fiscal deficits, the government turns to the domestic market by issuing government securities. The holding of government securities is demand determined for households and policy determined for financial institutions. The residual is absorbed by the BOT.

Net holdings of foreign assets of the BOT are also taken as residual.

The portfolio choices of households, corporations and financial institutions follow that of Taylor and Rosensweig (1990). Briefly, the choice depends on a vector of returns (cost) on each asset (liability) as well as on the amount of the assets (liabilities). The desire to hold a combination of different assets (liabilities) is assumed to result from a function of CES utility (cost) type.

Most interest rates in the model are fixed. The exceptions are the interest rates on non- agricultural loans and interest rates in informal markets, which are determined by the equilibrium of demand for and supply of loans in their respective markets.

The paper shows the effect of an exogenous decline in foreign interest rate on the economy.

With a lower interest rate on foreign borrowings, both corporations and financial institutions prefer to borrow more from abroad. As the cost of funds is now cheaper for financial institutions, they are willing to supply more non-agricultural loans in the domestic market. At the same time, the demand for non-agricultural loans by corporations declines as they also borrow from abroad. As a result the interest rate on non-agricultural loans declines. This has an impact on the real variables of the economy.

With a lower interest cost, producers of non-agricultural products are willing to produce more and demand more inputs, particularly labour. Demand for labour increases the wage rate in the non-agricultural sector. Given the limited supply of labour in the economy, shift of labour from the agriculture to the non- agricultural sector puts pressure on agricultural wages as well. Thus the average wage rate rises. With increased wage cost, agricultural sector also requires more working credit. As the amount of loans available in the formal sector remains the same, they have to resort to borrowing from the informal market at a higher cost.

GDP in the agricultural sector decreases slightly while that in the non-agricultural sector rises. The combined result is an increase in GDP for the whole economy. Exports rise slightly while imports increase more. (However,

savings in interest payments abroad more than offset trade deficit with the result that the current account deficit declines.)

Jemio and Jansen (1993) study is also for Thailand and is in the tradition of structuralist CGE framework. The distinguishing features of this study compared to the other two studies reviewed earlier, by us, are as follows :

1. The model is dynamic.
2. It has a larger disaggregation of commodities and sectors.
3. The financial portfolio of each agent, including financial intermediaries, is modelled in greater detail. Thus, in the model, full portfolio decisions become visible rather than only net holdings of financial assets as is the case with the Rosensweig and Taylor (1990) study.
4. The role of international finance is made more explicit by including the main types of international finance and by defining the main channels through which these different types of finance flow in and out of the economy.
5. The model has created a special account for the stock exchange of Thailand (SET) which is a destination for investment by domestic agents and foreigners (portfolio investment).
6. In contrast to earlier models, the dynamic nature of the present model gives more weight to the role of asset and liability stocks in the adjustment process.

The purpose of the study is to perform simulations of fluctuations in external variables (terms of trade, access to international finance) and of economic policy measures (devaluation of exchange rate and an expansionary fiscal policy) and to study their impact and effectiveness.

Real sector specification, in the model, follows the standard structuralist CGE specification. The level of domestic output is determined by a CES production function in the case of agriculture and mining sectors. The prices in these two sectors are assumed to follow world market prices and any gap between demand and supply is cleared through exports (or imports).

The other four sectors (light manufacturing, other manufacturing,

construction, public utilities and services) engage in mark up pricing and are characterized by excess capacity. However, supply may be constrained by either the availability of foreign exchange to finance import of goods or shortage of labour. In case of these binding constraints, prices (and mark-up rates) adjust to close the demand-supply gap.

Average wage rate in the model follows the changes in the price level.

The model incorporates saving, investment and portfolio behaviour of each institutional agent in greater detail. Each agent satisfies the wealth constraint.

The "accumulation balance" (total assets= total liabilities+ net wealth) adjustment of the household sector follows the 'prior saving' approach. Households savings are determined by the level of disposable income and the level of wealth. To their savings, households can add liabilities, obtained from domestic financial institutions. Total funds are then allocated to the various financial assets through a CES type stock-adjustment function following Rosensweig and Taylor (1990) specification described earlier. This describes the changes to the initial asset structure that are made in response to changes in relative profitability of the various assets. Household investment in real assets is, implicitly, derived as a residue.

Corporate investment is demand determined. The investment demand equation was estimated econometrically; accelerator mechanism, level of inflows of direct foreign investment and the real rate of interest were found to have a significant impact on investment demand. Though foreign exchange constraint and budget constraint are specified for investment they are not binding in Thailand.

Corporations also decide on their financial assets and liabilities portfolio using CES stock adjustment function. It is assumed that commercial banks satisfy the credit demands of the corporations.

Government investment and consumption expenditure are exogenous (policy) variables. The closure for the government balance is provided by the credit from the BOT.

The central bank can increase the interest rate charged on its loans and limit the level of credit to banks and other financial institutions. Credit rationing by the central bank is captured through an indirect mechanism, by specifying the minimum level of its foreign exchange reserve required (MIREs). If that level becomes binding, the central bank rations credit to financial institutions.

One of the unique features of the model is that it distinguishes commercial banks from the other financial institutions (OFIs). The adjustment of commercial banks and OFIs assets and liabilities portfolio follows the same portfolio adjustment function as in the other sectors. The domestic interest rate fluctuates to clear any gap between the demand for and supply of credit.

Another interesting feature of the model is the introduction of SET as a price clearing market. The flows of funds in and out of the SET are determined by the returns and costs of funds compared to those on alternative assets and liabilities. The inflow of portfolio investment funds from abroad is exogenous. At the SET, the prices of shares moves to equilibrate demand and supply fluctuations.

The balance of the current account and the capital account transactions determines the foreign reserve holdings by the BOT, which acts, in principle, as the closure of the whole model.

The key policy instruments in the model are: the nominal exchange rate, the MIREs, the interest rate charged by the central bank, the level of government consumption and investment expenditure and tax rates.

The model has been simulated for two types of shocks (1) external shocks (2) policy interventions.

From the results of these simulation exercises, we see that an increase in the world interest rate has small contractionary impact on GDP because the higher world interest rate reduces foreign borrowing which affects adversely the funds available for investment. On the other hand, a higher interest rate also lowers foreign portfolio investment which reduces the SET index and through the interaction between the financial markets also reduces the returns on domestic financial assets. However, the higher international interest rate is not

translated into higher level of the domestic interest rates as most of the rates of return (such as the rate of return on corporated and unincorporated capital, the administered rate of return on government bonds) are determined predominantly by non-financial factors.

A decrease in the level of foreign portfolio investment by 20 bn Baht affects the economy via

1. wealth effect of fluctuations in the SET index; negative value leads to a decrease in wealth and, therefore, a decrease in consumption.
2. monetary aspects of the inflows of portfolio funds.

Foreign portfolio investment funds enter the Thai economy, in the first instance, as commercial bank deposits. Banks use these funds to purchase the desired stocks. A drop in inflow leads to a drop in the reserves and supply of credit from the banking sector and thus investment is adversely affected. As a consequence, there is an increase in unemployment and hence a drop in household income, saving and investment. A substantial fall in GDP and the price level is also reported. Though the impact on exports is minor, imports fall with the decrease in investment and production. There is a substantial fall in current transfer payments as a result of the reduction of foreign share ownership.

On the other hand, a decrease in the inflows of direct foreign investment was found to be far more contractionary than a decrease in portfolio investment. This shows the high degree of dependence of Thai economy on foreign capital.

The level of private corporate investment demand falls not only because of the fall in the level of foreign investment but also because of the "knock on effects" of foreign investment on private investment demand.

The monetary effects are much weaker in this case because the direct investment flows are not channeled through the monetary system. Though the monetary system loses some foreign reserves, a decrease in credit demand prevents the interest rate from rising.

As far as the simulation exercises with policy intervention are concerned, a devaluation by 10% was found to be contractionary. The higher cost of

imported inputs leads to an increase in the domestic price level. As a result, the real wage and private consumption expenditure fall.

Since devaluation increases the domestic currency value of the foreign liabilities and of the debt- servicing obligation, current transfer payments to the rest of the world increase and result in a decrease in the net profits of private corporations and state enterprises. This adversely affects the level of their investments. The devaluation improves the real exchange rate only for two years. Thereafter the real exchange rate deteriorates due to the domestic inflation.

The value of both foreign assets and liabilities in local currency terms increases due to devaluation. This change in the relative returns leads to portfolio reallocation by economic agents. There is also slower accumulation of external debt because of the improvement in the current account.

The simulation exercise with expansionary fiscal policy shows a substantial rise in the GDP level and acceleration in inflation. As a result, the real exchange rate declines and exports suffer. Imports rise with the higher level of aggregate demand and current transfer payments to the rest of the world increase with the increase in foreign borrowing. The current account deficit widens.

The income growth generates a higher level of private savings and private corporations also increase their borrowing from banks and from abroad. There is no increase in the domestic interest rate and no crowding out of private investment.

However, the central bank runs out of foreign reserves at the end of the period.

In one scenario, MIREs was introduced and it was found that it leads to an abrupt cut in domestic credit and hence a severe fall in private investment and in GDP .

Thus, a fiscal expansion, as modeled here is unsustainable.

2.2.2.2.3 CGE Models for India

Taylor (1983) study, for India, emphasizing the structuralist approach describes the following three types of short- run macro- adjustment mechanisms:

1. Changes in capacity utilization i.e. output adjustment.
2. Shifts in income distribution resulting in forced saving.
3. Balance of payment adjustment.

Real sector specification of the model incorporates these adjustment mechanisms.

While specifying the real side of the economy, full utilization of capacity is assumed so as to emphasize price instead of output changes. Excess demand adjusts towards zero by forced saving in the short run. The mark-up rate is an endogenous macro-variable, while output is determined by available fixed capital. Continuous flow of labour is assumed, while excess macro demand is driven to zero during a period in which money wage does not change.

The growth rate of capital (investment) is assumed to depend on the difference between the rate of profit and the real interest rate.

No saving is assumed from wages and interest income and savings from profits are a constant fraction of the profits. Then, together with the profit rate, the savings- investment balance brings the price level in equilibrium. The profit rate varies inversely with the interest rate and the money wage and positively with the price level.

As a result, during the era of rising prices, distributional shifts towards profit income earners take place and generate higher savings (forced savings).

The financial side of the model distinguishes three kinds of assets, namely, money (held in the form of deposits), loans to firms and gold (which is meant to represent an asset group consisting of assets like currency, precious objects, land and real estate).

Firms are assumed to hold deposits equal to their working capital requirement. On the other hand, the public is assumed to keep a fraction of its

wealth in the form of bank deposits.

It has been assumed in the model, that banks do not hold excess reserves. However, they are subject to a minimum reserve requirement prescribed by the Reserve Bank of India.

Thus, the total supply of loans to the firms from the banks is equal to total deposits with the banking sector net of reserve requirement. The interest rate is supposed to vary rapidly to drive excess demand to zero in the market for loans. On the other hand, a controlled interest rate is assumed to be paid on bank deposits.

Gold is held in anticipation of capital gains. The real expected percentage capital gain on gold is equal to the expected price of gold net of expected inflation. In the short run, gold is assumed to have a market clearing price.

In the model without gold, an increase in the price level (due to monetary expansion) raises the value of the firms' physical capital. In the absence of widely traded equities, firms will put their windfall gains to use by demanding more loans. With bank lending limited by reserve requirements, public lending to firms rises and puts upward pressure on the interest rate, which leads to a reduction in bank deposits. Another effect of the rising expected inflation rate is the reduction in the real rate of interest and increase in investment demand. The relationship between price and interest rate can be either positive or negative, depending on whether cost pressure or investment demand reduction from a rising interest rate is stronger.

The transmission mechanism is altered crucially when gold is included in the model. The result would depend on whether the new deposits come from the category of assets termed 'gold' or from existing productive loans from the public in response to an increase in deposit rate. The credit availability to firms increases only when the new deposits come from a reduction in gold holdings. However, in this case, the medium run effect might be an increase in gold price if the saving rate goes up in response to a rise in interest rate. In such a situation, there would be less demand pressure at a given interest rate and hence there would be lower prices and interest rates. The portfolio will shift towards money

and gold and there could be a further acceleration in gold prices and shifts away from loans.

The model without gold for India (gold was dropped from the model for lack of reliable data) was simulated for a reduction in the net non-monetary liabilities of the RBI. This resulted in a decrease in money supply by 4%. The results point out the increase in interest rate, cost push in manufacturing through an increase in the cost of working capital and a decrease in investment demand, increase in prices in all the sectors and a decrease in output of the non-agricultural sectors. As a result, income is distributed in favour of agriculture and profits.

Another experiment was with 15% devaluation under the assumption that exports do not respond to a higher exchange rate. In this exercise, the prices of non-agricultural products increased as a result of a higher cost of intermediate imports, while real wage as well as aggregate demand decreased. This resulted in reduced production in those sectors where there were quantity adjustments, and lower prices in the agricultural sectors. However, there is an overall increase in prices. There is a favorable effect on trade deficit in rupee terms due to an increase in the nominal value of exports and remittances, and the reduction in the volume of intermediate imports. Along with non-agricultural prices there was an increase in the nominal value of investment. The nominal export subsidies of the government fall releasing the required resources for increased saving. So, there is a net increase in saving from the government, and a decline in total bank credit expansion and hence money supply. The interest rate, therefore, rises which puts pressure on the price level via higher cost of working capital and decreases real investment.

As pointed out by Chitre and Naik (1989), the main weakness of the model lies in the assumption of a market clearing interest rate. Due to a heavily administered interest rate structure, the nominal interest rate does not clear the loan market. In such a situation, a quantity adjustment mechanism like credit rationing has to be considered, as the availability of credit rather than its cost, becomes a crucial consideration. They also doubt the assumption that interest

payments on working capital form a significant portion of the firms, total costs, or any variations in it to affect price determination in the short run.

The Sarkar and Panda (1986) model superimposed the money-price quantity feedback on the core price-quantity model in order to analyze the effects of fiscal and monetary policies in a comparative static framework.

Agricultural output and price levels are kept exogenous in the model. Agricultural prices are specified as the sum of intermediate input costs, import costs and value added costs. On the other hand, excess capacity has been postulated in the non- agricultural sector so that supply adjusts to demand. Mark-up pricing on the prime cost is postulated for these sectors. The mark-up rates are endogenously determined in the monetary block.

Wage rates in non-agricultural sectors are partially indexed to the consumer price index. Government wage rate also follows partial indexation.

The society is divided into three income classes, namely, agricultural wage income earners, non- agricultural wage income earners, and non- agricultural non- wage income earners.

Private consumption levels are endogenously determined by linking consumption to income level, which in turn is linked to the production process. The sectoral consumption is responsive to both income levels and prices after certain floor consumption levels are specified by a linear expenditure system.

The savings for the three income classes are specified as functions of their respective incomes.

Nominal private fixed investment depends on GDP and commercial credit advanced by the banking system whereas nominal public investment is treated as exogenous.

A monetary block is appended to the real sector block. Money supply (M3) in this block is determined from base money using the money multiplier. The base money is an accounting identity (it is a sum of RBI credit to the government, net foreign assets and other assets).

Bank credit to the government (commercial bank loans as well as RBI credit) is determined directly from the budget deficit (defined as the difference between government expenditure and government income).

Bank credit to the commercial sector is computed residually from the money supply identity.

The overall price level (GDP deflator) is specified as a linear function of money supply, the real GDP and one year lagged price level. The consistency between the overall price level, determined directly from money supply, and the GDP deflator computed from the sectoral factor costs, is brought about by changes in the mark-up rates of the non agricultural sectors.

Thus, both the mark-up and the wage rates respond to the money supply pressure.

In the model, changes in the monetary sector affect the real sector in two ways. First, money supply affects prices, which in turn affects the real magnitudes. In the absence of an explicit money demand function, P implicitly clears the money market. The cost side gets adjusted to the price P , determined by the monetary equation through the endogenous mark-up rate T . Second, there is a direct linkage through the effect of commercial credit on private investment.

On the other hand, the linkage from the real sector to the monetary sector is via savings (private sector saving, government budget deficit and balance of payments).

Simulation exercises were carried out with alternative government budgetary decisions. Increase in direct tax rate results in a decline in real GDP, general price level, private consumption and budget deficit, whereas real investment and tax revenue increases. The second set of effects operates through the budget deficit decline. A lower level of budget deficit lowers the monetary base and money supply and, therefore, the overall price level declines. Also the mark-up and the wage rates in the non-agricultural sectors respond to money market pressures, and this leads to a chain of effects through private income, consumption and output.

On the other hand, an increase in the indirect tax rate leads to a decrease not only in GDP, price level, consumption and budget deficit but also in investment. The second set of effects operating through the budget deficit reduction, noted in the previous scenario, operates in this scenario too and brings about an overall decline in the price level. However, an increase in the indirect tax rate directly pushes cost and prices upwards. Therefore the ultimate price decline in this scenario turns out to be less than in the previous scenario. On the basis of results of these two simulations, Sarkar and Panda suggest that a direct tax rate increase scenario should be preferred to an indirect tax rate scenario if national income growth and price control are the two major criteria of policy evaluation.

Another set of exercises was carried out in which the government expenditure was specified to increase. When the resulting deficit is monetized, there is a substantial increase in GDP and the price level. Both consumption and investment increase in real terms. There is a buoyancy effect whereby tax revenue collection increases even when tax rates are not changed. When the increased government expenditure was financed by increased tax rates, the real GDP increased and budget deficit as well as price level declined. Real investment increased but real consumption fell down. Tax revenue increased subsequently.

The weak points of this study are :

1. Only an econometric estimate of the parameter connecting the monetary base and the change in money supply has been made. No behavioural explanation for monetary expansion has been provided. Changes in fiscal policy not only directly affect the real sphere of the economy but also have an impact on the economy via changes in monetary base, money supply and hence overall price level. This, in the presence of non homogeneity in the system, affects the real variables of the economy. Therefore, one needs to specify a behavioural equation connecting the monetary base with the government budget deficit.
2. In the model, the banking sector is a consolidated complex of the central bank, commercial banks, savings banks, development banks and other financial institutions. Therefore, the model is not able to capture the way the banking

system is regulated through reserve requirements, restrictions on interest rates and other provisions for forced lending to the government. These provisions have important implications for the system. The government taps the banking system for finance either by imposing relatively high reserve requirements or by increasing the rate of issue of base money. Although less inflationary, the former route typically drives down real yields to depositors and drives up lending rates of interest to private borrowers, thus reducing private investment. On the other hand, if the government resorts mainly to the issue of base money without increasing reserve requirements, the rate of price inflation will be higher, although "crowding out" of private investment will be somewhat less. Therefore, any realistic financial model of a less developed country should have a larger disaggregation of financial intermediaries and financial assets.

2.2.3 Conclusions

From the above review of literature, the following conclusions emerge which should be kept in mind while building a meaningful financial CGE model for India.

1. Construction of financial CGE model cannot be purely in the neo-classical tradition though this tradition provides an analytically traceable framework for the impact of change in any exogenous variable. Structural rigidities (for example partial wage indexations) in the system introduce non-homogeneity in the system and money becomes non neutral. The structural characteristics/ features (like existence of various power groups affecting the determination of prices in the system) of an economy play an important role while determining the outcome of any policy change. Therefore any financial CGE model for India, or for that matter for any developing country, should also take into account these structural characteristics and rigidities.
2. The financial side of the model needs to be disaggregated in greater detail and behavioural equations (rather than just accounting identities) need to be

specified for various financial intermediaries. This kind of specification would make it possible to study the impact of various policy variables in the financial spheres in the liberalized scenario (for example, impact of removal of restriction on the banking sector in the form of CRR and SLR and introduction of a market determined system of interest rates).

3. Private sector investment, public sector investment and the process of financing the investment by both the sectors should be explicitly modelled. As pointed out earlier, in a developing country like India, there is no attractive market for the government bonds because of low interest rates on them. Government deficit is financed mainly by imposing restrictions on the banking sector in the form of SLR. This, in the presence of a high government deficit, reduces the supply of funds to the private sector and increases the cost of funding to the the private sector. As a result private investment may be "crowded out" by public investment.

4. In the liberalized regime, interest rates are expected to have a greater role to play, and therefore, there is need to introduce interest rate sensitive holding of various assets.

5. Money supply does gets affected by the behaviour of various economic agents. Therefore the process of credit creation needs to be made endogenous and dependent on the government policies.

Major weaknesses in the surveyed literature¹⁸:

1. Most of the models, surveyed above, have constructed IS-LM type of macro models for financial assets, financial intermediaries and financial markets and imposed it on the real sector specification followed in CGE framework. While constructing the financial block, mainly an outward- looking view is adopted and the inward looking view is neglected. Thus, in none of the models

18

The model developed by us in the chapter 4 is also not free of these drawbacks. We have not tried to improve over these drawbacks because of the vastness of the subject and the lack of time. However, it is important to know the limitations of these studies so that the future modelling efforts can try to overcome these weaknesses.

surveyed, we found any justification for the existence of the various types of financial assets and financial institutions. For example, in the specification of the money demand equation, in most of the models, the existence of transaction costs is assumed but the sources of transaction costs are not modelled explicitly. The existence of transaction costs is introduced by incorporating a C-I-A constraint or finance constraint. However, nowhere do these costs arise due to behavioural specification of the agents. Similar is the case with other financial assets. Their special characteristics- risk as well as returns- do not appear explicitly in the models. It has been suggested that the adoption of the Tobin-Markowitz type mean- variance framework may be the right step in this direction.

Most of the models surveyed do not provide any behavioural equations for the financial intermediaries. Only accounting identities are specified as far as these intermediaries are concerned.

2. Introduction of expectations is also one of the most unsatisfactory aspects of these applied models. Mostly an adaptive framework is used while specifying expectations. None of the models reviewed make use of rational expectations. Even in theoretical literature, perfect foresight is assumed when the rational expectation framework is used. This makes money inessential. Therefore, rational expectations can be introduced in CGE models only after dropping the perfect foresight assumption. As suggested by Radner (1990), the assumption of "bounded rationality" can also solve the problem. But to our knowledge, no empirical work has been carried out using the bounded rationality assumption.

3. Most of the models have used financial SAM and calibration procedure to generate share parameters. These models borrow elasticity parameters and elasticity of substitution parameters from the existing literature. This is necessitated by the large size of the models. But this leads to an ad hoc specification of various types of parameters and makes CGE models useless for forecasting purposes, though these models can be used for the purpose of policy analysis and experimentation. Though a difficult task, there is a clear need for

econometric estimation of various parameters in full- real- financial CGE models.

Thus, we see that in certain aspects CGE models have gone beyond theoretical developments. For example, the introduction of financial assets and financial intermediaries [i.e. these models do not provide theoretical justification for these aspects and hence, might pose serious technical and conceptual existence problems]. On the other hand, there are certain areas where these models are not able to incorporate certain theoretical concepts such as rational expectations and bounded rationality. Therefore, there is a lot of scope - both on theoretical and empirical fronts - for improvements and further developments in this framework.

Chapter 3

A FINANCIAL SOCIAL ACCOUNTING MATRIX FOR INDIA

3.1 Introduction

In carrying out any empirical study, an accurate, consistent, reliable and comprehensive set of data is as important as the realistic modelling of the economy or "theoretical systematization of economic connections". During last fifty or sixty years, sustained efforts have been made, all over the world, to convert such economic data as happened to be available in a complete and coherent system of national accounts. During this period of development of different accounting frameworks, Hicks(1942) coined the phrase "Social Accounting" and after some years UN Report (1947) recommended and designed a social accounting framework for the estimation of the national income. But it was the sustained effort of Richard Stone and his associates, who developed a complete and consistent matrix in the course of Cambridge growth project, which led to popularity of Social Accounting Matrix (SAM) as an accounting framework and its use in empirical studies.

In most of the countries the data regarding important aspects of the economy is collected in the form of National Income Accounts, Input-Output Tables, Flow of Funds Accounts and Balance Of Payments Statements. Social Accounting Matrix provides us with a coherent framework, in which all these different accounts, which characterize different parts of an economy during a given base year, can be combined and integrated in a convenient and consistent manner so as to have a consistent picture of the general interdependence of different activities taking place in the economy.

3.2 Basic Structure of a SAM

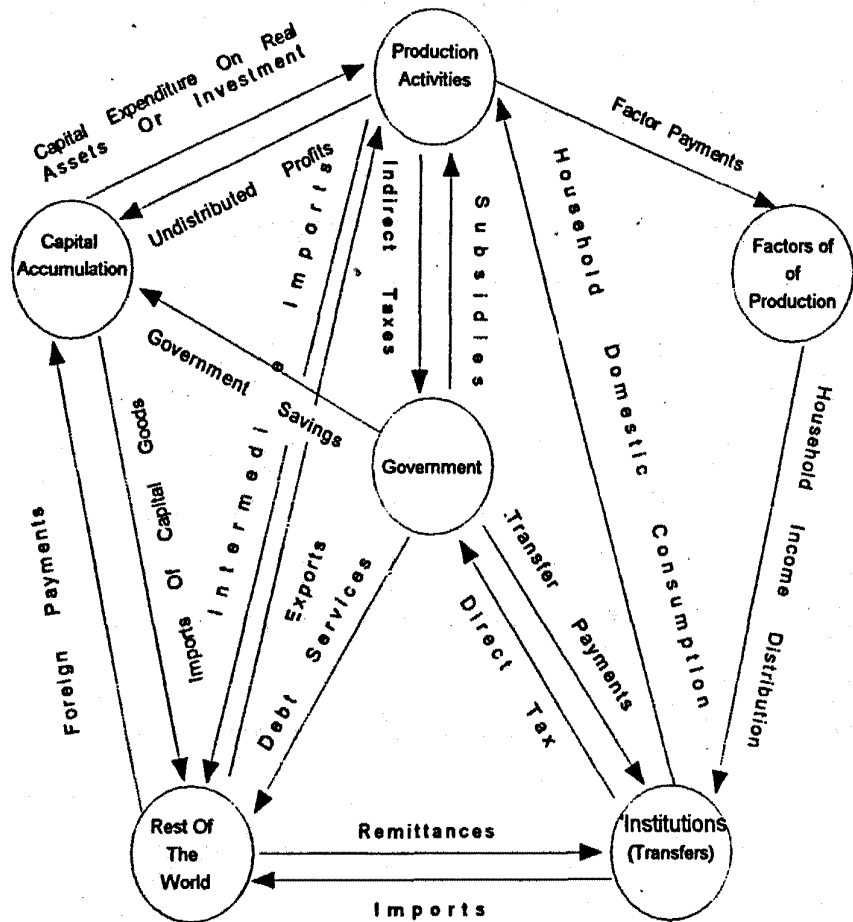
A SAM is a simple and efficient way of representing the fundamental law of economics, i.e. for every income there is a corresponding outlay or expenditure. It is so structured that each transactor or group of transactors that needs to be considered in relation to some particular issue has its own row and column in the matrix. These rows and columns are identically ordered. By definition, there must be two sides to every transaction and by convention, receipts of transactor j are entered in row j of the SAM and expenditure by transactor k are entered in column k . Because of this presentation of accounts the matrix becomes square in the form and the corresponding row and column totals of matrix turn out to be equal.

SAM is a very flexible format of presenting the statistical data regarding economic activities in the sense that no fixed pattern regarding the classification or disaggregation and order of accounts is followed. However, whatever the format presentation of SAM, it explicitly incorporates various crucial transformations between variables (For example, mapping of the factorial income distribution from the structure of production and in some cases the mapping of the distribution of income among different types of households from this factorial income distribution). In short, it is the tabular form of flow diagram of economic activities which in pictorial form shows a mass of complex interrelationships.

The complex interrelations are the results of interactions of economic agents or institutions (such as households, producers, etc.) in the sphere of economic activities -consumption, production and accumulation - in their current and capital accounts. Sometime there are just transfer payments among the economic agents. Figure 3.1, which is a flow diagram of an economy, shows all these constituent elements of an economy.

The presentation of economic interrelations in flow-diagram is clear and useful only when the number of circles or accounts to be presented, is small. Representation of a large set of accounts in this way would make it impossible to prevent the lines from crossing each other (especially when each account is

Figure 3.1 : Flow Diagram of Economic Activities



disaggregated into sub accounts and when there are transfers among the constituent of an account itself) and the result would be visual confusion. SAM provides us with an alternate format of presentation, capturing the complex interrelations existing in any economic system. By presenting a complete, consistent and comprehensive set of data on the economy, the SAM becomes a snapshot of the economy.

Figure 3.2 provides a basic SAM. To understand such matrix Pyatt and Roe (1977) mention two basic rules:

- (1) For every row there is a corresponding column and the system is complete only if the corresponding row and column totals are identical.
- (2) Every entry is a receipt when read in its row context and expenditure when read along the column. The description of social accounting matrices as single entry accounts derives from this rule.

Following these two rules the entries, or cells, in the Social Accounting Matrix can be read either along a column or along a row. For exposition, we will read down along a column and fill the entries of each cell. When a SAM is read down along a column, it shows how total resources of the economy are utilized by the different institutions/economic agents, activities and factors of production on current and capital account. In our explanations of different cells we have used notations $c(r,w)$ where c stands for cell, r for row and w for column. Thus $c(1,1)$ stands for the cell arising from the interaction of the first row and the first column.

Now let us start reading the cells of a basic SAM given in figure 3.2.

Column 1: Domestic and imported intermediate inputs and factors of production are combined during the process of production. Expenditure made to acquire these goods, i.e. expenditure on purchases of domestic raw materials, imports of raw materials and payments of factors of production is captured in the cells $c(1,1)$, $c(7,1)$ and $c(2,1)$ respectively. Beside, indirect taxes are also paid when these goods are marketed. This is captured in $c(5,1)$. Together these make up the total cost of any production activity, i.e. $c(8,1)$.

Column 2: This column shows the allocation of factor incomes to the providers

Figure 3.2: A Schematic Representation of a Social Accounting Matrix (SAM)

		Expenditures								
		1	2	3	4	5	6	7	8	
		Production Activities	Factors Of Production	Institutions			Combined Capital Account	Rest Of The World	Totals	
				Current Accounts						
				Households	Firms	Government				
Receipts	1	Production Activities	Raw material purchases of domestic goods		Household consumption expenditure on domestic goods	Raw material purchases of domestic goods	Government current expenditure	Investment expenditure on domestically produced goods	Exports of goods and services	Aggregate demand = gross outputs
		2	Factors of Production	Value added payments to factors					Net factor income received from abroad	Incomes of the domestic factors of production
	3	Institutions	Current Account	Households	Allocation of labour income to households	Current transfers between households	Profits distributed to domestic households	Current transfers to domestic households	Net non factor income received from abroad	Incomes of the domestic institutions after transfers
				4	Firms	Allocation of operating surplus to firms				
				5	Government	Indirect taxes on inputs	Direct taxes on income and indirect taxes on current expenditure	Direct taxes on companies + operating surplus of states etc		Indirect taxes on capital goods
	6	Combined Capital Account		Household savings	Undistributed profits after tax	Government current account surplus		Balance of payments deficit (residual)	Aggregate savings	
	7	Rest of the World (current)	Imports of raw materials		Household consumption expenditure on imported goods		Debt servicing	Imports of capital goods		Imports
	8	Totals	Total costs	Incomes of the domestic factors of production	Total outlay of households	Total outlay of firms	Total outlay of government	Aggregate investment	Total foreign exchange receipts	

of factor services. For example wages would go to the households, $c(3,2)$ and operating surplus to the firms, $c(4,2)$. $C(8,2)$ is then total income of the domestic factors of production.

Column 3: It shows the allocation of total household expenditure on different items. Households spend part of their income on consumer goods either produced domestically, $c(1,3)$ or imported, $c(7,3)$. Certain part of income they pay out as transfers, $c(3,3)$ (for example, rural households supporting students in urban areas or urban workers sending remittances to retired parents in rural areas). After paying direct taxes, $c(5,3)$ remaining is saved by the households in their capital account, $c(6,3)$. Total expenditure by the households is given in $c(8,3)$.

Column 4: Similarly, firms use their receipts for paying dividends to households, $c(3,4)$ and direct taxes - corporate taxes to the government, $c(5,4)$. Remaining is saved as retained profits in $c(6,4)$. Together these cells give us total receipts of the firms in $c(8,4)$.

Column 5: The total outlays of the government, $c(8,5)$, is in the form of expenditure on domestically produced goods, $c(1,5)$, transfer payments to domestic households, $c(3,5)$, and to firms, $c(4,5)$, interest payment to the rest of the world, $c(7,5)$ and current account surplus, $c(6,5)$.

Column 6: The funds acquired by each institutions are in part transferred to other institutions as current expenditures in the manner described in column 3,4 and 5 above. Beyond this, they spent on capital goods supplied either by domestic production activities $c(1,6)$ or by import $c(7,6)$. Together these cells, with indirect taxes on capital goods, $c(5,6)$ give us aggregate investment expenditure in the economy at market prices, $c(8,6)$.

Column 7: This column describes the total receipts from the rest of the world in the form of revenue from exports, $c(1,7)$; factor income, $c(2,7)$; non-factor income, $c(3,7)$, $c(4,7)$, $c(5,7)$ and foreign savings in the form of balance of payments deficit, $c(6,7)$. The total of these cells gives us the total foreign exchange receipts, $c(8,6)$.

Column 8: This column gives the aggregate of different accounts as aggregate

demand(= aggregate output), c(1,8); total factor incomes, c(2,8); incomes of domestic institutions (households, firms, government after transfers, c(3,8), c(4,8) and c(5,8); aggregate savings, c(6,8) and total imports, c(7,8).

3.3 The Disaggregated Financial Social Accounting Matrix for India

Very few Social Accounting Matrices have been constructed for India. Pioneering work in this area is by Sarkar and Subba Rao(1981 b).Handa and Nigam (1990) have also constructed Social Accounting Matrices for three years viz, 1973-74, 1978-1979 and 1984-85. But all these matrices disaggregate only the current account of the economy. Since our study is concerned with financial sphere of the economy we have attempted a financial SAM (FSAM) for the year 1983-84 which also has a disaggregated capital account (i.e. the detailed disaggregation of financial assets and financial institutions of the economy). To our knowledge, no such SAM has been constructed for India as yet.

3.3.1 The Base Year

The year 1983-84 has been chosen as the base year for our FSAM. The choice of the year has been dictated primarily by the availability of data. Various national accounts are reconciled in the Social Accounting Matrix and, therefore, availability of these accounts for the latest year has been the guiding factor for the choice of the base year. National Accounts Statistics (NAS) are available till 1995 and flow of funds accounts till 1991-92. But Input-Output Transaction Tables (I-OTT) have been constructed in India for the year 1983-84 which is the latest. There are also various other accounts, reference to which will be made from time to time during the construction of FSAM, which are available only for the year around 1983-84. Thus, the year 1983-84 has been chosen as the base year.

3.3.2 Sources of Data

Consistency and reliability of the data are the two guiding factors for

choosing the data sources. Main sources of data are National Accounts Statistics published by CSO¹. Data on input-output has been taken from the I-OTT, 1983-84 (CSO-1990) and data on sources and uses of financial transactions is available from Flow of Funds (FOF) Accounts (Reserve Bank of India (RBI) Bulletin- 1991). All the data for macro-variables has been picked up from NAS and all the micro-data available from different sources has been adjusted so as to match with the data on macro-variables available from NAS.² The reason for this exercise is that NAS is the only publication in our country which gives data regarding all the macro-variables of the economy, and consistency requirement in the formulation of SAM demands adjustment of data available from different sources.

Many other publications of Government of India and RBI have also been utilized as secondary sources of data, reference to which is made below, at appropriate places.

3.3.3 The Level of Disaggregation:

The level of disaggregation of different accounts of a FSAM is determined not only by the issues one wants to address in the model but also by statistical expediency in terms of what data is available. Keeping these two factors in mind we have divided the FSAM into various main and sub-accounts, details of which

1

NAS-CSO-1991 publication has been chosen because it gives us the latest revised figures for the year 1983-84. There has been no further revision in this year data in later publications of NAS-CSO

2

In this process, entries of FSAM differed from the original published figures, at times by large magnitudes. However, this kind of adjustment and some simplifying assumptions (as will be noticed in the following pages) become unavoidable as the experience of other countries for which financial CGE models have been constructed (for survey of such models refer to chapter 2) also points out.

This kind of exercise, inspite of its drawbacks, is not without its advantages as it points out the inconsistencies in the existing data base of a country. It also indicates the need for making concentrated and integrated efforts for building the data base related to various aspects of an economy in a consistent manner. Though manitudes of data available from FSAM on various aspects of an economy can not be regarded as precise on, they do give us the broad picture of the economy and the direction of change in the broad aggregates (if such matrices are constructed for a number of periods).

are given below :

3.3.3.1 Classification of Production Activities: The Economy has been divided into two broad productive sectors viz.: agricultural sector and non-agricultural sector. To keep matters simple and also as our emphasis is on the financial sector specification we do not disaggregate these sectors further.

3.3.3.2 Classification of Factors of Production/Factor Payments: To analyze the production decision process adequately, the factors of production in the aggregated FSAM have to be divided further. In National Account Statistics, value added in the production process is classified to accrue to labour, capital (rent, profit and interest) and mixed income of self employed. Thus we also disaggregate value added here in terms of labour, capital and self employed.

In the category of returns to self employed we include, following NAS, own account workers and employees in receipt of unincorporated business net income. This consists of returns to labour services, to entrepreneurial activities, and to the deployment of capital owned by the self employed. There are considerable conceptual problems associated with distinguishing between returns to labour and returns to capital in the total income of this group of population. Along with this problem, there is also the problem of insufficient data on the ownership of assets in India which restricts us from attempting a calculation of returns to non-corporate capital employed in each production activity. Therefore, following NAS, in preference to splitting the returns to self employed into labour and capital elements, we have adopted this composite factor as a separate category of factor payment.

3.3.3.3 Classification of Institutions/Economic Agents: Domestic institutions are classified into household sector, private corporate sector (including only non-financial firms), public sector (including government administration, departmental enterprises and public sector non-departmental non-financial enterprises) and financial sector (including both private and public sector financial firms). Besides, there is an account for the rest of the world (ROW). To provide a link between the flows in the real and financial sectors of the economy, we have divided the firms into non-financial corporate firms and financial firms.

These institutions/ economic agents are further disaggregated in the current account and the capital account as follows:

-Current Account: The public sector is further disaggregated in this account into the government sector, consisting of government administration and departmental enterprises and the public sector non-departmental enterprises (consists of only non-financial enterprises).

-Capital Account: The most novel part of our FSAM is the disaggregated capital account. The combined capital account, which is the feature of the existing SAMs for India, is disaggregated to correspond to the current accounts of five institutions i.e. the household sector, the private corporate sector, the public sector, the financial sector and the ROW. This would allow us to explicitly model the portfolio behaviour of/ allocation by various institutions among various real as well as financial assets and liabilities.

In this account, we do not distinguish between the government sector and the public sector non-departmental non-financial enterprises in order that our classification of institutions/ economic agents should match with that in the RBI-FOF.

However, in the present study, financial sector is further disaggregated in the capital account so as to deal with the process of financial intermediation explicitly. To allow for explicit analysis of the authority intervention in the credit market, a capital account for the Central Bank - the Reserve Bank of India (RBI) - is also separately defined. Also, we have further disaggregated the capital account of financial institutions into the capital account of Commercial and Co-operative Banks (referred as the banking sector in the present exposition) and Other Financial Institutions (OFIs). This was done to take account of different nature of their liabilities. The demand deposits of the banking sector are considered money by the non-banking public, but this is not the case with the liabilities of the OFIs. Therefore, changes in monetary policies directed towards these institutions and their assets and liabilities would have different effects on the economy. Also, there is a difference in the nature of the assets of these two types of financial institutions. The banking sector usually lends to the existing

well-established enterprises for comparatively short duration. On the other hand, the objective of the OFIs, as most of them are term lending development banks, is promotional. They are supposed to finance risky but promising new ventures for long duration on comparatively soft terms. Such distinction among financial institutions especially becomes important when emphasis is on the study of the effect of monetary and fiscal policy changes on the markets for money and other financial assets and via them on the real sphere of the economy.

In the capital account of our FSAM, we also differentiate between various assets/ liabilities.

3.3.3.4 Classification of Assets: Physical assets are separated out from financial assets. Financial assets are further divided into the following assets:

-Monetary Assets: We have employed 'M3' as a money stock measure in our economy. This consists of

- (a) Cash in the hands of non bank public
- (b) Demand plus time deposits of the non bank public with the banking sector.

-Non-Monetary Assets:

A. Contractual Assets: these consist of provident funds and life funds.

B. Non Contractual Assets:

- (a) Securities of the various institutions (private corporate securities, OFIs' securities and the government securities)
- (b) Small Savings
- (c) Domestic loans and advances
- (d) Reserves with the banking sector
- (e) Foreign claims/Foreign assets
- (f) Other assets/liabilities³

Various accounts of our FSAM are summarized in figure 3.3 and 3.4.

3

It is an established fact that the existence of informal financial market (curb market) dampens the desired effects of monetary policies and therefore, to take account of this we would have even liked to introduce assets of the curb market. But the non-availability of comprehensive and consistent data on this market has discouraged us from introducing it into the FSAM. And, therefore, the analysis is restricted only to the formal financial market.

Figure 3.3: Schematic Presentation Of Current Account Of The FSAM

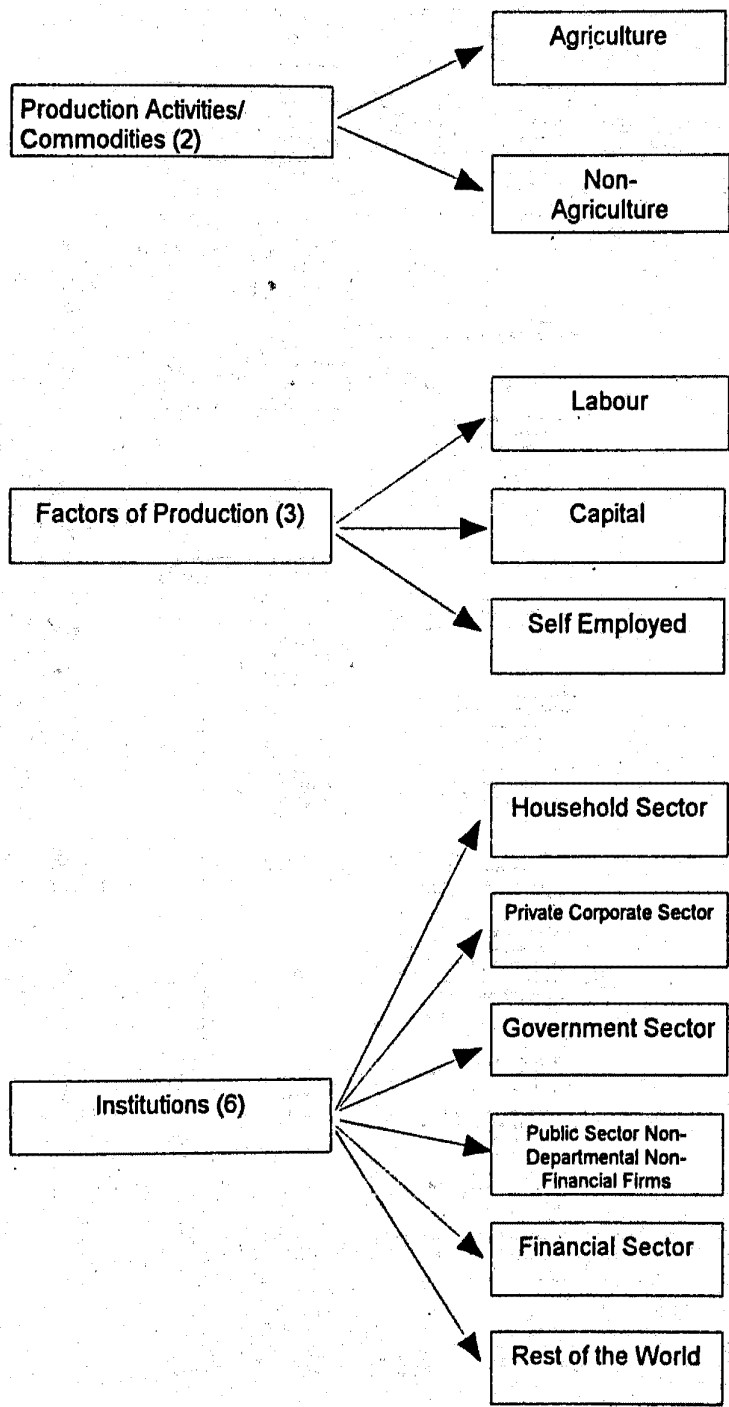
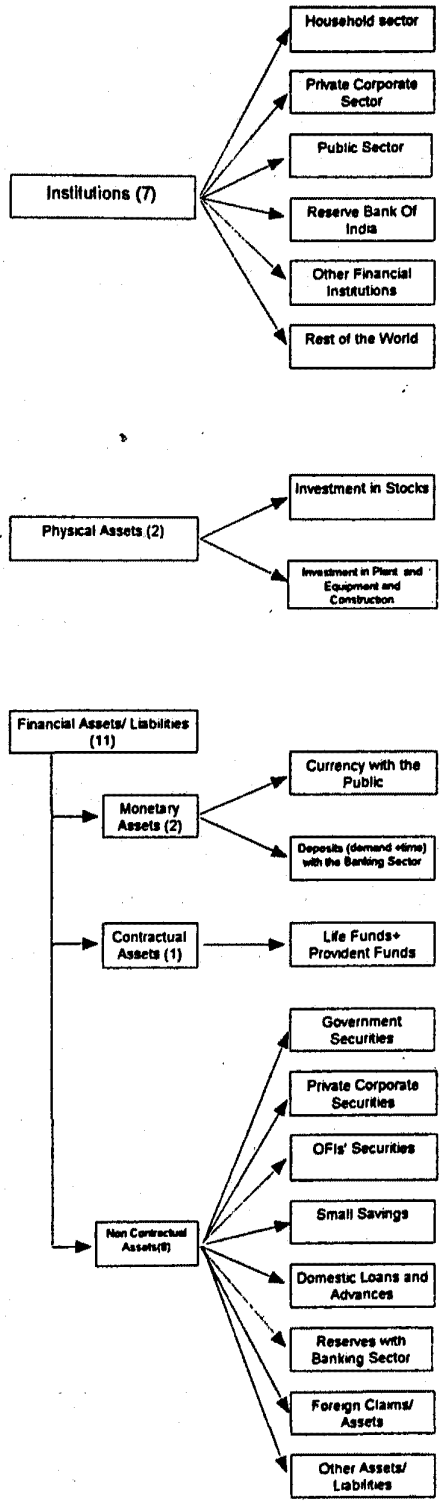


Figure 3.4 : Schematic Presentation of Capital Account of the FSAM



3.4 Construction of the FSAM - 1983-84 for India

The estimated financial FSAM for the year 1983-84 for India has been presented in Table 3.1.

The estimation procedure for each of the block and each cell of our FSAM has been described below.

Various data sources, as mentioned earlier, have been used in the construction of the FSAM, 1983-84, for India. These data sources are published by different organizations and there are large conceptual and methodological differences in the estimation of various economic variables. Differences in the values of various variables were present not only in the publications of different organizations but also in the different publications and different issues of the same publication of the same organization. This leads to discrepancies and inconsistencies in the totals of rows and columns of the FSAM. We have tried to remove and reconcile these discrepancies and inconsistencies by suitable adjustments. While adjusting these discrepancies we have taken, for the reasons mentioned earlier, the NAS data as giving control totals and adjusted the data from other sources so that their total matches with the corresponding control total.

The FSAM is constructed in various stages and steps. At each stage of construction we have attempted to correct the inconsistencies that may have emerged in the earlier stages due to the use of data from different sources such as I-OTT, NAS, FOF, etc.

3.4.1 Current Account of the FSAM

Stage I: Input-Output Block

Step 1: Information on input-output transactions is available from the I-OTT, 1983-84. These tables give Industry x Industry, Commodity x Commodity,

Industry x Commodity and Commodity x industry Transaction Tables under different assumptions. We have chosen commodity x commodity tables because we are interested in knowing the impact of changes in the monetary variables on the prices and production of commodities at the disaggregated level.

Step 2: As mentioned earlier, commodity producing sectors are divided into two sectors. Therefore, 60x60 commodity x commodity I-OTT, 1983-84 was aggregated into 2x2 commodity x commodity I-O TT.

Aggregation of 60x60 I-OTT, 1983-84 provides us with the data which can be used to fill the entries of 2x2 Input-Output block i.e. cells created by the intersection of first 2 rows and 2 columns in the FSAM. 2x2 Input-Output, commodity x commodity matrix is given in table 3.3.

Description of two sector matrix with the detailed composition of the sectors from the I-OTT, 1983-84, is given in Table 3.2. (Numbers in the brackets indicate the sector numbers of the 60x60 I-OTT, 1983-84).

Stage II: Final Use (Expenditure) Block

Step 1: I-OTT, 1983-84 also provides us with data on private final consumption expenditure, government final consumption expenditure, gross fixed capital formation, change in stocks, exports and imports for 60 commodities. These are again aggregated into two commodities described above.

Step 2: When we compare the aggregates of these final expenditure figures from I-OTT, given in Table 3.4, with NAS 1991 data figures for the same variables discrepancies arise. These discrepancies are due to different data sources as well as the use of different years of publication of NAS by I-OTT than by us (i.e. NAS 1991). Over the period of time NAS data have been revised. And, as noted earlier, we have used NAS 1991 figures which is the latest publication giving the revised figures for the year 1983-84.

The extent of discrepancies, in different items of Gross Domestic Product

from the two data sources, can be seen from Table 3.4.

From this table we can see that not only are there discrepancies between NAS and I-OTT but also between the gross domestic product and gross domestic expenditure figures of NAS - 1991. Total discrepancy amounts to Rs.1,958 crores. Sources of this discrepancy are as follows:

(1) On account of final consumption expenditure [Rs.3,342 crores; NAS 1991, p.16].

(2) On account of gross domestic capital formation [Rs.(-)1,573 crores; NAS 1991, p.18].

(3) On account of export and import [Rs.397 crores and Rs.208 crores respectively; NAS 1991, p.20].

Data on government final consumption expenditure seems to be more firm. Therefore, while adjusting discrepancies on account of final consumption expenditure, we assume that there are no errors and omissions in the estimates of government final consumption expenditure and all the errors and omissions in the consumption expenditure data arise due to errors and omissions in the estimates of private final consumption expenditure.

Discrepancy arising on account of gross domestic capital formation [Rs. (-) 1,573 crores] has been allocated to gross fixed capital formation and change in stocks on a pro rata basis (rates being proportion of each of the items to total gross domestic capital formation). Thus, Rs.(-)1,461 crores (i.e. 92.87%) has been allocated to gross fixed capital formation and remaining Rs.(-)112 crores is allocated to change in stocks.

Export and import data has also to be adjusted for differences between the "figures of merchandise exports/ imports from the two sources viz RBI and DGCI&S" [NAS 1991, p.21]. Export then amounts to Rs.13,536 crores [Rs.13,139 crores+ Rs 397 crores] and import to Rs.17,883 crores [Rs.17,675 crores + Rs 208 crores].

After making adjustments for these discrepancies the corrected data for the components of gross domestic expenditure is given in table 3.5, col.2.

Step 3: Comparing this adjusted data for the components of expenditure on

gross domestic product with I-OTT we can see the amounts of discrepancies (again given in Table 3.5) which have to be adjusted.

For adjusting the data on private final consumption expenditure, gross capital formation, export and import we assume that the control total of these items is as given in table 3.5 under the heading "Data for SAM" [derived after adjustment to NAS data (col.2 of Table 3.4), step 2, in the manner described above]. I-OTT gives data on different items of final expenditure net of net indirect taxes. We assume that net indirect taxes are estimated accurately. The entire amount of discrepancy is then allocated to each category of final expenditure on pro rata basis, rates being proportion of each of the items of final expenditure to total final expenditure as shown in I-OTT. The unadjusted final use matrix, the proportions as well as the amounts required for adjustments in this matrix, so that the data available after these adjustments become consistent with NAS 1991, are given in Table 3.6.

Step 4: After these adjustments, we get the adjusted final use matrix at factor price. To get the same matrix at market price we have adjusted net indirect taxes to each commodity by the type of final use. Since information is not available on the allocation of indirect taxes on different commodities by the type of final use, we have apportioned total net indirect tax on each type of good for final use in proportion to the amount of each type of good to the total amount under each type of final use category.

The Final use matrix at factor price, amount of indirect taxes to be added to get the same matrix at market price and final use matrix at market price is also given in Table 3.6.

Step 5: Information obtained in this form is used to fill the cells of the FSAM (Table 3.1) showing the expenditure on different commodities by different institutions, namely, the household sector, the government sector and the ROW. Information on gross fixed capital formation and change in stocks is used to fill the cells showing the expenditure on capital account (i.e. investment). Cells

arising out of the intersection of production activities and the ROW are filled with the import data. Instead of showing the data on import of final good by institutions we have presented it under different commodity head because our representative consumer is assumed to consume a composite commodity (composite of domestic good and imported good).

Step 6: Aggregating the intermediate consumption demand during the process of production with consumption and investment demand of different institutions, we get the total demand for different commodities in the economy. The last column of the real SAM in Table 3.1 gives us this.

Stage III: Factor Payment Block

Let us turn now to the distribution of gross value added (GVA) to different factors of production.

In the intermediate (Input-Output) block we have seen the amount of intermediate input supplied to different commodities produced in the economy.

During the process of production value is added over and above the value of intermediate inputs. This value generated during the production process is then distributed to factors of production in the form of wages, interest, rent and profits. Following steps describe the estimation procedure for GVA and its distribution to different factors of production in the economy.

Step 1: Amount of GVA during the process of production of different commodities is available from I-OTT, 1983-84. There is discrepancy worth Rs.908 crores in the estimate of GVA provided by I-OTT, 1983-84, and by NAS-1991. This amount of discrepancy we added to GVA figures (as available from I-OTT) by different commodities in proportion to total GVA. This adjustment is given in Table 3.7.

Step 2: GVA is distributed to the factors of production in the form of

agricultural wage income, non-agricultural wage income, agricultural non-wage income and non-agricultural non-wage income and income of self employed. Distribution of net domestic product (NDP) to different factors of production is provided in the new series of NAS-Factor Incomes, 1994 (with base year 1980-81). The amount and the proportion of NDP going to different factors is presented in Table 3.8. Estimated proportions in Table 3.8 were then applied to NDP estimated, below, in step 3 of Stage III. The resultant distribution of NDP among different factors of production is available from Table 3.10.

Step 3: Net Value Added (NVA) is obtained by subtracting consumption of fixed capital¹ from GVA by each commodity group (see Table 3.9).²

Step 4: We are interested in the distribution of GVA among different factor payments. But we have information only on the distribution of NVA among different factor payments.

We know that consumption of fixed capital is financed from gross profits (which is a part of the operating surplus) and the mixed income of self employed. We do not have any direct information on the amount of consumption of fixed capital financed from the gross profits and amount financed from the mixed income of self employed. But we do know that the profits arise in the organized sectors of the economy whereas the mixed income of the self employed in the unorganized sectors of the economy. NAS provides us the information on amount of NVA by the organized and the unorganized sectors. We aggregated this information and classified between our broad commodity groups. This is

1

Information on the consumption of fixed capital is available from NAS-1991 which is presented in Table 3.9.

2

The NVA figure obtained in this way for each commodity group is slightly different from that available from NAS-1991 data for the same commodity groups. This difference arises because we have used "adjusted" GVA data from I-OTT rather than GVA data from NAS-1991 for each commodity category.

presented in Table 3.11. Proportion of NVA contributed by organized and unorganized sectors, calculated by us, are also presented in Table 3.11.

These proportions of NVA contributed by the organized and the unorganized sectors were then applied to consumption of fixed capital so as to estimate the parts of it which were financed from the profits (operating surplus) and the mixed income of self employed respectively. These estimates are tabulated in Table 3.12. Table 3.13 provides estimates of gross profits and gross mixed income of self employed which are gross of consumption of fixed capital.

Distribution of GVA among different factor payments, estimated under stage III is presented in Table 3.14.

Stage IV: Income Block

Different types of factor payments have to be distributed to the household sector, the private corporate sector, the financial sector, the government sector, the non departmental public enterprises and the ROW.

Step 1: In our factor payments categories we have differentiated 'factor income of self employed' from other categories. This is a mixture of return to different types of factors of production. As pointed out earlier the distinction between the employment income and the profits (operating surplus) cannot be made in the case of income of persons working on their own accounts. Such incomes are, therefore, separately classified as mixed income of self employed. Only the income of corporate capital is recorded as non wage income in agricultural and non agricultural sectors. The unincorporated capital income is directly attributed to the household sector which owns it, and this is done to keep the proper track of sectoral structure of informal capital ownership which does not have the mobility of corporate capital.

Step 2: Wage income, both agricultural and non-agricultural, is also attributed to the household sector.

Step 3: On the other hand, non-wage income (operating surplus= interest+ rent+ profits) from both sectors, agricultural as well as non-agricultural, is attributed to the corporate non financial firms in private and public sectors, financial institutions and government in the manner described below.

Total non-wage income is generated in the domestic economy as well as in the ROW. Non-wage income generated by the ROW is assumed to be non-agricultural non-wage income.

Agricultural non-wage income in our economy amounts to Rs.1,684 crores. Financial institutions do not generate any agricultural non-wage income and, therefore, we distribute agricultural non-wage income only among corporate non-financial firms and government.

Information on total non-wage income generated in the public sector is available from NAS-1991. We have separated public sector account into three sub accounts viz.

- (i) Government Sector: which consists of
 - (a) Administrative Enterprises
 - (b) Departmental Enterprises
- (ii) Non-Departmental Non-Financial Public Sector Enterprises
- (iii) Public Sector Financial Enterprises

Departmental Enterprises include the RBI, which is a financial enterprise contributing Rs.42 crores to total GVA by the government sector. Since this amount is negligible (0.2%), we assume that all departmental enterprises are non-financial. Details of GVA, its distribution into factor payments and division of gross non-wage income between agricultural and non-agricultural sectors are available from Table 3.15. The total gross non-wage income by administrative departments is only from the non-agricultural sector. On the other hand, total gross non-wage income generated by departmental enterprises is distributed between agricultural and non-agricultural sectors in proportion to the gross domestic product by departmental enterprises in agricultural and non-agricultural sectors respectively. Out of the total GVA by departmental enterprises, (Rs.6,591 crores), Rs.2,079 crores (i.e. 32%) is from the agricultural sector and the rest i.e. Rs.4,512 crores (68%) is from the non-agricultural sector. Applying

these proportions to the gross non-wage income generated by departmental enterprises, we get gross non-wage income from agricultural and non-agricultural sectors to be Rs.617 crores and Rs.1,310 crores respectively.

Similar type of information for the public sector non-departmental enterprises, financial as well as non-financial, is compiled in Table 3.16. Again, the proportion of GVA generated in the agricultural sector, Rs.213 crores (1%), and the non-agricultural sector, Rs.20,854 crores (99%), to total GVA, Rs.21,067 crores were applied to estimate the amount of non-wage income, (Rs.12,055 crores) from agricultural, (121 crores), and non-agricultural, (Rs.11,934 crores).

Similar information can also be generated for the entire financial sector (private sector financial enterprises + public sector financial enterprises) on the basis of NAS - Factor Incomes, 1994, and NAS 1991. (Refer to Table 3.17).

Since the contribution of the unorganized sector in NVA in the financial sector is negligible (3%) we assume that the whole of consumption of fixed capital is from the organized sector and hence forms a part of the gross profits (operating surplus).

The only sector for which gross non wage income from the agricultural and non-agricultural sectors has to be estimated is private corporate non-financial sector. This is estimated as residual and presented in Table 3.18.

Till now, we have distributed GVA and NVA in the domestic economy to domestic institutions/ agents. However, these domestic institutions also receive and transfer non-wage income from/to the ROW. In the absence of any other relevant information, we have distributed the non-wage income from the ROW among different institutions, in proportions in which they generate non-wage income in the domestic economy. We have also assumed that this non-wage income from abroad is only non-agricultural. After subtracting gross non-wage income generated in agricultural sector from total gross non-wage income we get non-wage income from non-agricultural sector which also includes the contribution of the ROW. Some non-wage income is transferred to the ROW by domestic institutions. We assume that this transfer is in proportion to their share in total non-wage income from non-agricultural activities.

All such transfers from/to the ROW are shown in table 3.19.

Stage V: Income and Expenditure Accounts

In this stage, we describe the estimation procedure for the estimates of income/ expenditure of different institutions. Partial information in this regard is available from NAS - 1991. For example, NAS - 1991 provides income and expenditure accounts of the public sector units. However, no information is available from this source as far as income and expenditure accounts of the private corporate sector are concerned.

Institutions transfer income among themselves. As far as the public sector is concerned, some estimates of transfers are available from NAS - 1991, but allocation of these transfers by different institutional categories is not available.

We will estimate income and expenditure items of different institutions starting with the government which, in the current account of our FSAM, consists of administrative departments and departmental enterprises.

Step 1: Estimates of Components of Government Expenditure and Income

Items of expenditure of the government sector for the year 1983-84 are presented in Table 3.20. From this table, we see that government transfers property income to other institutions in the form of interest on public debt (Rs.3,739 crores) and other property income (Rs.474 crores). We do not have any information on allocation of this property income to different institutions. In the absence of any direct availability of such estimates, we assume that the government sector transfers property income to different institutions in proportion to their claims on it in the form of government securities, treasury bills, small savings etc. Amounts of these claims by different types of institutions are shown in Table 3.21. This table is compiled from the Financial Balance Sheet for India for the year 1983-84 given in Table 3.35³.

3

Financial Balance Sheet for India for the year 1983-84 is prepared by updating the Financial Balance Sheet for India for the year by Venkatachalam and Sarma (1977). Data on flows of each

From this balance sheet we see that the amount of the claims of the private corporate sector on the government is negligible. Therefore, we assume that there are no transfers from the government sector to the private corporate sector.

We have also assumed, following NAS, that the government sector does not transfer any amount to the ROW on current account, (this is also assumed in NAS) and all transfers to ROW are on capital account.

Transfers to the public sector non departmental enterprises are Rs.43 crores (estimated later). Remaining interest on public debt and other property income (Rs.4,170 crores) is distributed between remaining two sectors i.e. the household sector and the financial sector. From the Financial Balance Sheet for India, as given in Table 3.35, we see that out of the two sectors, approximately 80% of the claims on the government sector is by the financial sector and remaining 20% is by the household sector. Applying these percentages, we see that the share of the financial sector in the interest on public debt and other property income is Rs.3,336 crores and that of the household sector is Rs.834 crores.

From Table 3.20 we see that the government sector transfers some amount which is not classified elsewhere (n.c.e.) [Rs.4,669 crores]. This item mainly consists of grants to aided schools, scholarships and stipends, welfare of the weaker sections of the society etc., i.e. most of it is to the household sector. Therefore we assume that whole of it is transferred to the household sector. To maintain the accounting identity even the item "inter-government accounting adjustment" (which is a small amount) has been added to the transfers to the household sector. Therefore, the total transfers to the household sector amount to Rs.4,754 crores. If one adds part of interest on public debt going to this sector, total transfers from the government sector to the household sector become Rs.5,588 crores. (See Table 3.21).

Distribution of interest on public debt and other current transfers from the

financial asset from FOF, RBI is added to the stocks of financial assets at the beginning of every year to arrive at the estimates of financial stocks at the end of every year.

government to different institutions is given in Table 3.21.

We have also compiled the income account of the government sector on the basis of NAS-1991 which is presented in Table 3.22.

We know that the government sector gets Rs.3,074 crores in the form of non-wage income from its production activities. It receives Rs.506 crores from the household sector in the form of fees and fines. The receipts from the direct taxes amount to Rs.5,355 crores and those from net indirect taxes to Rs.20,866 crores. All these items add up to Rs.29,801 crores. Since we know that total expenditure of the government sector is Rs.31,987 crores and the total expenditure has to be equal to total receipts, we assume that Rs.2,186 crores (amount of discrepancy between expenditure and receipts) is the amount which the government sector gets as property income transfer from the various institutions in the proportions calculated below.

Since we do not have any information on the amounts of property transfers from various institutions, we again assume that they are in proportion of the government sector's claims on other sectors in the form of financial assets. Again, we have made use of the Financial Balance Sheet to estimate these proportions (see Table 3.23). The proportions estimated on the basis of information contained in this Table were then applied to total transfer of property income (calculated as residual) to the government sector so as to get its institutional composition (see Table 3.23).

Step 2: Expenditure and Income Accounts of The Public Sector Non-Departmental Non-Financial Enterprises

We have seen that the public sector non-departmental non-financial enterprises get Rs.8,831 crores in the form of non-wage income. From the income account of these firms, as given in the NAS-1991, we see that they also get Rs.867 crores as property income from other institutions. We are interested in the contribution of different sectors in this property income.

In order to find the contribution of different institutions in the property

income of this sector, we have made use of the combined balance sheet of selected operating government companies, for the year 1978-79, available from the RBI Bulletin, 1982. RBI publishes such balance sheets from time to time. The year 1978-79 is the one nearest to 1983-84 for which such estimates are available. Since in this balance sheet, the institutional distribution is available only for investment, we have distributed the total property income received by this sector in proportion to its investment in the shares and securities of different institutions. Part of the balance sheet from the RBI Bulletin, 1982, which shows the amount of investment by government companies in shares and securities of different institutions, is presented in Table 3.24. From this Table we see that it mostly invests in government (5%) and industrial securities (95%). Applying the proportions available from the above Table to total transfer to this sector we get that Rs.43 crores are from the government sector (5%) and Rs.824 crores from the private corporate sector (95%).

Total income of the public sector non-financial non-departmental enterprises then amounts to Rs.9,698 crores (Rs.8,831 crores as non-wage income + Rs.867 crores as property income from other institutions).

We take the total income figure to be the control figure for the public sector non-departmental non-financial enterprises and adjust expenditure figure to this.

Items of expenditure for this type of enterprises are direct taxes Rs.1,239 crores (NAS, 1991), transfer to the government sector Rs.1,640 crores (calculated earlier). Its gross saving amounts to Rs.2,930 crores. The total of these items is Rs.5,809 crores and therefore there is a discrepancy of Rs.3,889 crores between receipts and disbursements of this sector, which has to be allocated to different sectors. In this task, we have again made use of the information available from the balance sheet of government companies for the year 1978-79 published in the various issues of RBI Bulletins and the FOF accounts again published in the RBI Bulletins. The combined balance sheet gives the detailed institutional classification only for borrowing. The two major lenders for this sector are the financial sector and the government sector. Out of the total

lending by the two institutions, 25% is by the financial sector and the remaining 75% is by the government sector.

Another major item of liability of this sector is paid up capital. We have studied the FOF account for the institutional ownership of this paid up capital. The major holder is the government sector.

On the basis of the above information, we can conclude that the major claimers in the property income, transferred by this sector, are the government sector and the financial sector. From the government account we have seen that the government sector gets Rs.1,640 crores from this sector. The remaining amount of the property income (Rs.3,889 crores), we assume, is transferred to the financial sector.

Income and expenditure accounts of the public sector non-departmental enterprises are presented in Table 3.25.

Step 3: Estimates of Income and Expenditure Accounts of the Financial Institutions

From the earlier accounts of our FSAM, we know that the financial institutions receive Rs.3,126 crores in the form of non-wage income, Rs.3,889 crores as property income from the public sector non-department non-financial enterprises and Rs.3,336 crores from the government sector as property income.

To have some idea about the major receivers of financial assistance from the financial institutions in the form of investment in securities and loans and advances and other assets, we again made use of the Financial Balance Sheet for India as presented in Table 3.35. From this Table, we see that the claim of the financial sector on the private corporate sector and on the household sector amounts to approximately 40% of its total claim on all the institutions. The remaining 60% claim is on the government sector and on the public sector non-departmental non-financial enterprises.

We have already seen that a total of Rs.7,225 crores is transferred from the government sector (Rs.3,336 crores) and the public sector non-departmental non-financial enterprises (Rs.3,889 crores). If we assume that Rs.7,225 crores are 60% of the total property income of the financial sector, then, 40% of the

total property income will be Rs.4,817 crores.

From the Financial Balance Sheet for India we see that the claim of the financial sector on the private corporate sector is approximately 70% and that on the household sector it is approximately 30%. Therefore, the contribution of the household sector is estimated to be Rs.1,445 crores (30%) and that of the private corporate sector to be Rs.3,371 crores (70%).

Adding the non-wage income of Rs.3,126 crores and the property income of Rs.12,042 crores, we get the total receipts of the financial sector as Rs.15,168 crores.

We have taken the estimate of income of the financial institutions as given and adjusted expenditure figures to get total income equal to total expenditure.

Let us turn to the estimates of items of expenditure of the financial sector. The financial sector consists of private as well as public sector institutions. While we do have some estimates of items of expenditures of the public sector financial institutions, we do not have any idea about such items for the private sector financial institutions. Therefore, from the information available on the public sector financial institutions, we have tried to estimate the items of expenditure of the public sector financial institutions. First, we estimate the total direct tax payment by the financial institutions. From the NAS-1991, we know that direct tax paid by the public sector financial institutions is Rs.626 crores. We also know (from NAS, 1991) that the contribution of the public sector financial institutions in the total NVA by the banking and financial sector is 83 percent.

We assume that direct tax payment is in proportion to the NVA⁴, and therefore direct tax payment by the private sector financial institutions is equal to Rs.128 crores. Total tax paid by the financial institutions is then estimated to be Rs.754 crores.

From NAS-1991, we know that gross saving by the public sector financial

4

Alternatively, it may have been preferably assumed that the direct tax payment is in proportion of operating surplus. However, this would not affect the income of the financial sector by even 0.5%.

institutions in the year 1983-84 is Rs.1,972 crores. Again we have assumed that saving by the private sector financial institutions is in proportion to their contribution in the NVA by the financial sector. This gives us the estimated saving of the private sector financial institutions to be Rs.404 crores. Therefore, total estimated saving of the financial sector is Rs.2,376 crores⁵.

The total receipt of this sector, as estimated earlier is equal to Rs.15,168 crores. A part of this, Rs.754 crores, is utilized to pay direct taxes and Rs.2,376 crores are saved. We have seen earlier that Rs.306 crores (see Table 3.22) is transferred to the government as property income. After allocating these items (a total amount of Rs.3,436 crores) an amount of Rs.11,732 crores remains to be allocated. This, we assume, is transferred to the non-government domestic institutions in proportion to their claims on the financial institutions. From the Financial Balance Sheet for India we see that out of the total claims on the financial sector by non-government institutions, 3% is by the private corporate sector and the remaining 97% is by the household sector. Using these proportions, the transfer to the household sector, worked out to be Rs.11,380 crores and that to the private corporate sector to be Rs.352 crores.

Estimates of income and expenditure accounts for this sector are presented in Table 3.26.

Step 4: Estimates of Income and Expenditure Accounts of the Private Corporate Sector

We know that the private corporate sector receives Rs.8,986 crores from the production activities in the form of non-wage income. It also gets Rs.352 crores from the financial institutions in the form of property income. Thus, its total receipt amounts to Rs.9,338 crores.

The amount of expenditure on different items by the private corporate sector is calculated as residual.

⁵

This saving we have distributed among the RBI, the banking sector and the OFIs.

The private corporate sector uses its receipts to pay direct tax. Total direct tax payment in the economy is Rs.5,355 crores. Total direct tax paid by the institutions other than the private corporate sector is Rs.4,855 crores. Residual amount of Rs.500 crores, we assume, is paid by the private corporate sector as direct tax.

The private corporate sector also saves in its capital account. We know that the total gross saving in the economy is equal to Rs.41,488 crores. Contribution of institutions other than the private corporate sector is equal to Rs.38,720 crores. We assume that the remaining amount i.e. Rs.2,768 crores is saved by the private corporate sector.

From the earlier accounts of our FSAM, we see that the private corporate sector pays Rs.131 crores to the government in the form of property income. Property income is also paid to the financial sector and the public sector non-departmental non-financial firms, which amounts to Rs.3,372 crores and Rs.824 crores respectively. The total disbursement in the above form is Rs.7,593 crores. Which leaves a discrepancy of Rs.1,743 crores between total receipts and total disbursements. We assume that Rs. 1,743 crores are transferred to the household sector in the form of property income. Estimated income and expenditure accounts of this sector are presented in Table 3.27.

Step 5: Estimates of Income and Expenditure Accounts of the ROW

These accounts are constructed on the basis of information available from NAS-1991, and presented in Table 3.28.

The components of income of the ROW are non-agricultural non-wage income, Rs.1,350 crores; non-agricultural wage income, Rs.72 crores; transfer payments from the household sector, Rs.11 crores, receipts from imports, Rs.17,883 crores. These together amount to total income of this sector, Rs.19,316 crores.

On the other hand, ROW spends Rs.13,536 crores on exports, and pays wage and non-wage income amounting to Rs.9 crores and Rs.469 crores respectively (which are assumed to be from the non-agricultural sector). It also

The private corporate sector uses its receipts to pay direct tax. Total direct tax payment in the economy is Rs. 5,355 crores. Total direct tax paid by the institutions other than the private corporate sector is Rs. 4,855 crores. Residual amount of Rs. 500 crores, we assume, is paid by the private corporate sector as direct tax.

The private corporate sector also saves in its capital account. We know that the total gross saving in the economy is equal to Rs. 41,488 crores. Contribution of institutions other than the private corporate sector is equal to Rs. 38,720 crores. We assume that the remaining amount i.e. Rs. 2,768 crores is saved by the private corporate sector.

From the earlier accounts of our FSAM, we see that the private corporate sector pays Rs. 131 crores to the government in the form of property income. Property income is also paid to the financial sector and the public sector non-departmental non-financial firms, which amounts to Rs. 3,372 crores and Rs. 824 crores respectively. The total disbursement in the above form is Rs. 7,593 crores. Which leaves a discrepancy of Rs. 1,743 crores between total receipts and total disbursements. We assume that Rs. 1,743 crores are transferred to the household sector in the form of property income. Estimated income and expenditure accounts of this sector are presented in Table 3.27.

Step 5: Estimates of Income and Expenditure Accounts of the ROW

These accounts are constructed on the basis of information available from CAS-1991, and presented in Table 3.28.

The components of income of the ROW are non-agricultural non-wage income, Rs. 1,350 crores; non-agricultural wage income, Rs. 72 crores; transfer payments from the household sector, Rs. 11 crores, receipts from imports, Rs. 17,883 crores. These together amount to total income of this sector, Rs. 19,316 crores.

On the other hand, ROW spends Rs. 13,536 crores on exports, and pays wage and non-wage income amounting to Rs. 9 crores and Rs. 469 crores respectively (which are assumed to be from the non-agricultural sector). It also

transfers some income (Rs.2,785 crores) to the household sector. Saving of this sector (deficit on the current account of balance of payment, also called foreign savings) is Rs.2,517 crores. Together, these give us total disbursements by the ROW equal to Rs. 19,316 crores which are equal to total receipts.

Step 6: Estimates of Income and Expenditure Accounts of the Household Sector

From earlier accounts of our FSAM, we see that the total receipts in the form of mixed income of self employed for the household sector is Rs.99,788 crores. The household sector also receives wage income of Rs.13,196 crores and Rs.48,778 crores from agricultural and non-agricultural activities respectively. (Though part of the non-agricultural wage income goes to the ROW, the household sector receives some non-agricultural wage income from the ROW). Transfers from other sectors are as follows: Rs.1,743 crores from the private corporate sector, Rs.11,380 crores from the financial sector, Rs.5,588 crores from the government sector and Rs.2,785 crores from the ROW. Together these give us the total income of the household sector equal to Rs.183,258 crores.

For estimating the expenditure account of the household sector we make use of information available from NAS-1991 and I-OTT, 1983-84.

From the earlier accounts of our FSAM we know that the household sector spends Rs.1,49,307 crores as private final consumption expenditure. From NAS 1991, we know that Rs.2,862 crores are paid to the government in the form of direct tax and Rs.506 crores as fees and fines. Rs.11 crores are transferred as remittances abroad. Transfers to the financial sector are Rs 1,445 crores and that to the government sector Rs.108 crores. Rs.29,018 crores are the gross saving of the household sector. Together these give total expenditure (including gross saving) by the household sector amounting to Rs.1,83,258 crores, which equals the total income of this sector. Income and expenditure accounts of the household sector are presented in Table 3.29.

3.4.2 Capital Account of the FSAM:

The capital account of our FSAM has accounts for assets- (financial as well as physical), financial liabilities, saving and for the institutions/ agents participating in the money and capital markets. Disaggregated assets and institutions in the capital account has already been listed. For constructing the accounts of financial assets and liabilities we have made use of FOF accounts of India for the year 1983-84, published in RBI Bulletin, 1991.

We construct below the capital account of our FSAM in three stages. Stage I is used to construct the accounts of financial assets and liabilities whereas stage II describes the construction of physical assets (investment) and saving accounts in the economy. Stage III balances the capital account of our FSAM. *All the figures are in flow terms.*

Stage I: Estimate of Flows of Financial Assets and Liabilities

Step 1: Basic data on flow of funds from RBI Bulletin, 1991, was first tabulated in the matrix form for various assets/liabilities for different institutions and is presented in Table 3.30⁶.

In any economy, not only the aggregate amount of total sources and uses of financial funds must tally but the same must also hold for each type of asset and liability. But from the basic FOF matrix, presented in Table 3.30, we see that there are discrepancies in the total for each type of asset and liability. In total, this discrepancy is around 4% but there are wide ranges for different types of assets - varying from no discrepancy for the small saving and life funds to 15%

6

As the institution wise details of "deposits" are not available from Table 3.30, we have presented it in Table 3.31.

of discrepancy in case of total investment in the form of shares and securities. The discrepancy between sources and uses for different assets arises due to unidentified financial transactions. Even in the identified transactions there is a divergence due to differences in valuation, timing and the reliability of the reported figures and the method of estimation. Therefore, the FOF accounts just give broad indication of the actual financial flows in the economy. But still they can be used to study the structure of the financial flows.

As the total amount of discrepancy appearing under unidentified assets is much less under "uses" than under "sources", we have taken "uses" data as given and adjusted the sources data in such a way that the total of "sources" equals the total of "uses". Details of adjustment in each item are given below. Such an exercise can also be carried out by taking sources data as given and adjusting the uses data.

Step 2: Various assets categories are aggregated/ disaggregated so as to match the various assets categories used in our model⁷ and the capital account of our FSAM. We have kept only those assets as separate categories for which we have given behavioural explanation in our model. Other assets, which are not important from the point of view of our study are clubbed with the "other assets not classified elsewhere". This type of aggregation would simplify the exposition of the model developed in chapter 4.

There are certain identified/ unidentified assets for which origin and/ or destination is not available from the FOF. These assets are also clubbed with "other assets". To balance the matrix, origin and/ or the destination of these assets is specified as "unidentified agent". There is no other reasonable way to distribute the amount under unidentified assets among identified assets. (As an exercise, we tried to adjust the amount with unidentified agents under deposits, investment and loans & advances to the identified agents on pro rata basis. The amount with these unidentified agents is sometimes very large and the

7

For the details of the model see chapter 4.

distribution on pro rata resulted in large changes compared to the original figures).

Various assets categories highlighted in our FSAM are as follows :

Money in our model is defined as "M3". It consists of cash in hand with the non-banking public, deposits of the non-banking public with the banking sector (i.e. commercial and co-operative banks) and the "other deposits" with the RBI.

Deposits of the banking sector with the RBI are termed as reserves of the banking sector with the RBI.

Private corporate securities in our model consist of shares and debentures issued by the private corporate sector and the deposits with the private corporate sector.

Contractual saving is sum of life funds and provident funds of FOF matrix.

In our FSAM, we do not differentiate among different types of foreign assets (except the deposits with the RBI and the banking sector which is a part of the money as defined above) and club them under "foreign claims"/ "foreign assets". This consists of loans and advances, investment in securities and other claims of foreigners.

Definitions of other assets are same as they are given in FOF.

Step 3: As mentioned above, the assets which have not been given behavioural explanation or are not policy variables are clubbed under "other assets". These "other assets" vary from agent to agent. We describe below the various asset categories highlighted in our FSAM for different economic agents.

Flow of cash (Rs.2,776 crores) and deposits with the banking sector (Rs.7,967 crores) of the household sector forms a part of money in the economy. The household sector invests in private corporate securities which consist of investment by the household sector in the shares and debentures of the private corporate sector, Rs.333 crores, plus the deposits with the private corporate sector, Rs.426 crores. Thus, the total amount under this category amounts to Rs.759 crores. Investment in the securities of the OFIs by the household sector (Rs.268 crores) is gaining importance in recent years and, therefore, has been

identified as a separate category in our model. On the other hand, investment in the securities of the banking sector, Rs.120 crores, have declined in importance and, therefore, we have not identified it as a separate category. We have clubbed the amount under this with "other assets" of the household sector. As the investment in government securities, Rs.129 crores, form very small amount of total uses of funds of the household sector we have clubbed this amount also with the "other assets" of the household sector. Another important item for the household sector is small savings (Rs.1,765 crores). Investment in "contractual savings" by the household sector is equal to Rs. 4,430 crores (constituents of which are life funds, Rs. 1,376 crores and provident fund Rs.3,054 crores). All other uses of funds by the household sector have been clubbed with "other assets" of the household sector. With this categorization of uses of funds, flow of "other assets" amounts to Rs.773 crores (this is the sum total of bank securities, Rs.120 crores, government securities, Rs.129 crores, compulsory deposits with RBI, Rs.82 crores, trade debt, Rs.(-)164 crores (Rs.(-)176 crores of it belongs to the private corporate sector and Rs.12 crores to the OFIs), deposits with the OFIs, Rs.306 crores, and deposits with the government sector, Rs.300 crores).

All sources of funds for the household sector such as loans from the banking sector (Rs.4,704 crores)⁸, loans from the OFIs (Rs.462 crores), loans from the RBI (Rs.1 crores), the private corporate sector (Rs.64 crores) and the government sector (Rs.203 crores) have been clubbed by us under "other liabilities". Thus total amount under "other liabilities" is Rs. 5,434 crores.

Addition to money with the private corporate sector is Rs. 509 crores. Cash component of it is Rs.39 crores and deposits Rs.470 crores. As other uses of funds of the private corporate sector such as government securities, Rs.9 crores, deposits with the government sector, Rs. 250 crores, OFI securities, Rs.

8

Loans from the banking sector to the household sector is a large amount. However, most of the loans to this sector such as loans to the small establishments, farming sector come under priority lending. Hence, we assume that loans to the household sector from the banking sector is an exogenous- policy variable and club it with "other assets".

75 crores, bank securities, Rs.(-)5 crores, other securities, Rs.22 crores, loans to the household sector, Rs.64 crores, other loans and advances, Rs.757 crores and "other unidentified assets", Rs.20 crores, are of minor importance in our model we have clubbed them under "other assets", which then amounts to Rs. 1,192 crores. Flow of foreign assets with the private corporate sector is Rs.18 crores.

Major sources of funds for the private corporate sector are private corporate securities, Rs.1,362 crores, loans from the banking sector, Rs.1,167 crores, loans from the OFIs, Rs.1,066 crores. Other domestic sources of funds clubbed under "other liabilities" amounts to Rs.740 crores, (loans from the RBI, Rs.3 crores, loans from the public sector, Rs.133 crores, trade debt from the household sector, Rs.(-)176 crores and investment by the public sector, Rs.146 crores and by the banking sector, Rs.31 crores in private corporate securities.)

As investment by the public sector in various financial assets is of minor importance from the point of view of our study, we have clubbed all the domestic assets of the public sector in "other assets" and all types of "foreign assets" under "foreign asset" categories. Thus, "other assets" of the public sector amounts to Rs.1,489 crores and "foreign assets" of the public sector amounts to Rs.(-)298 crores.

Major sources of funds for the public sector are government securities held by the RBI, Rs.794 crores, the banking sector, Rs.2,070 crores, the OFIs Rs. 1,841 crores; small savings from the household sector, Rs.1,765 crores; contractual saving from the household sector, Rs.1,155 crores. "Other liabilities" of the public sector, Rs.4,513 crores, is the sum total of investment in government securities by the household sector, Rs.129 crores, and the private corporate sector, Rs.9 crores, small savings by the OFIs, Rs.644 crores, deposits with the public sector by the banking sector, Rs.(-)9 crores, the OFIs, Rs.956 crores, the private corporate sector, Rs.250 crores, and the household sector, Rs.300 crores and the loans from the banking sector, Rs. 1,606 crores and the OFIs, Rs.637 crores and other claims of the RBI, Rs.(-)9 crores.

In the capital account of our FSAM, the financial sector has been disaggregated into the RBI, the banking sector and the OFIs.

Major uses of funds for the RBI are loans to the banking sector, Rs. 680 crores, loans to the OFIs, Rs. 533 crores and credit to the public sector in the form of government securities, Rs.794 crores. Investment in "other domestic assets" is Rs.(-)6 crores (which is the sum total of currency Rs.(-)9 crores, bank securities, Rs.(-)1 crores, loans to the private corporate sector Rs.3 crores, loans to the household sector, Rs.1 crore). Foreign assets of the RBI amount to Rs.1,233 crores.

Sources of fund for the RBI are: Money, Rs.3,261 crores (cash, Rs.2,796 crores and deposits, Rs.465 crores), Reserves and Balances of the banking sector, Rs.2,948 crores (which consists of cash, Rs. 131 crores plus deposits, Rs.2,817 crores⁹), "other liabilities", Rs.(-)3,514 crores (compulsory deposits, Rs.82 crores, cash, Rs.75 crores, government deposits with the RBI, Rs.(-)3,671 crores) and foreign liabilities, Rs.1,339 crores.

The banking sector's uses of funds consists of balances with the RBI, Rs. 2,948 crores, investment in government securities, Rs. 2,070 crores, OFIs securities, Rs. 928 crores, loans to the private corporate sector, Rs.1,167 crores. All other assets have been clubbed together and put under "other assets". Total of "other assets" of the banking sector is then Rs.7,118 crores (This consists of investment in private corporate securities, Rs.31 crores, "other securities, Rs.9 crores, loans to the public sector Rs.1,606 crores, the OFIs, Rs.7 crores, and the household sector Rs.4,704 crores, deposits with the public sector, Rs.(-)9 crores, "other deposits", Rs.18 crores, and other unidentified assets, Rs.752 crores). Foreign assets of the banking sector totals to Rs.221 crores.

Sources of finance for the banking sector are money, Rs.9,204 crores (all in the form of deposits), loans from the RBI, Rs.680 crores, loans from the OFIs,

9

For simplification we have assumed that cash and deposits of the banking sectors are kept with the RBI.

Rs.794 crores, and "other domestic liabilities", Rs.808 crores ("other domestic liabilities" consists of deposits from the public sector, Rs.361 crores, loans from the public sector, Rs. 15 crores, investment in the banking sector securities by the RBI, Rs.(-)1 crores, the OFIs, Rs.268 crores, the private corporate sector, Rs.(-)5 crores, the public sector, Rs.50 crores and the household sector, Rs.120 crores).

Uses of funds for the OFIs are as follow : Money, Rs.144 crores (Cash Rs.(-)19 crores plus deposits with the banking sector, Rs.229 crores and deposits with the RBI, Rs.(-)66 crores), loans to the banking sector and the private corporate sector are Rs.794 crores, Rs.1,066 crores respectively and investment in government securities, Rs.1,841 crores. Uses of funds in "other domestic assets" amounts to Rs.3,999 cores (private corporate securities, Rs.603 crores, banking securities, Rs.268 crores, other securities, Rs.168 crores, deposits with the public sector, Rs.956 crores, other deposits, Rs.(-)1 crores, loans to the public sector, Rs.637 crores, loans to the household sector, Rs.462 crores and other loans and advances, Rs.54 crores, small savings, Rs.644 crores, and other unidentified assets, Rs.208 crores). Foreign assets amounts to just Rs.58 crores.

Main sources of funds for the OFIs are investment in OFIs securities by the banking sector, Rs.928 crores and the household sector, Rs.268 crores; loans from the RBI, Rs.533 crores, contractual savings, Rs.3,275 crores and "other domestic liabilities", Rs.1,106 crores (this consists of investment in OFI securities by the private corporate sector, Rs.75 crores, and the public sector, Rs. 251 crores, loans from the banking sector, Rs.7 crores, the public sector, Rs.455 crores, deposits by the household sector Rs.306 crores, trade debt from the household sector Rs.12 crores). Foreign liabilities of the OFIs amount to Rs.95 crores.

Money with the ROW amounts to Rs.1,069 crores (deposits with the banking sector, Rs.538 crores and deposits with the RBI, Rs.531 crores). All other assets of the ROW, as they do not play any important role in our model, have been grouped together and amounts to Rs.1,955 crores (government

securities, Rs.14 crores, private corporate securities, Rs.4 crores, loans to the RBI, Rs.1,339 crores, loans to the OFIs, Rs.95 crores, loans to the private corporate sector, Rs.(-)72 crores, loans to the public sector, Rs.1,101 crores and other unidentified assets, Rs.(-)526 crores).

Total sources of funds for the ROW are Rs.1,232 crores (deposits with the ROW by OFIs, Rs.28 crores, by the public sector, Rs.81 crores, investment in foreign securities by the RBI, Rs.1,233 crores, by the OFIs, Rs.6 crores, by the private corporate sector, Rs.18 crores, loans to the ROW by the public sector, Rs.(-)1,032 crores, by the OFIs, Rs.24 crores, other foreign assets of the public sector, Rs.653 crores and of the banking sector, Rs.221 crores).

Stage II:

Stage I has been utilized to show the volume and direction of financial flows. In stage II we estimate the total amount of investment in physical assets and saving.

Step 1 : From the real account of our FSAM we have saving figures for the household sector, the private corporate sector, the public sector non-departmental enterprises, the government sector, the financial sector and the ROW.

To get the public sector saving, we have added the saving of the non-departmental enterprises and the government sector. On the other hand, in the capital account of our FSAM, we need disaggregation of saving of the financial sector among the RBI, the banking sector and the OFIs.

To disaggregate the financial sector saving among the RBI, the banking sector and the OFIs, we have assumed (for simplification) that the RBI does not have any saving. Total saving of the financial sector is then allocated to the banking sector and the OFIs in the proportions in which they appear in FOF, RBI Bulletin, 1991. The total saving by the banking sector and the OFIs, as shown in the RBI Bulletin, Jan.1991 (p.6) is Rs. 1,675 crores. Share of the banking sector in this is 0.52 and that of the OFIs is 0.48. We apply these proportions to

distribute the total saving of Rs.2,376 crores (as estimated in the earlier accounts of our FSAM) between the banking sector and the OFIs. Thus, we get saving by the banking sector as Rs.1,236 crores and that of the OFIs as Rs.1,140 crores.

Step 2 : To estimate the amount of investment by different institutions, we constructed capital formation matrix by type of institutions. In constructing this matrix use is made of NAS, 1991. The basic capital formation matrix is presented in Table 3.32. Statement 31 and statement 32 of NAS- 1991, give information on gross capital formation and net capital formation in the public sector by different institutions (i.e. administrative departments, departmental enterprises and non-departmental enterprises). Amount of consumption of fixed capital by different institutions in the public sector is available from capital finance accounts of these institutions given in NAS-1991. Similarly, information on gross fixed capital formation and change in stocks is available from these accounts on the public sector. Capital formation by the non-departmental enterprises has been divided into the non-departmental financial enterprises and the non-departmental non-financial enterprises. The sum total of capital formation by administrative departments, departmental enterprises and non-departmental non-financial enterprises is termed as capital formation by the public sector.

As far as capital formation by the private corporate sector and the household sector are concerned, statement 19 and statement 20 of NAS- 1991 have been utilized.

We have to divide the total amount of gross fixed capital formation, change in stocks, gross capital formation, consumption of fixed capital and net capital formation in the private corporate sector between the non-financial private corporate firms and the financial private corporate firms. For this purpose we have made use of information available on gross fixed capital formation, change in stocks, and gross capital formation from statement 20 of NAS- 1991 which gives the required data by industry of use. Thus, for the entire banking and insurance sector, gross fixed capital formation is Rs.351 crores. Subtracting the contribution of the financial enterprises in the public sector, Rs.192 crores, we

get the amount of gross fixed capital formation by the financial private corporate firms to be Rs. 159 crores. Similarly, change in stocks in the banking and insurance sector is Rs.13 crores and, therefore, after subtracting the share of the financial public sector firms we get change in stocks in the financial private corporate firms to be Rs.(-)1 crores. As far as gross capital formation is concerned, total of it in the banking and insurance industry is Rs.364 crores. Again, subtracting the contribution of financial enterprises in the public sector, Rs.206 crores, from this, we shall get the amount of gross capital formation by the financial private corporate firms, which is then Rs.158 crores. From statement 69 of NAS- 1991, we see that consumption of fixed capital in the banking and insurance industry is Rs.106 crores. Deducting the amount of consumption of fixed capital by the public sector financial enterprises (i.e. Rs.59 crores) we get the consumption of fixed capital by the private sector financial enterprises as Rs.47 crores. Then the net capital formation by the private sector financial enterprises is Rs.111 crores.

Subtracting the capital formation by the private sector financial enterprises from the total capital formation by the private corporate firms we get the capital formation by the private corporate non-financial firms.

After making all the above adjustments, the rearranged capital formation matrix is given in table 3.33.

The capital formation by the financial sector has to be further divided among the RBI, the banking sector and the OFIs. In the absence of any relevant information and for simplification we have assumed that the RBI is not engaged in capital formation. Entire capital formation by the financial sector is then divided between the banking sector and the OFIs. RBI Bulletin, Jan.1991 (p.6), gives total investment by the financial sector to be Rs.351 crores. Proportion of the banking sector in it is 0.8 while that of the OFIs is 0.2. We have used these proportions to distribute the total gross capital formation of Rs.364 crores (as estimated in earlier accounts of our FSAM) between the banking sector and the OFIs. Thus, total gross capital formation by the banking sector is Rs.291 crores and by the OFIs it is Rs.73 crores.

Stage III :

Table 3.34 shows :

1. The FOF matrix after incorporating the adjustment, described in stage I, section 3.4.2, in the accounts of various institutions. From this matrix we see that the sources and the uses sides of various assets match.
2. Saving and investment by various economic agents (as estimated in stage II, section 3.4.2, above).

Our task in this stage is to balance the capital account of our FSAM i.e. to have following identity for each economic agent or institution :

$$\text{Sources} + \text{Saving} = \text{Uses} + \text{Investment}$$

As we see from Table 3.34 this identity is not satisfied for institutions/agents under consideration.

One of the source of discrepancy may be the discrepancy between the estimated saving and investment. Total saving for all the agents, as estimated above, is equal to Rs.41,488 crores. On the other hand, total investment of all the agents amounts to Rs.43,061 crores.

From the current account of our FSAM, we see that total investment in the economy estimated from the production side is Rs. 41,488 crores. This is same as the total saving of the agents. Therefore we take this as control total and assume that there is an "unidentified agent" which invests Rs.(-)1,573 crores.

The amount of discrepancy between the total source (financial sources + saving) for each of the economic agent is given in Table 3.34. As we have already balanced total saving and investment, we now concentrate on balancing the financial sources and the financial uses side - of each agent. In this effort, we have taken the amount under the financial uses side of each agent as controlled amount and adjusted the financial sources side accordingly. This "error" term is added to the sources side of each agent in the "other liabilities". The source of these unidentified liabilities or "error", in the absence of any relevant information, is assumed to be "unidentified agent".

After all these adjustments, financial as well as real blocks of our FSAM balance and we get the balanced financial FSAM presented in Table 3.1.

Table 3.1: Financial Sector Accounting Matrix for India for the Year 1983-84

Sector	Code	Sector										Sector										Sector										Sector										Sector																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50									
...

Note: The same table is shown in two parts on page 149A and 149B.

1. ...
 2. ...
 3. ...
 4. ...
 5. ...
 6. ...
 7. ...
 8. ...
 9. ...
 10. ...
 11. ...
 12. ...
 13. ...
 14. ...
 15. ...
 16. ...
 17. ...
 18. ...
 19. ...
 20. ...
 21. ...
 22. ...
 23. ...
 24. ...
 25. ...
 26. ...
 27. ...
 28. ...
 29. ...
 30. ...
 31. ...
 32. ...
 33. ...
 34. ...
 35. ...
 36. ...
 37. ...
 38. ...
 39. ...
 40. ...
 41. ...
 42. ...
 43. ...
 44. ...
 45. ...
 46. ...
 47. ...
 48. ...
 49. ...
 50. ...

Notations

- AGR = Agriculture
- NAGR = Non-Agriculture
- AW = Agriculture Wage Income
- ANW = Agriculture Non-Wage Income
- NAW = Non-Agriculture Wage Income
- NANW = Non-Agriculture Non-Wage Income
- HH = Household Sector
- PSNFF = Private
- PSNDNFF = Private Sector Non-Departmental Enterprises
- FF = Financial Institutions
- DT = Direct Tax
- NINDT = Net Indirect Tax
- GOVT = Government Sector
- ROW = Rest of the World
- PS(TOT) = Public sector (Total)
- RBI = Reserve Bank of India
- BS = Banking Sector
- OFI = Other Financial Institutions
- RES = Reserves
- DEP = Deposits
- GS = Government Securities
- IS = Private Corporate Securities
- OFI_s = Other Financial Institution Securities
- SM = Small Savings
- CS = Contractual Savings
- L_b = Loans to the Banking Sector
- L_d = Loans to the OFI
- L_p = Loans to the private Corporate Sector
- FA/FL = Foreign Assets/Foreign Liabilities
- OA/OL = Other Assets/Other Liabilities
- INVST = Investment
- PC = fixed Investment
- ST = change in Stocks

Table 3.1A : Financial Social Accounting Matrix for India for the Year 1983-84

CURRENT A/C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
AGR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
AGR	16776	17088	33864					61359								55		1274
NAGR	11153	110860	122013					87948								21086		12262
TOT (COM)	27929	127948	155877					149307								21141		13536
AW	13196		13196															
ANW	1684		1684															
NAW		48841	48841															9
NANW		23214	23214															469
HH	52580	47208	99788	13196		48778			1743		11380					5588		2785
PSNFF					946		8040				352							
PSNDNFF					121		8710		824							43		
FF							3126	1445	3372	3889						3336		
DT								2862	500	1239	754							
NINDT	1207	19659	20866															
GOVT					617		2457	615	131	1640	306			5355	20866			
ROW	1187	16696	17883			72	1350	11										
CAPITAL A/C																		
HH								29018										
PSNFF									2768									
PSNDN										2930								
GOVT																1879		
PS (TOT)																	4809	
FF											2376							
RBI																		
BS												1236						
OFI													1140					
ROW																		2517
MONEY																		
CASH																		
DEP																		
RES																		
GS																		
IS																		
OFI _s																		
SM																		
CS																		
L _b																		
L _d																		
L _p																		
FA/FL																		
OA/OL																		
INVST																		
PC																		
ST																		
ERROR																		
TOTAL	97783	283566	381349	13196	1684	48850	23683	183258	9338	9698	15168	1236	1140	5355	20866	31987	4809	19316
	AGR	NAGR	TOT (COM)	AW	ANW	NAWA	NANW	HH	PSNFF	PSNDNFF	FF	BS	OFI	DT	NINDT	GOVT	PS(TOT)	ROW
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

1571

Table 3.1B : Financial Social Accounting Matrix for India for the Year 1983-84

																											Rs Crores							
	HH	PSNFF	PS (TOT)	RBI	BS	OFI	ROW	MON	CASH	DEP	RES	GS	IS	OFIS	SS	CS	Lb	Ld	Lp	FA/FL	OA/OL	INV(TOT)	PC	ST	ERROR	TOTAL								
Cap ac	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	Cap ac							
1																										97783	AGR	1						
2																						1231	239	992		283566	NACR	2						
3																						41488	38530	2958		381349	TOT (COMO)	3						
4																										13196	AW	4						
5																										1684	ANW	5						
6																										48850	NAW	6						
7																										23683	NANW	7						
8																										183258	HH	8						
9																										9338	PSNFF	9						
10																										9698	PSNDNFF	10						
11																										15168	FF	11						
12																										5355	DT	12						
13																										20866	NINDT	13						
14																										31987	GOVT	14						
15																										19316	ROW	15						
16																												CAPITAL AC						
17													759													5434	HH	16						
18																										2233	-68	740	10	34462	PSNFF	17		
19																													2085	8517	PSNDNFF	18		
20																															PSNDNFF	18		
21																															GOVT	19		
22												4705			1765	1155											1115	4513		3304	21366	PS (TOT)	20	
23																																FF	21	
24																																	FF	21
25																																	FF	21
26	10743	509				144	1069																										FF	21
27	2776	39				-19																											FF	21
28	7967	470				163	1069																										FF	21
29						2948																											FF	21
30				794	2070	1841																											FF	21
31	759																																FF	21
32	268				928																												FF	21
33	1765																																FF	21
34	4430																																FF	21
35				680		794																											FF	21
36				533																													FF	21
37					1167	1066																											FF	21
38		18	-298	1233	221	58	1955																										FF	21
39	773	1192	1489	-6	7118	3999																											FF	21
40	15724	6798	20175		291	73																											FF	21
41	12809	6573	20258		281	70																											FF	21
42	2915	225	-83		10	3																											FF	21
43																																	FF	21
44	34462	8517	21366	3234	14743	7975	3024	12465	2796	9669	2948	4705	759	1196	1765	4430	1474	533	2233	3187	14565	41488	38530	2958	4952	4952	953769	TOTAL	44					
Cap ac	HH	PSNFF	PS(TOT)	RBI	BS	OFI	ROW	MON	CASH	DEP	RES	GS	IS	OFIS	SM	CS	Lb	Ld	Lp	FA/FL	OA/OL	INV(TOT)	PC	ST	ERROR	TOTAL								
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44								

149 B

Table 3.2: Description of Sectors for the 2 x 2 Commodity by Commodity Block in Table 3.1.

No.	Sector	Composition of the Sector
1.	Agriculture	Food Crops (01), Cash Crops (02), Plantation Crops (03), Animal Husbandry (05), Forestry and Logging (06), Fishing (07)
2.	Non-Agriculture	Coal lignite (08), Crude Petroleum and Natural Gas (09), Iron Ore (10), and Other Minerals (11), Sugar (12), Food-Other than Sugar (13), Beverages (14), Tobacco Products (15), Cotton Textiles (16), Wool Silk and Synthetic Fibre Textiles (17), Jute, Hemp and Mesta Textiles (18), Textile Products (19), Wood and Wood Products except Furniture (20), Furniture and Fixtures (21), Paper and Paper Products (22), Printing, Publishing and Allied Activities (23), Leather and Leather Products (24), Plastic and Rubber Products (25), Petroleum Products (26), Coal Tar Products (27), Inorganic Heavy Chemicals (28), Organic Heavy Chemicals (29), Fertilisers (30), Paints Varnishes and Lacqures (31), Pesticides, Drugs and Other Chemicals (32), Cement (33), Non-Metallic Minerals Products (34), Iron and Steel industries (35), Other Basic Metal Industries (36), Metal Products except Machinery and Transport Equipment (37), Agricultural Machinery (38), Industrial Machinery for Food and Textile (39), Other Machinery (40), Electrical Machinery (41), Railway Transport Equipment (42), Miscellaneous manufacturing industry (43), Construction (45), Electricity Gas and Water Supply (46,47), and Railway Transport Services (48), Other Transport Services (49), Storage and Ware Housing (50), Communication (51), Trade (52), Hotels and Restaurants (53), Banking and Insurance (54,55), Education Research and Other Services (56-60).

Note: Figures in the brackets are the sector numbers from I-OTT Tables 1983-84, GOI, CIS (1988).

Table 3.3: Intermediate Input-Output Block

Rs. Crores			
Sectors	Agriculture	Non-Agriculture.	Total
(1)	(2)	(3)	(4)
Agriculture	16776	17088	33864
Non-Agriculture	11153	110860	122013
Total	27929	127948	155877

Source: CSO-GOI(1988); I-OTT, '1983-84.

Note: Slight difference between the above matrix and I-OTT, 1983-84 occurs because of rounding off of figures.

Table 3.4: Comparison of Gross Domestic Product and its Components for 1983-84

(Rs. Crores)

Item	Sources of data		Discrepancies between two Sources of Data
	NAS-1991	IOTT-1983-84	
(1)	(2)	(3)	(4)
1. GDP at Factor Cost	186723	185815	908
2. Net Indirect Taxes	20866	20866	-
3. GDP at Market Prices	207589	206681	908
1. Government Final Consumption Expenditure	21141	21141	-
2. Private Final Consumption Expenditure (PFCE)	145965	145899	66
3. Gross Fixed Capital Formation (GFCF)	39991	38320	1671
4. Change in Stocks (CIS)	3070	5857	-2787
5. Exports	13139	13139	-
6. less Imports	17675	17675	-
7. Discrepancies	1958	-	1958
8. Expenditure on Gross Domestic Product	207589	206681	908

Source: 1) For Col.2 : NAS-CSO 1991, pp 14,15.
2) For Col.3 : I-OTT, 1983-84, GOI, CSO (1988).

Table 3.5: Components of Gross Domestic Expenditure and Discrepancies between "Data for SAM" and I-OTT, 1983-84

(Rs. Crores)

Components	Sources Of Data		Discrepancies
	Data for SAM	I-OTT	
(1)	(2)	(3)	(4)
1. Government Final Consumption Expenditure (GFCE)	21141	21141	-
2. Private Final Consumption Expenditure (PFCE)	149307	145899	3408
3. Gross Fixed Capital Formation (GFCF)	38530	38320	210
4. Change in Stocks (CIS)	2958	5857	-2899
5. Exports	13536	13139	397
6. less Imports	17883	17675	208
7. Expenditure on Gross Domestic Product	207589	206681	908

Source: For Col.3: I-OTT, 1983-84, GOI, CSO (1988).

Note: Col. 2 is derived by adding col. 4 of Table 3.4 to col. 2 of Table 3.4.

Table 3.6: Adjustment in Final Use Matrix

(Rs. Crores)

Sectors	PFCE	GFCE	GFCF	CIS	EXP	less IMP	Total Final Use
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.AGR							
AC	57946	55	206	1949	1284	1172	60268
P	0.41	0.00	0.01	0.33	0.09	0.07	
Ad	1397	-	2	-957	36	15	463
AF	59343	55	208	992	1320	1187	60731
IND	2016	-	31	-	-46	-	2001
AM	61359	55	239	992	1274	1187	62732
2.NAGR							
AC	83035	20363	34982	3908	12369	16503	138154
P	0.59	1.00	0.99	0.67	0.91	0.93	
Ad	2011		208	-1942	361	193	445
AF	85046	20363	35190	1966	12730	16696	138599
IND	2902	723	3101	-	-468	-	6258
AM	87948	21086	38291	1966	12262	16696	144857
3.Total							
AC	140981	20418	35188	5857	13653	17675	198422
Ad	3408	-	210	-2899	397	208	908
AF	144389	20418	35398	2958	14050	17883	199330
IND	4918	723	3132	0	-514	0	8259
AM	149307	21141	38530	2958	13536	17883	207589

Source: (1) for "AC" :CSO(1988); IOTT-1983-84

(2) for "Total IND", IOTT -1983-84

(3) for "Total AM", Table 3.5, col.2.

(4) for "Total Ad", Table 3.5, col.4.

Notations used in the model are as given below

(i) PFCE : Private Final Consumption Expenditure

(ii) GFCE : Government Final Consumption Expenditure

(iii)GFCF : Gross Fixed Capital Formation

(iv) CIS : Change in Stocks

(v) EXP : Exports

(vi) IMP : Imports

(vii) AGR : Agriculture

(viii)NAGR:Non Agriculture

(ix) AC : Actual amount in Rs. Crores from I-OTT (1983-84)

(x) P : Proportion of each good used under each final use category.

(xi) Ad : Adjustment required in "AC" so as to get controlled total in Rs. Crores

(xii) AF : Amount at factor price in Rs. Crores

(xiii)IND : Net indirect tax

(xiv) AM : Amount at market price in Rs. Crores

Table 3.7: Adjusted Amounts Of Gross Value Added

(Rs. Crores)

Commodities	GVA	Proportion to GVA	Amount to be Adjusted	Adjusted GVA
(1)	(2)	(3)	(4)	(5)=(2+4)
AGR	67133	0.36	327	67460
NAGR	118682	0.64	581	119263
Total	185815		908	186723

Source: col.2 is available from I-OTT (1983-84).

Note: For notations see Table 3.6.

Table 3.8: Factor Income by Broad Commodity Groups -1983-84

(Rs. Crores)

Category	Total NVA from NAS	Compensation of employees (Wage Income)	Operating Surplus (Non-Wage Income)	Mixed income of self employed
Commodity Groups				
(1)	(2)	(3)	(4)	(5)
AGR				
A	63725	13205	1512	49008
P		0.2072	0.0237	0.7691
NAGR				
A	103769	48820	15321	39628
P		0.4705	0.1476	0.3819

Source: Compiled from NAS - (FACTOR INCOME); 1994.

Notation used in the Table are as follows:

A: Amount in Rs. Crores

P: Proportion to total amount of factor income or Net Domestic Product

For remaining notations see table 3.6.

Table 3.9: Distribution of Consumption of Fixed Capital, Gross Value Added Among Broad Categories

(Rs. Crores)

Sectors	Gross Value Added	Consumption Of Fixed Capital	Net Value Added
(1)	(2)	(3)	(4)
Agriculture	67460	3773	63687
Non Agriculture	119263	15456	103807
Total	186723	19229	167494

Source: Col. 2 from Table 3.7, col.5.
Col.3 compiled from NAS 1991.

Table 3.10: Distribution of Net Value Added Among Different Factor Payments

(Rs. Crores)

Sectors	Total Net Value Added	Compensation Of Employees (Wage Income)	Operating Surplus (Non Wage Income)	Mixed Income of Self Employed
(1)	(2)	(3)	(4)	(5)
AGR	63687	13196	1509	48982
NAGR	103807	48841	15322	39644
Total	167494	62037	16831	88626

Source: Col.2 from Table 3.9, col 4.

Note: Proportions available from the Table 3.8 are applied to estimate figures under columns 3, 4 & 5.

Table 3.11: Net Value Added by Organized and Unorganized Sectors

(Rs. crores)

Sectors	Organized	Unorganized	Total	Proportion	
				Organized	Unorganized
(1)	(2)	(3)	(4)	(5)	(6)
AGR	2961	60764	63725	0.0465	0.9535
NAGR	52982	50787	103769	0.5106	0.4894
Total	55943	111551	167494		

Source : Compiled from NAS 1991.

Table 3.12: Finance of Consumption of Fixed Capital from Operating Surplus and Mixed Income of Self Employed

(Rs. crores)

Sectors	Consumption of Fixed Capital	Financed from Operating Surplus	Proportion Applied	Financed from Mixed Income Of Self Employed	Proportion Applied
(1)	(2)	(3)	(4)	(5)	(6)
AGR	3773	175	0.0465	3598	0.9535
NAGR	15456	7892	0.5106	7564	0.4894
Total	19229	8067		11162	

Source: Col.2 compiled from NAS 1991.
Col.4 and col.6 from Table 3.11, col.5 and col.6 respectively.

Table 3.13: Estimated Gross Operating Surplus and Gross Mixed Income of Self Employed

(Rs. Crores)

Sectors	Operating Surplus	Consumption of Fixed Capital	Gross Operating Surplus	Mixed Income of Self Employed	Consumption of fixed capital	Gross Mixed Income of Self Employed
(1)	(2)	(3)	(4)	(5)	(6)	(7)
AGR	1509	175	1684	48982	3598	52580
NAGR	15322	7892	23214	39644	7564	47208
TOTAL	16831	8067	24898	88626	11162	99788

Source : Col. 2 & 5 from Table 3.10, col.4 & 5 respectively.
Col. 3 & 6 from Table 3.12, col.3 & 5 respectively.

Note: For notations see table 3.6.

Table 3.14: Distribution of Gross Value Added to Different Factor Payments

(Rs. Crores)

Sector	GVA	Wage Income	Non Wage Income	Gross Mixed Income of Self Employed
(1)	(2)	(3)	(4)	(5)
AGR	67460	13196	1684	52580
NAGR	119263	48841	23214	47208
TOTAL	186723	62037	24898	99788

Source: 1) col.2 from Table 3.9, col.2.
2) col.3 from Table 3.10, col.3.
3) col.4 & 5 from Table 3.13, col. 4 & 7 respectively.

Table 3.15: Gross Value Added and its Composition - Government Sector

(Rs. Crores)

Item	Administrative Departments	Departmental Enterprises	Total
(1)	(2)	(3)	(4)
Gross Value Added	14583	6591	21174
Consumption of Fixed Capital	1323	2302	3625
Net Value Added	13260	4289	17549
Compensation of Employees	13260	4664	17924
Operating Surplus	-	-375	-375
Gross Non Wage Income	1323	1927	3250
Non Wage Income from Agriculture	-	617 (32%)	617
Non Wage Income from Non Agriculture	1323	1310 (68%)	2633

Source: Compiled on the basis of NAS-1991.

Note: Total gross non wage income generated in departmental enterprises is distributed between agriculture and non-agriculture sectors in proportion to the gross domestic product by types of activities.

Table 3.16: Gross Value Added and its Composition - Public Sector Non - Departmental Enterprises

(Rs. Crores)

Item	Total	Financial Enterprises	Non Financial Enterprises
(1)	(2)	(3)	(4)
Gross Value Added	21067	4864	16203
Consumption of Fixed Capital	4431	59	4372
Net Value Added	16636	4805	11831
a.Compensation of Employees	9012	1888	7124
b.Operating Surplus	7624	2917	4707
Gross Non Wage Income	12055	2976	9079
Non Wage Income from Agriculture	121	-	121
Non Wage Income from non Agriculture	11934	2976	8958

Source: Compiled on the basis of NAS-1991 and NAS (Factor Income); 1994.

Table 3.17 : Gross Value Added and its Composition - Financial Sector (Private+ Public)

(Rs. Crores)

Item	Total
(1)	(2)
Gross Value Added	5963
Consumption of Fixed Capital	106
Net Value Added	5857
Compensation of Employees	2457
Operating Surplus	3201
Gross Non Wage Income	3307
Mixed Income of Self Employed	199

Source: Compiled on the basis of NAS, 1991 and NAS (Factor Income), 1994.

Note: Since contribution of unorganized sector in NVA in the financial sector is very small (around 3%) we assume that whole of consumption of fixed capital is from organized sector and thus form part of gross profits.

Table 3.18: Estimates and Distribution of Gross and Net Value Added to different Factor Payments for the Private Corporate Non Financial Firms as Residual

(Rs. Crores)

Item	Govt.	Public Sector Non Financial Firms	Financial Firms	Total	Total for the Economy	Private Sector Non Financial Firms
(1)	(2)	(3)	(4)	(5)= (2+3+4)	(6)	(7)=(6-5)
GVA	21174	16203	5963	43340	186723	143383
CFC	3625	4372	106	8103	19229	11126
NVA	17549	11831	5857	35237	167494	132257
a.Wage Income	17924	7124	2457	27505	62037	34532
b.Non Wage Income	-375	4707	3201	7533	16831	9298
Gross Non Wage Income	3250	9079	3307	15636	24898	9262
a.Non Wage Income from Agriculture	617	121	-	738	1684	946
b.Non-Wage Income from Non Agriculture	2633	8958	3307	14898	23214	8316
Mixed Income of Self Employed	-	-	199	199	99788	99589

Source: Col.2 from Col. 4 of Table 3.15.
 Col.3 from Col.4 of Table 3.16.
 Col.4 from Table 3.17.
 Col.6 from Table 3.10,3.12,3.13,and 3.14.

Note : For notations see Table 3.6.

Table 3.19: Receipt/Transfer of Non Wage Income from/to the Rest of the World

(Rs. Crores)

Instr.	Gross Non Wage Income (excl. ROW)	Prop. To Total Non Wage Income	Non Wage Income from ROW	Gross Non Wage Income (incl. transfers from ROW)	Gross Non Wage Income from AGR	Non Wage Income from NAGR	Prop. to Total of col. (7)	Non Wage NAGR Income after transfer to ROW	Gross Non Wage Income after Transfer to ROW
(1)	(2)	(3)	(4)	(5)= (2+4)	(6)=	(7)= (5-6)	(8)	(9)	(10)= (6+9)
Govt.	3250	0.13	61	3311	617	2694	0.11	2457	3074
Public Sector Non Dept-mental Non Financial Firm	9070	0.37	173	9252	121	9131	0.39	8710	8831
Financial Firm	3307	0.13	61	3368	-	3368	0.14	3126	3126
Private Corporate Non Financial Firm	9262	0.37	174	9436	946	8490	0.36	8040	8986
Total	24898	1.00	469*	25367	1684	23683	1.00	22333	24017
ROW								1350*	
Total (including ROW)								23683	

Source: Col.2 and col.6 from Table 3.18.

Note: * from NAS 1991, pp 238.

+ from NAS 1991, pp 240.

Table 3.20: Expenditure Account of the Government for the year 1983-84.

(Rs. Crores)

Item	Railways	Communication	Government Administrative & Other Departments	Total Expenditure
(1)	(2)	(3)	(4)	(5)
Final Consumption Expenditure	-	-	21141	21141
Property Income	353	121	3739	4213
Current Transfers not else where classified	1	6	4662	4669
a. To the ROW	-	-	22	
b. To Other Sectors	-	-	4640	
Inter Government Accounting Adjustment	-	-	85	85
Net Saving	-217	86	-1615	-1746
Consumption of Fixed Capital	978	296	2351	3625
Gross Savings	761	382	736	1879
Total Expenditure				31987

Source: Compiled on the basis of NAS-1991.

Table 3.21: Distribution of Interest on Public Debt and Other Current Transfers from the Government to Different Institutions

(Rs. Crores)

Institutions	Interest on Public Debt & Other Property Income	Proportions Applied	Current Transfers not else where classified	Total Transfers
(1)	(2)	(3)	(4)	(5)
1.Financial Institutions	3336	0.80	-	3336
2.Households	834	0.20	4754	5588
3.Total (1+2)	4170	1.00	4754	8924
4.Public Sector Non- Financial Non- Departmental Firms	43	-	-	43
5.Total (3+4)	4213	-	4754	8967

Table 3.22: Income Account of the Government for the Year 1983-84.

Item	Amount in Rs. Crores	Proportion Applied
(1)	(2)	(3)
Non Wage Income	3074	
Fees and Fines	506	
Direct Taxes	5355	
Net Indirect Tax	20866	
Property Income of Which	2186	
a. Financial Firms	306	0.14
b. Private Corporate Firms	131	0.06
c. Public Sector Non Departmental Firms	1640	0.75
d. Households	109	0.05
Total	31987	

Source: Same as for Table 3.20.

Table 3.23: Claims of the Government on Various Economic Agents

Institutions	Amount in Rs. Crores	Proportions to total (item 6)
(1)	(2)	(3)
1. Financial Institutions	7468	0.14
a. RBI	1887	
b. Banking Sector	2521	
c. OFIs	3060	
2. Private Corporate Sector	3062	0.06
3. Households	2563	0.05
4. Total	13093	
5. Government Companies	39428	0.75
6. Total (4+5)	52521	

Table 3.24: Pattern of Investment by Public Sector Non-Departmental Non-Financial Enterprises

Institutions	Investment in Rs Crores	Proportion to Total (item 8)
(1)	(2)	(3)
1. Government Securities	114	0.05
2. Semi Government Securities	5	
3. Industrial Securities	2550	0.95
4. Shares and Debentures of Subsidiary Companies	8764	
5. ROW	53	
6. Others	411	
7. Total	11897	
8. Grand Total (7-4-5-6)	2669	

Source: Compiled from RBI Bulletin-1982.

Table 3.25: Estimates of Income and Expenditure Accounts of Public Sector Non Departmental Non Financial Enterprises

(Rs. Crores)

Item	Income	Item	Expenditure
(1)	(2)	(3)	(4)
1. Non Wage Income	8831	1. Direct tax	1239
2. Property Income Transfers From	867	2. Property Income Transfers to	5529
a. Government	43	a. Government	1640
b. Private Corporate Firms	824	b. Financial Institutions	3889
3. Total	9698	3. Gross Savings	2930
		4. Total	9698

Source: Compiled on the basis of NAS 1991.

Table 3.26: Estimates of Income and Expenditure Accounts of Financial Institutions

(Rs. Crores)

Item	Income	Item	Expenditure
(1)	(2)	(3)	(4)
1.Non Wage Income	3126	1.Direct Tax	754
2.Property Income	12042	2.Property Income	12038
a.Public Sector Non Departmental Enterprise	3889	a.Government	306
b.Government	3336	b.Private Corporate Sector	352
c.Private Corporate Sector	3372	c.Households	11380
d.Households	1445	3.Gross Saving	2376
4.Total	15168	4.Total	15168

Table 3.27: Estimates of Income and Expenditure Accounts of Private Corporate Sector

(Rs. Crores)

Item	Income	Item	Expenditure
(1)	(2)	(3)	(4)
1.Non Wage Income	8986	1.Direct Tax	500
2.Property Income from Financial Institutions	352	2.Property Income Transfers	6070
3.Total	9338	a.Government	131
		b.Financial Institutions	3372
		c.Public Sector Non Departmental Enterprises	824
		d.Households	1743
		3.Gross Savings	2768
		4.Total	9338

Table 3.28: Estimated Income and Expenditure Accounts of Row

(Rs. Crores)

Item	Income	Item	Expenditure
(1)	(2)	(3)	(4)
1.Non Agricultural Non Wage Income	1350	1.Exports	13536
2.Transfer Payments from Households	11	2.Wage Income	9
3.Imports	17883	3.Non Wage Income	469
4.Non Agricultural Wage Income	72	4.Remittances to Households	2785
5.Total	19316	5.Gross Savings	2517
		6.Total	19316

Source: Compiled on the basis of NAS -1991.

(1) Col.2 pp. 240 of NAS-1991.

(2) Col.4 pp. 238 of NAS-1991.

Table 3.29: Estimated Income and Expenditure Accounts of Household Sector

		(Rs. Crores)	
Item	Income	Item	Expenditure
(1)	(2)	(3)	(4)
1.Mixed Income of Self Employed	99788	1.Private Final Consumption Expenditure	149307
2.Wage Income of Which from	61974	2.Direct Tax	2862
a.Agriculture	13196	3.Fees and Fines	506
b.Non Agriculture	48778	4.Remittances abroad	11
3.Property Income of Which	21496	5.Gross Savings	29018
a.Private Corporate Firms	1743	6.Other Transfers	1554
b.Financial Firms	11380	a.Financial Firms	1445
c.Government	5588	b.Government	109
d.ROW	2785	7.Total	183258
4.Total	183258		

Source: Compiled on the basis of NAS-1991 and other accounts of FSAM.

Table J.36: Basic Flow of Funds Matrix for India for the year 1983-84

ITEM	R.B.I.		BS		OFI		PSNFF		PS		ROW		HH		TOTAL	
	S	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U
1 CASH	2967	-9		131		-19		39	26	75				2776	2993	2993
2 DEP	-826		10575	2826	309	1196	426	720	1824	-3229	185	1069		8999	12493	11581
3 INV		1684	325	3038	1697	2836	1115	119	3736	567	832	18		850	7705	9112
a GS		452		2070		1841		9	3736			14		129	3736	4515
b PCORS				31		553	1115			146		4		333	1115	1067
c BS		-1	325			268		-5		50				120	325	432
d OFIS				928	1697			75		251				268	1697	1522
e FS		1233				6		18			832				832	1257
f OTHERS				9		168		22		120						319
4 LOANS	1337	1559	1309	7484	1242	3037	2746	821	3772	1308	-423	2463	5434		15417	16672
a RBI			856		592				90			1339	1		1539	1339
b BS		680			41	794	1524		953	15			4704		7222	1489
c OFI		533	491	7			824		736	455		95	462		2513	1090
d PSNFF		3		1167		1066				133	7	-72	64		71	2297
e PS		342	37	1606	462	637	188				-430	1101	203		460	3686
f HH		1		4704		462		64		203						5434
g ROW	1337		-75		136	24	49		2163	-1032					3610	-1008
b OTHERS					11	54	161	757	-170	1534					2	2345
5 SS						644			2409					1765	2409	2409
6 LF					1168				208					1376	1376	1376
7 PF					2140				951					3054	3091	3054
8 CD	82													82	82	82
9 TRD					12		-176		1730	1393				-164	1566	1229
10 FC nec			-113	221	12					653	-324	-526			-425	348
11 DI nec	-605		2141	752	210	208	1664	20	2243	424					5653	1404
12 TOTAL	2955	3234	14237	14452	6790	7902	5775	1719	16899	1191	270	3024	5434	18738	52360	50260

Note:

- SS : Small Saving
- LF : Life Fund
- PF : Provident Fund
- CD : Compulsory Deposits
- TRD : Trade Debt
- nec : Not else where classified

For remaining notations see Table 1.

Table 3.31 : Disaggregation of 'Deposits' in Flow of Funds Matrix for India for the year 1983-84

Sectors	RBI	BS	OFIs	PSNFF	PS	ROW	HH	Total
	u	u	u	u	u	u	u	u
Deposits (TOT)		2826	1196	720	-3229	1069	8999	11581
RBI		2817	-66		-3671	531		-389
BS			229	470	361	538	7967	9565
OFIs							306	306
PSNFF			50				426	476
PS		-9	956	250			300	1497
HH								
ROW			28		81			109
Others		18	-1					17

Source : Uses data is compiled from Flow of Funds Accounts- RBI Bulletin 1991.

Note : u = uses

For remaining notations see Table 3.1.

Table 3.32: Capital Formation Matrix By Type of Assets And By Type of Institutions

Rs. Crores

S.No.	Institutions	GFCF	CIS	GCF	Less CFC	NCF
1	2	3	4	5	6	7
1.	Public Sector	20450	-69	20381	8056	12325
a.	Adm & Dep.Ent.	9757	-160	9597	3625	5972
b.	Non Dep Non Fin. Ent.*	10501	77	10578	4372	6206
c.	Financial Ent.*	192	14	206	59	147
2.	Pvt. Corp. Sector	6732	224	6956	2782	4174
a.	Non Fin. Pvt.Corp. Firms *	6573	225	6798	2735	4063
b.	Financial Pvt. Cor. Firms*	159	-1	158	47	111
3.	Household Sector	12809	2915	15724	8391	7333
4.	Total	39991	3070	43061	19229	23832
5.	Banking & Insurance	351	13	364	106	258

Source: Compiled on the basis of NAS-1991

Note: * Division is estimated by us.

GFC : Gross Capital Formation

CFC : Consumption of Fixed Capital

NCF : Net Capital Formation

for remaining of the notations see table 3.1

Table 3.33: Rearranged Capital Formation Matrix By Type of Assets and by Type of Institutions

(Rs Crores)

No.	Institutions	GFCF	CIS	GCF	Less CFC	Net CF
1	2	3	4	5	6	7
1.	Households	12809	2915	15724	8391	7333
2.	Pvt.Corp.Sector	6573	225	6798	2735	4063
3.	Financial Institutions	351	13	364	106	258
4.	RBI	-	-	-	-	-
2.	Banking Sector	281	10	291	85	206
3.	OFls	70	3	73	21	52
4.	Public Sector	20258	-83	20175	7997	12178
5.	Total	38530	2958	41488	19229	22259

Note: For notations see Table 3.32.

Table 3.34: ADJUSTED FLOW OF FUNDS MATRIX FOR INDIA

		Rs Crores																	
ITEM	RBI		BS		OFI		PSNFF		PS		ROW		HH		UNIDENTIFIED		TOTAL		
	S	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U			
1	MONEY	3261		9204		144		509				1069		10743				12465	
a	CASH	2798				-19		39						2778				2798	
b	DEPb			9204		229		470					538	7967				9204	
c	DEPc	465				-68							531					465	
2	RES	2948			2948													2948	
3	GS		794		2070		1841			4705								4705	
4	PCORS							759						759				759	
5	OFIs				928	1196								268				1196	
6	Lb		680	1474			794											1474	
7	Ld		533			533												533	
8	Lp				1167		1068	2233										2233	
10	SM									1765				1765				1765	
11	CS					3275				1155				4430				4430	
12	OA	-3514	-8	808	7118	1106	3999	740	1192	4513	1489		5434	773	5478			14565	
a	RBI			-1				3		-9	-3596		1	82					
b	BS		-1			7	268	31	-5	1597	426		4704	120	779				
c	OFI			268	7			603	75	2237	706			318	429				
d	PSNFF		3	-5	31	75	603			259	279			64	-176	799			
e	PS	-3596	-9	426	1587	706	2237	279	259				203	429	3471				
f	HH	82	1	120	4704	318	462	-176	64	429	203		482						
g	UNIDEN				779		429		799		3471								
13	FA/FL	1339	1233		221	95	58	-68	18	1115	-298	1232	1955			-526		3187	
14	TOTAL	4034	3234	11488	14452	6205	7902	3664	1719	13253	1191	1232	3024	5434	18738	4952		50260	
15	SA			1236	291	1140	73	2768	8798	4809	20175	2517		29018	15724		-1573	41488	
16	TOT	4034	3234	12722	14743	7345	7975	6432	8517	18062	21366	3749	3024	34452	34462	4952	-1573	91748	
17	DISC.	-800		2021		630		2085		3304		-725		10			6525	6525	
18	TOTAL	3234	3234	14743	14743	7975	7975	8517	8517	21366	21366	3024	3024	34462	34462	4952	4952	98273	

Note:

S : Saving

I : Investment

For remaining of the notations see Table 3.1.

Table 3.35 : Financial Balance Sheet for India - as on 1983

		Rs Crores																
SECTORS	R.B.I.		BS		O.F.I.		PSNFF		PS		R.O.W.		HH		UNIDENTIFIED		TOTAL	
	S	U	S	U	S	U	L	A	L	A	L	A	L	A	L	A		
1	MONEY	18167		48388			1604		2824				1947			60180		
a	CASH	16082					109		403							15570		16082
b	DEPb			48388			711		2421					646		44610		48388
c	DEPc	2085					784							1301				2085
2	RES	6418			6418													6418
3	GS		25902		15070		13757				54729							54729
4	IS				197		1861	7099								5041		7099
5	OFls				3649	4501										852		4501
6	Lb		976	4624			3648											4624
7	Ld		3055			3055												3055
8	Lp				14481		5765	20246										20246
9	Lg		372		8101		3877				12350							12350
10	Lh				24019		2945							26964				26964
11	SM									6921						6921		6921
12	CS					21820				7456						29276		29276
13	OA /OL	3055	756	5503	2183	4899	7206	8339	8889	5515	28430			3455	10630	27328		58094
a	RBI	3055	236								1887					932		3055
b	BS		45	5503			1532		24		2521					1381		5503
c	OFls		46			4899			36		3060					1757		4899
d	PSNFF		10					8339			3062					5267		8339
e	GOVT						3504		718	5515						1293		5515
f	HH		1						891		2563				3455			3455
g	OA nec		418		2183		2170		7220		15337							27328
14	FA/FL	3020	4265		207	253	171		47	11215	1910	6600	14488					21088
15	TOTAL	30660	35326	58515	74325	34528	40834	35684	11760	98186	30340	6600	16435	30419	112900	27328		321920

Notations :

L=Liabilities

A=Assets

For remaining notations see table 3.1

Chapter 4

THE MODEL

4.1 Introduction

With the objective of assessing the effect, on output, investment, employment, income, consumption, personal asset holdings etc., of money supply changes through various policy adjustments viz. fiscal policy, monetary policy, credit policy, we have tried to model the Indian economy in a general equilibrium framework.

For such an analysis, we need a disaggregated picture of not only the real side of the economy but also the financial side, i.e. financial sectors/intermediaries and financial assets.

Keeping this requirement in mind, we have constructed a model which integrates a general equilibrium micro model describing the real side of the economy with a macro (but more micro-oriented compared to earlier models - which are referred to below) financial model, explaining the behaviour of the various economic agents relating to changes in their portfolio of asset holdings. Our model draws heavily on the work of Adelman and Robinson (1982), Bourguignon, Branson and de Melo (1989; also referred as BBM model) and the work of economists working for the OECD project on Adjustment and Equity in Developing Countries (1991, 1992).

BBM model and models used in project on "Adjustment and Equity in Developing Countries" combine the explicit micro-economic optimizing behaviour, characteristics of computable general equilibrium models with asset portfolio behaviour of microeconomic models in Tobin's (1969) tradition. Though we have followed a similar approach we have tried to incorporate various structural features of the Indian economy (such as the dualistic nature of the Indian economy with existence of market clearing prices in the agricultural

sector and fixed prices (demand determined output) in the non-agricultural sector, existence of the captive market for government bonds, administered structure of interest rates during the period under consideration, existence of various types of financial intermediaries and financial assets, etc.). These structural features are reflected not only in various original distributional characteristics between sectors, between factors of production and among economic agents and in the many parameter values used in the functional forms but also in various closure rules.

Our model economy is composed of five sectors/agents¹. They are

1. Household (consumer) sector.
2. Private corporate sector.
3. Public sector.
4. Financial (Financial intermediaries) sector.
5. Foreign (Rest of the World) sector.

These sectors/agents interact in the commodity markets, labour market, financial market and foreign exchange market.

The state of the economy is defined in terms of equilibrium in all the above markets subject to certain specifications and closures.

The model is specified in three sub-parts. First part deals with the specification of relationship of variables in the real sector while the second part with those in the financial sector. Third part specifies expectations. An interim period model has been built to introduce recursive dynamics in the model. In the real side of the computable general equilibrium model we have specified the relations determining supply and demand for goods and factors of production, prices and wages, income of and expenditure by institutions (economic agents), saving and investment by institutions and real market equilibrium conditions. On the other hand, financial sector deals with the specification of portfolio decisions of the household sector, investment financing decision of the private corporate sector (producers), budget deficit financing decisions of the government sector,

1

Some of these sectors are further divided; justification for which is given in chapter 3, section 3.3.3.3.

balance sheet and portfolio decisions of various financial institutions (i.e. central bank, commercial and co-operative banks, and other financial institutions), and financial market equilibrium conditions. Expected inflation is determined in the third part of the model. Updating procedure for fixed and exogenous variables and parameters are specified in the interim period model.

Equations of the model are listed in Table 4.1. We describe, below, these relations (equations) in detail. Table 4.2 lists the endogenous variables. Table 4.3, on the other hand, lists the exogenous variables, policy variables, elasticity and share parameters required to be estimated on the basis of FSAM or econometrically.

4.2 Description of the Model

4.2.1 Real Sector

The diagrammatic presentation of the real side of the model is available from Figure 4.1.

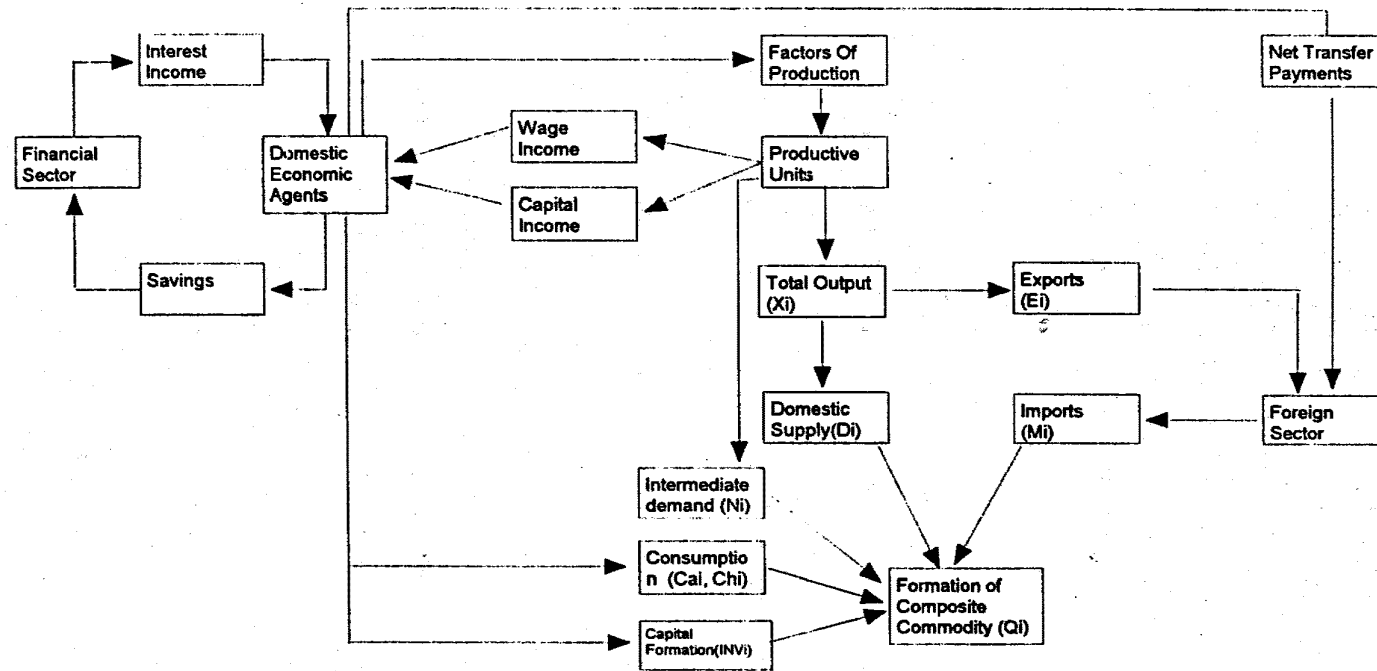
Below, we describe the specification of each block of this side of the model.

4.2.1.1 Output Block

Production activities are disaggregated into two categories namely agricultural and non-agricultural. [Disaggregation into these categories is justified in our earlier chapter dealing with the construction of FSAM].

Each activity is assumed to produce only one commodity. Total domestic production of agricultural commodities is weather determined in our model and therefore fixed in a given period of time. On the other hand, in the non-agricultural sector excess capacity is postulated so that supply adjusts to demand (e.1). In both the sectors, intermediate inputs used in the production process follow the Leontief fixed co-efficient rule (e.4). Thus, there is no substitution between the various components of intermediate demand.

Figure 4.1 : The Structure Of The Real Sector Of The Model



The arrows indicate the direction of the flows

The output produced is either exported (E_i) or sold in the domestic market (D_i^d). The problem for the producer is to sell the output abroad or in the home market so as to obtain maximum profit. In this case production function can be visualized as a CET² (constant elasticity of transformation) function between exports and domestic sales (eq.2). The supply of exports, derived from producers' profit maximization by using the CET function, then depends on the ratio of the domestic price (PD_i) to the world price of exported good (PE_i) [eq.3].

4.2.1.2 Commodity Demand Block

The domestic output is combined with the imported commodity so as to get a composite commodity (Q_i^d). This composite commodity is used for consumption (by the household sector and the government sector), investment, intermediate production of goods, and stocks of goods by various economic agents.

Household sector consumes two composite commodities, [Q_i^d , composite of imported (M_i) goods and domestically produced goods (D_i^d)]. Demand for composite commodities by the household sector is specified as a function of its total expenditure and the prices. Following the convenient if not theoretically very satisfying practice, we assume that, prior to any consumption decision, the household decides on the proportion of its income that will be saved³.

Again, theoretically, we should derive demand functions from explicit utility function. But, for simplicity we do not explicitly model the utility maximization behaviour. In practical application this makes the task easier.

2

Most of the functions are specified as either CES or Cobb-Douglas so as to minimize the number of parameters to be estimated. This is a usual practice in CGE models.

3

See Dervis, de Melo and Robinson (1982), p 146.

However, these consumption functions satisfy the budget constraint⁴. Income constraint or budget constraint states that the income must equal the sum of saving, tax payments and consumption expenditure by the household sector. Thus specified, consumption (C_{hi}) is a linear expenditure (LES) function⁵ of household income (Y_h) net of tax (t_h) and saving (S_h) and prices of composite commodities (P) [eq.5].

Total demand for consumption (GCONS) by the government sector is taken as a policy variable and its sectoral allocation is given by fixed co-efficients in the model.

Composite commodity i is demanded not only for consumption but also for investment by various economic agents. Government demand for investment (I_g) is specified as a policy variable in the model. Demand for investment by the financial institutions is exogenously specified in the model. On the other hand, demand for investment by the household sector and the private corporate sector is an endogenous variable in the model. Total investment by different economic agents is then, first, allocated to different productive commodity sectors, j 's, in fixed proportions (inv_j). Demand for composite commodity i for the production of investment goods used in different productive sectors is again given by fixed co-efficients; called, capital composition co-efficients (v_{ij}). (eq.6).

Eq.7 specifies the demand for composite commodity i for "change in stocks" (DST_i) held by different economic agents. It is assumed (for simplification) that the nominal expenditure on this item is allocated across productive sectors with constant proportionality co-efficients, st_j . Demand for composite commodity i for the production of "change in stock" is also given by fixed co-efficients, γ_{sij} , (eq.7).

4

See Dervis, de Melo and Robinson (1982), p 147.

5

Though most functions are specified as CES, we do not extend this specification to the consumer demand. Demand functions derived from CES functions display unitary income elasticities. Since income elasticities of demand for most goods differ from unity, one needs a more general formulation. Most of the CGE models, therefore, incorporate linear expenditure system (LES) as far as the specification of consumer demand functions is concerned. See Taylor (1990), p52.

The output produced is either exported (E_i) or sold in the domestic market (D_i^d). The problem for the producer is to sell the output abroad or in the home market so as to obtain maximum profit. In this case production function can be visualized as a CET² (constant elasticity of transformation) function between exports and domestic sales (eq.2). The supply of exports, derived from producers' profit maximization by using the CET function, then depends on the ratio of the domestic price (PD_i) to the world price of exported good (PE_i) [eq.3].

4.2.1.2 Commodity Demand Block

The domestic output is combined with the imported commodity so as to get a composite commodity (Q_i^d). This composite commodity is used for consumption (by the household sector and the government sector), investment, intermediate production of goods, and stocks of goods by various economic agents.

Household sector consumes two composite commodities, [Q_i^d , composite of imported (M_i) goods and domestically produced goods (D_i^d)]. Demand for composite commodities by the household sector is specified as a function of its total expenditure and the prices. Following the convenient if not theoretically very satisfying practice, we assume that, prior to any consumption decision, the household decides on the proportion of its income that will be saved³.

Again, theoretically, we should derive demand functions from explicit utility function. But, for simplicity we do not explicitly model the utility maximization behaviour. In practical application this makes the task easier.

2

Most of the functions are specified as either CES or Cobb-Douglas so as to minimize the number of parameters to be estimated. This is a usual practice in CGE models.

3

See Dervis, de Melo and Robinson (1982), p 146.

However, these consumption functions satisfy the budget constraint⁴. Income constraint or budget constraint states that the income must equal the sum of saving, tax payments and consumption expenditure by the household sector. Thus specified, consumption (C_{hi}) is a linear expenditure (LES) function⁵ of household income (Y_h) net of tax (t_h) and saving (S_h) and prices of composite commodities (P) [eq.5].

Total demand for consumption (GCONS) by the government sector is taken as a policy variable and its sectoral allocation is given by fixed co-efficients in the model.

Composite commodity i is demanded not only for consumption but also for investment by various economic agents. Government demand for investment (I_g) is specified as a policy variable in the model. Demand for investment by the financial institutions is exogenously specified in the model. On the other hand, demand for investment by the household sector and the private corporate sector is an endogenous variable in the model. Total investment by different economic agents is then, first, allocated to different productive commodity sectors, j 's, in fixed proportions (inv_j). Demand for composite commodity i for the production of investment goods used in different productive sectors is again given by fixed co-efficients; called, capital composition co-efficients (u_{ij}). (eq.6).

Eq.7 specifies the demand for composite commodity i for "change in stocks" (DST_i) held by different economic agents. It is assumed (for simplification) that the nominal expenditure on this item is allocated across productive sectors with constant proportionality co-efficients, st_i . Demand for composite commodity i for the production of "change in stock" is also given by fixed co-efficients, γ_{si} , (eq.7).

4

See Dervis, de Melo and Robinson (1982), p 147.

5

Though most functions are specified as CES, we do not extend this specification to the consumer demand. Demand functions derived from CES functions display unitary income elasticities. Since income elasticities of demand for most goods differ from unity, one needs a more general formulation. Most of the CGE models, therefore, incorporate linear expenditure system (LES) as far as the specification of consumer demand functions is concerned. See Taylor (1990), p52.

Composite commodity i is also used for further production as an intermediate good. Total intermediate demand for good i (N_i) is specified in the eq. 8.

Thus, total demand for composite commodity i , (Q_i^d), is a sum of consumption demand by the household sector (C_{hi}) and the government sector (C_{gi}); investment demand (INV_i) by the productive commodity sectors; use of commodity i in "change in stocks" (DST_i) and intermediate demand for good i (N_i). [eq.9].

In our model consumers differentiate between the imported commodity and the domestically produced commodity. Therefore, imports are not perfect substitutes of domestically produced commodities. We can think of imported commodities (M_i) and domestically produced commodities (D_i^d) being combined by the consumers to form the composite commodities (Q_i^d) [eq.10]. Given the specified prices for the imported and domestic commodities, the problem facing the consumer is to consume a specified level of composite commodity, Q_i^d , with minimum cost incurred on the inputs M_i and D_i^d . In this formulation demand for imports and domestically produced commodities become derived demands, in just the same way as the demand for factor inputs is a derived demand in a traditional production function. This approach was first suggested by Armington (1969) and has been used widely in CGE modelling. The solution to this problem occurs when the marginal rate of substitution between M_i and D_i^d equals the ratio of the price of the imported commodity to the price of the domestically produced commodity⁶ (see eq. 11).

Total real GDP which is a sum of total household sector consumption, total government sector consumption, total investment, total change in stock, total exports minus total imports, is defined in the eq.12.

4.2.1.3 Price Block

⁶

See Dervis, de Melo and Robinson (1982), pp 222.

Various prices used in the model are defined in this section.

The prices of goods are defined at producer's prices in order to distinguish indirect taxes (tr_i) and tariffs (tm_i, te_i). World price of imported commodity (PWM_i) is fixed as far as our country is concerned (small country assumption). Import price in domestic currency, PM_i , is equal to the world price converted into domestic currency at the given exchange rate, ER , and adjusted for import tax, tm_i , and indirect tax, tr_i . [eq.13]. Similarly, we take world price of exported commodity (PWE_i) as fixed (again small country assumption). Again, export price in domestic currency, PE_i , (adjusted for export tax, te_i , and indirect tax, tr_i), is equal to the world price converted into the domestic currency at the fixed exchange rate [eq.14].

Price of the composite commodity, P_i , is a weighted average of price of domestic commodity in the domestic market, PD_i and import price, PM_i , [eq. 15]. The producer price, PX_i , on the other hand, is a weighted average of the export price and the domestic price of commodity sold in the domestic market [eq.16].

Eq. 17 gives the net producer's price as the price of output from which the costs of intermediate inputs $\sum a_{ij}P_j$ is subtracted.

The price of the capital good, PK_i [eq.18] is derived as the weighted average of the prices of the capital goods by sector of origin, weights being capital composition co- efficient (γ_{ij}).

Finally, the general price index (PIND) is computed [eq. 19] as the weighted average of the two composite commodities' prices, weights being the share of a composite commodity in the total demand for both the composite commodities in the economy.

4.2.1.4 Product Market Equilibrium

Two types of closure rules are used in our model as far as the product market is concerned. First, we assume that price is fully flexible in the agricultural sector and the equilibrium between domestic demand for and supply of the domestically produced agricultural commodity in the domestic market is brought about by price changes of domestically produced commodity [eq.20].

Second, for non-agricultural commodity, we have assumed that price is fixed, using a variable mark up pricing rule, by the producers and supply adjusts to meet the demand. See equation 21, where non-agricultural price is determined by applying the variable mark up (τ) on the unit prime cost consisting of material input cost ($a_{ij}P_j$) and wage cost (b_iW_i). Mark up in the non-agricultural sector would vary so as to equate price index determined in the real sector of the model (eq.19) and price index determined in the financial sector of the model (eq.107, described below).

4.2.1.5 Labour Market

Demand for labour demand by the representative producer in both the productive sectors, is a function of real wages and total domestic supply, [eq.22] while supply of labour, in both the sectors, is fixed in the given period [eq.23].

The nominal wage rate is assumed to be fully flexible in the agricultural sector and equilibrium occurs when labour demand is equal to labour supply [eq.23]. On the other hand, wage is fixed and partially indexed in the non-agricultural sector [eq.24]. As a result, involuntary unemployment occurs in this sector [eq.25]. Employment is demand determined in this sector.

The lag in adjustment in the nominal wage rate would result in consequences affecting real variables of the economy, and the path of adjustment of the economy to external shocks that affect money supply and thus inflation. These interlinkages among money supply, inflation, nominal wage and real variables of the economy would be dealt with later, below, in section 4.3 on Interlinkages and Conclusion.

4.2.1.6 Income Block

Our representative household receives not only wage income ($\Sigma W_i L_i$) and fixed proportion (α_{hi}) of capital income ($KINC_i$) generated in the i^{th} productive sector but also return on securities from the private corporate sector ($r_{pr} PCORS_{sh(t-1)}$), interest payment on deposits ($r_{bd} DEP_{sh(t-1)}$), return on small savings with the government sector ($r_{gsm} SM_{sh(t-1)}$), return on OFI's securities

$(r_{dh} OFIS_{sh}^{t-1})$ and other transfer payments from the private corporate sector ($OTRF_{ph}$), financial institutions ($OTRF_{fn}$), the government sector ($OTRF_{gh}$) and the transfers from ROW (TRF_{wh}). Eq. 26 shows the total household sector income (Y_h) net of interest payment on loans ($r_{dh} L_{sh}^{t-1}$).

Eq. 27 defines the capital income. Capital income generated from the productive sector i is equal to total the sales revenue net of intermediate cost and labour payments in the domestic market and net wage payments to the ROW but inclusive of non wage income from the ROW.

Sources of income for the private corporate sector, in our model, consist of fixed proportion of capital income ($\sum \alpha_{pi} KINC_i$) from different productive commodity sectors, interest earnings on deposits ($r_{bd}^{t-1} DEP_{sp}^{t-1}$), and other transfers from financial institutions ($OTRF_{fp}$) (refer to eq.28).

The government administrative and departmental income consists of share in capital income ($\sum \alpha_{ai} KINC_i$), direct tax revenue from the household sector ($t_h Y_h$), the private corporate sector ($t_p Y_p$), the non-departmental non financial enterprises ($t_e Y_e$) and the financial institutions ($t_f Y_f$). It also receives indirect taxes on imports, exports and domestically sold goods [$\sum t_{ni} (PWM_i ERM_i + PE_i E_i + PD_i D_i^d)$] besides import tariff ($\sum t_{mi} PWM_i ER M_i$) and export tariff ($\sum t_{ei} PE_i E_i$). Other components of the government sector income consist of transfers from the household sector (TRF_{ha}), the private corporate sector (TRF_{pa}), the non-departmental non-financial enterprises (TRF_{ea}) and the financial institutions (TRF_{fa}) (eq.30).

Income of the government non-departmental non-financial enterprises, on the other hand, as specified in eq. 29, consists of share in the capital income ($\sum \alpha_{ei} KINC_i$), transfers from the government administrative and departmental enterprises (TRF_{ae}) and the private corporate sector (TRF_{pe}).

In eq. 31, income of the financial institutions is specified. It consists of share in the capital income ($\sum \alpha_{fi} KINC_i$), interest receipts from the private corporate sector to the banking sector ($r_{bip} L_{sbp}^{t-1}$), to OFIs ($r_{dip} L_{sdp}^{t-1}$), from the household sector to the OFIs ($r_{dih} L_{sdh}^{t-1}$), other transfers from the private corporate sector ($OTRF_{pf}$) and the household sector ($OTRF_{hf}$) and transfers from

the government administrative & departmental enterprises (TRF_{gf}) and non-departmental non-financial enterprises (TRF_{ef})

ROW's income is specified in eq.32 and consists of share in the capital income ($\Sigma\alpha_{wi}KINC_i$), import earnings ($\Sigma PM_i M_i$), non-agricultural wage income ($\Sigma WBwi$) and transfers from the household sector (TRF_{hw}).

4.2.1.7 Saving Block

Savings of various institutions are defined in this block.

Saving of the household sector is specified as a behavioural equation. Saving (S_h) of the household sector, is a function of the net household income, and responds, with an elasticity α_{ih} , to the average real interest rate [$r_h/(1+\pi)$] on all the assets which the household sector holds [eq.33]. The average interest rate is an outcome of the allocation decisions (among various assets) described below in section 4.2.2 of the model.

Eq. 34 shows saving of the private corporate sector as income of the private corporate sector net of direct taxes and interest payments to the banking sector and the OFIs and other transfer payments to these financial institutions, return on securities and other transfer payments to the household sector and transfer to the government administrative & departmental and non-departmental non-financial enterprises.

Saving of the government administrative and departmental enterprises is simply defined, in eq 36, as government income minus consumption expenditure on commodities and various transfers (interest payments on small savings and other transfers to the household sector, transfers to the non-departmental non-financial enterprises and the financial institutions) by the government sector.

Saving of the non-departmental non financial enterprises in eq. 35, on the other hand, is the total income net of direct tax and transfer payments to the government administrative & departmental enterprises, and the financial institutions.

Total public sector saving is thus the sum total of saving by the government administrative & departmental enterprises and the non-departmental

non-financial enterprises. It is specified in eq. 37.

Total saving of the financial institution is specified in eq. 38 and consists of total income net of direct tax, interest payment to the household sector on OFIs securities, interest payments on bank deposits to the household sector and the private corporate sector and other transfer payments to the household sector, the private corporate sector and the government administrative departments and departmental enterprises. This total saving is distributed between the banking sector and the OFI's in fixed proportion in eq 39 and 40 respectively.

The ROW saving, as specified in eq. 41 is equal to the income net of agricultural and non-agricultural wage transfers and transfer payments to the household sector.

4.2.2 Financial Sector

Financial decisions of different economic agents, i.e. the household sector, the private corporate sector, the government sector and the financial institutions are channelled through the financial system.

The financial infrastructure of an economy consists of financial institutions, financial instruments and financial markets.

Interest in knowing the real and financial sector interlinkages necessitates addition of financial block in the model. Thorbecke, Kim, Roland Holst and Berrian (1992) have justified introduction of financial sector in computable general equilibrium models on three accounts. First, since many policy instruments which are part and parcel of the adjustment package are financial and monetary, or have important financial and monetary repercussions, a financial sector model which could be integrated with the real side model had to be designed to capture the combined effects of these measures. Second, some of the neo-Keynesian features specific to the economy which are incorporated in the real side model (for example, the prevalence of price rigidities in some markets) cannot be adequately captured by a purely neo-classical (real) model. In the latter model, change in the aggregate price level is the numeraire which can not be

endogenously derived (relative prices are not affected by a change in the aggregate price level). Third, when both saving and investment are endogenously determined in the computable general equilibrium model, the effects of changes in financial variables such as interest rates and the removal of credit rationing (following the financial liberalization reform) on both investment and savings, and through them on the medium and long term growth path of the economy, can be substantial and can only be captured through the explicit modelling of the financial sector.

In our financial sector block, we have introduced not only financial instruments but also financial intermediaries. There are at least two reasons for including financial intermediaries in the model. First, the amount of resources channelled through them are enormous not only in advanced capitalist economies but also in developing countries like India. This makes their influence on the economy far-reaching. Second, most models analysing the effects of monetary policy on the economy have neglected the very existence of a financial sector.

Besides providing efficient mechanism for transferring investible funds from savers to investors, financial intermediaries reduce the degree of direct control over the monetary aggregates. Explicit introduction of financial intermediaries would enhance our understanding of the effect of monetary and credit policy on the real sectors of the economy and the transmission mechanism.

In the financial sector modelling, in order to model explicitly the private corporate sector's investment and financing decisions, we maintain the distinction between the household sector and the private corporate sector within the private sector. On the other hand, the Reserve Bank of India (RBI) is distinguished from the government so as to capture monetary control and fiscal control explicitly in the model. We have also separated the RBI from the rest of the banking sector i.e. commercial and co-operative banks in order to differentiate inside money from outside money. This would allow us to examine the crowding out of private investment due to government borrowing from the banking sector. Rest of the intermediaries (besides the RBI and the banking sector) are termed as Other Financial Intermediaries (OFIs).

Traditionally, a distinction has been drawn between the commercial banks, on the one hand, and non-bank financial intermediaries on the other. The rationale of this distinction was that the banks were regarded as being unique in that the indirect securities they issue (their deposits) are a means of payment and are, therefore, money, while the indirect securities of all other intermediaries are not generally acceptable as a means of payment and are, therefore, not money. Similarly, these intermediaries can also be distinguished on the basis of their assets. Commercial banks usually provide credit for working capital requirement and the credit extended by them is, therefore, of short term duration. On the other hand, most of the non-bank financial intermediaries in India are development banks and provide long term credit or development loans to the producers. Therefore, any analysis dealing with the financial sector must distinguish these two types of financial intermediaries. The RBI, using different instruments in its hands (especially by charging different lending rates / refinancing rates to these two types of intermediaries) can control and change the allocation of loans to these two types of intermediaries. Any change in policy affecting the proportion of the RBI loans to these intermediaries has an impact on output and growth. Reduction in loans to commercial banks would restrict the working capital to the producers and thus immediate impact of it would be mainly on output. On the other hand, reduction in loans to the OFIs would have an impact, by and large, on total investment and thus growth. Also, by clubbing OFIs with the banking sector, we would not be able to see the effect of transactions between the OFIs and the banking sector. For example, transactions between the OFIs and the banking sector directly affect the borrowed reserves of the banking sector and, thus, the credit creating capacity of the banking sector. As pointed out by Shrivastava (1978), financing - refinancing from the OFIs affects the profitability of the banking system, hence the arrangement of bank portfolio and finally the creation of money supply.

Money is introduced in computable general equilibrium models in

following different ways⁷ :

1. Some modellers introduce a "clover constraint" (also called "finance constraint" or "cash in advance constraint") [Tsiang, 1988].
2. Some adopt "utility approach" to monetary theory. In this approach, money is incorporated into the general equilibrium framework on par with any other commodity with 'utility' being attributed to the services provided by real money balances. In this approach the concept of money as a means of payment is lost.
3. Some emphasize "transactions cost approach". In this approach money is treated as a part of budgetary constraint on utility maximization and, therefore, emphasis is placed on transaction demand for cash in the framework of inventory theory.
4. Sometimes even more drastic shortcut is used and the demand for money function is directly specified in the model. We have also followed this shortcut and specified demand for money function by a traditional demand function.

The financial sector's specification follows the approach of Tobin (1969; 1982), where the household sector makes decisions on consumption and savings, on the one hand, and on the allocation of its accumulated savings (a non-human wealth) between various assets on the other. However, the specification of assets and rates of return is modified in order to conform to the institutional characteristics of the Indian financial markets and also to include commercial and co-operative banks and other financial institutions as additional institutions.

Tobin's (1969) specification is in "stock" terms. However, Tobin (1982) changed the emphasis from stock approach to flow approach. He points out that money market cannot operate in a dimensionless point of time. Equilibrium that can be thought of in a slice of time has to be that existing between adjustment in stock demanded and stock supplied. In a pre-specified slice of time, portfolios of an individual cannot adjust fully to the new market information due to lags in response because of costs of transactions and decision making. Using this argument, Tsiang (1988) emphasized that, in a given period of time, the

7

Implications and constraints imposed by each approach have been described in chapter 2 of our thesis.

meaningful concept is that of the flow equilibrium rather than that of the stock equilibrium.

Thus, in a realistic model, one should have a flow equilibrium in a given period of time and over a period of time the model should be able to show stock equilibrium. Transition from flow equilibrium to stock equilibrium would require specification of behavioural equations showing the desired levels of demands and supplies of different stocks as well as speed of adjustment with which discrepancy between desired levels of demand and supply of each stock gets reduced. Such a specification would require fully dynamic inter-temporal model. But, for simplicity, we have not attempted such a specification. Also, poor availability of data on stocks of various assets (financial balance sheet) have prevented us from attempting such a formulation⁸. Instead, we assume that the discrepancies between desired levels of demands and supplies of stocks get adjusted within the period, which is one year in our case. We also assume that initial stock of assets are in equilibrium and flow equilibrium within the period brings the end of the stocks also into equilibrium. This type of specification would allow us to use flow of funds data (which is available for India on a regular basis) for the estimation of behavioural equations specified, below, in the financial sector of our model.

4.2.2.1 Household's Portfolio Decisions

Saving, by the household sector, in our model, is a two-step decision. The first step relates to the magnitude of saving, and the second to the form in which this saving is held. Following a convenient practice, we have also assumed that the amount of saving by the household sector is decided before its consumption expenditure. Total saving, as specified in the eq. 33, is a function

8

Latest study by Deepak Mohanty (1994) on the stocks of various assets is not desegregate enough to be useful for our model. Venkatchalam Sharma (1977) study is till the period 1972. We have made use of this study for some benchmark estimates by updating the stock figures for the year 1971-1972 by adding flow of funds data for various years. However this gives very rough approximation of financial balance sheet data (see Table 35, chapter 2).

of net household income and the average real interest rate.

The household sector holds his saving in the form of various physical and financial assets. These various assets are imperfect substitutes of each other because each has its built-in advantages: for example provident fund provides safe income after retirement, shares and securities allow the household sector to have capital gain/loss, time deposits provide secure income year after year, money holdings reduce transaction costs in exchange, etc. The choice of assets by the households is not guided merely by rates of return but also by other built-in-advantages of various assets. Though these built-in-benefits are realized they are not explicitly modelled here. So, our representative household invests its saving in various assets according to a branching decision⁹ which is shown below in fig 4.2. This tree approach, indicating multi-level budgeting reflects our desire to keep the number of parameters to a minimum.

This tree approach is a variation of Tobin's approach¹⁰. Under Tobin (1969, 1982) approach, all the explanatory variables appear in all the asset demand specifications. Under the tree approach though all the explanatory variables do not appear in all the equations, influence of them is taken into account indirectly. However, this approach simplifies the model by restricting the number of parameters and makes the empirical work easier.

In the specification of most of the asset demand equations, the volume of financial saving rather than income is specified as the principal argument. For these assets, income ceases to be relevant once the household has decided about total volume of saving. Given the total financial saving, household decides about its allocation among competing assets depending on,

- i) the availability of various assets.
- ii) their respective rates of return.
- iii) the rate of inflation on physical assets (as a measure of the foregone rate of

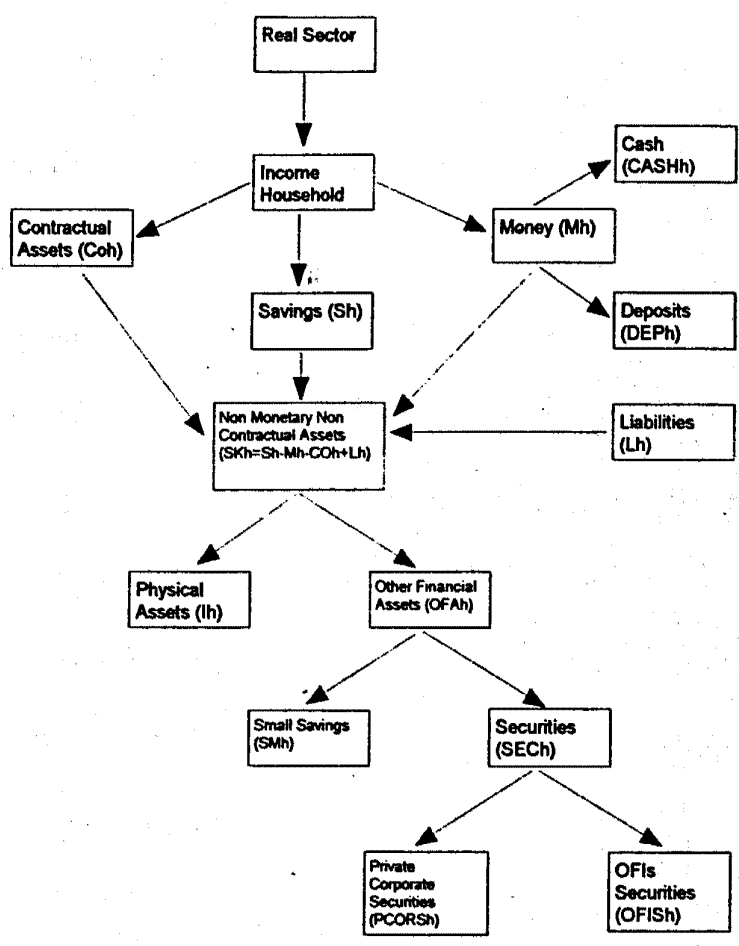
9

See Bourguignon, Branson and de Melo (1989), pp.16.

10

Alternative approaches of portfolio allocation of the economic agents, following Tobin (1969) specification, are described in detail in chapter 2, section 2.2.1.

Figure 4.2 : Structure Of Household Hierarchical Portfolio Allocation Process



return) represented by the expected rate of inflation.

In selecting the rates of return, one is constrained to consider only a few (or weighted average of some). Multicollinearity problem may arise while econometrically estimating these equations, if all the rates of return are included as explanatory variables in all the equations.

The first step in the hierarchical portfolio decision making process consists of the determination of household money demand according to the eq. 42. Demand for money by the household's money demand (in flow terms) ΔM_h , in our model, depends on real income with elasticity α_{3h} , price level with elasticity 1 and real rate of return on money holding relative to the average real rate of return on all the other assets held by the representative household with elasticity α_{4h} .

This total money holding is then divided between cash in hand and deposits¹¹. Various studies on demand for financial assets have specified currency - deposit ratio as a negative function of the number of bank branches, for e.g. Srinivas, Nayak and Roy (1982) model also specifies the currency deposit ratio as a negative function of the number of bank branches.

So the demand for cash by the household sector, as specified in equation 43, responds inversely to bank branch expansion to total population $(BB/POP)_{t-1}$ with an elasticity ϵ_{oh} and to interest rate on deposits with an elasticity ϵ_{4h} . Lagged value of bank branches is taken as a variable because bank branch expansion may take some time to show its effect in terms of higher bank deposits. Remaining of the money is kept as deposits (demand as well as time deposits) with the banking sector [eq.44]. Eq.45 shows the estimation of share of cash to deposits.

Saving in the contractual assets (ΔCO_h) is specified as some fixed

11

Since all the asset variables are specified in flow terms, we hence forth drop the word 'change' before them, in our description of various equations of the model. In model equations Δ denotes change.

proportion of the income of the household sector [eq.46]. It has been argued¹² that the rate of interest is ineffective (or has little impact) in influencing saving in the form of contractual financial assets which are regarded as regular expenses by the household sector in India. The decision to save in these forms is not expected to be responsive to interest rate variations. Also, such savings are predominantly guided by security and precautionary motives besides being necessitated by employment regulations. Saving in this form becomes a commitment on the part of the subscriber and the rate of return ceases to be the determining variable. This contractual saving is distributed between the OFIs and the public sector in the fixed proportions (refer to eq. 47 and eq.48). Eq.49, on the other hand, shows total holding of the non-monetary non-contractual, non-exogenous assets (S_{kh}). This is equal to the saving of the household sector net of money, contractual saving and exogenously specified other assets and change in stocks (ΔST_h). However, it includes total loans available from OFIs (ΔL_{dh}) and other liabilities (ΔL_h) which are exogenously specified in the model.

The household also invests in physical assets (eq.50). Disaggregation of assets between financial and non-financial assets in underdeveloped countries is necessary. Large part of their assets is in physical assets, especially in rural areas. Change in physical assets is equal to investment and change in stocks. As seen from NAS - Sources and Methods (1989), investment data consists of investment in housing and machinery and equipments. However, it does not provide data on land holdings and holdings of precious metals such as gold¹³. Thus, we have taken the rate of return on capital, in the economy, as an explanatory variable for demand for investment.¹⁴ Though one should take the return on capital in the household sector, non-availability of data prevents us from introducing such a

12

See Pandit (1991) and NCAER (1964).

13

For the analytical description of the effect of change in gold holdings see Taylor (1983).

14

While empirically estimating the return on capital, we have combined the capital income on account of both corporated income and unincorporated income. Since unincorporated capital income is a mixed income of self employed, the return to capital is over estimated in our study.

return and, thus, we take return on total capital income as an explanatory variable. Also, since investment in housing forms the largest proportion (approximately 57% in 1983-84) of total investment by the household sector, we take the expected inflation (π) as proxy for the rate of return on housing. Inflation is expected to play an important role in our model because higher value of expected inflation leads to the diversion of funds from financial assets to physical assets. The inflation rate is thus an important variable determining the investment in physical assets. Thus, in our model total demand for investment by the household sector responds to the real rate of return on capital relative to the real rate of return on non-monetary, non-contractual, non-exogenous financial assets (r_{on}) with an elasticity ϵ_{1h} and to the expected inflation rate with an elasticity ϵ_{5h} . [eq.52]. Eq.51 gives the total holding of non-monetary, non-contractual, non-exogenous financial assets (ΔOFA_h).

In the next step of the branching decision, remaining of the saving i.e. $S_{kh} - I_h$ or ΔOFA_h is distributed between small savings [eq.53] (the term is used here to denote household's total claims on the government sector) and securities, [eq.54]. The allocation of ΔOFA_h between small savings (ΔSM_h) and securities (ΔSEC_h) responds to the real rate of return on small savings (r_{gsm}) relative to the real rate of return on securities (r_{sh}) with an elasticity ϵ_{2h} [eq.55].

In the last stage of branching decision, the household sector allocates its remaining saving (i.e. $\Delta OFA_h - \Delta SM_h$ or ΔSEC_h) between private corporate securities ($\Delta PCORS_h$) [eq.56] and OFIs securities ($\Delta OFIS_h$) [eq.57]. The share of these two types of securities responds to the real rate of return on private corporate securities (r_{ps}) relative to the real rate of return on OFIs securities (r_{ds}) [eq.58]¹⁵.

15

Investment in banking sector securities is taken as exogenously given in our model because it form a small proportion of household's uses of funds. And, also, there does not seem to be any trading in these securities. On the other hand, though investment in OFI, securities (mainly UTI) and private corporate securities also form a small proportion it has been specified endogenously in the model. This specification is based on the observation that investment in these securities is growing in importance in 80's.

4.2.2.2 Private Corporate Sector Investment and Financing Decisions

For the specification of the private corporate sector, in our model, we wanted to distinguish private corporate producers by different commodity groups so as to take into account the effect of credit rationing on sectoral production. However, non-availability of data on various aspects involved in investment and financing decisions of different firms in a consistent manner prevented us from such a disaggregation. For example, though we have data on total investment in each commodity group sector by the private sector we do not have disaggregation of this total investment by the household sector and the private corporate sector. Similarly, from the flow of funds data we would be able to get the change in the total lending to the private corporate sector by the different financial institutions. However, there is absolutely no data available regarding this aspect by commodity group sector in a consistent manner.

The private corporate sector requires finance over and above their saving, to cover their investment, change in working capital (money holding), change in stocks and change in "other domestic asset" holdings. This requirement for funds net of exogenously specified domestic liabilities and foreign liabilities gives what we have termed as deficit of the private corporate sector [eq. 63].

Both, change in working capital (also equal to change in money holding) and change in stocks are quite small compared to investment in fixed capital. So, the demand for working capital is simply taken to be proportional to the nominal value of the level of output in the private corporate sector [eq.60]. Change in stocks as well as "other assets" are specified exogenously in the model.

Investment demand by the private corporate sector, on the other hand, is specified as a behavioural equation depending on the rate of return on capital available in the economy relative to the average cost of domestic borrowing [eq.59]. The return to capital is measured by the current period capital income in the economy ($\Sigma K_i N C_i$) divided by the stock of capital ($\Sigma P K_i K_i$). So the formulation takes into account both the cost of investment and the cost of

financing. This specification is a variant of the "q" theory of Tobin¹⁶. Tobin (1969) defined "q" to be the ratio of the market value of a firm to the replacement cost of the firm. The greater is this ratio, the greater would be the incentive to add to the capital and, hence, the greater would be the rate of investment. For practical purposes, the value of the firm is measured using data from equity and bonds. However, in underdeveloped countries where stock markets are not developed, current period capital income can be taken as a proxy for the market value of capital. A new feature is the cost of financing capital. Investment demand also responds negatively to the expected rate of inflation with an elasticity ϵ_{4p} (eq.59).

As we have seen earlier, the rate of inflation plays an important role not only in the household sector portfolio decision making process, but also acts as an important variable affecting the private corporate sector's investment decision. Inflation has a negative impact on investment. As argued by de Janvry, Sadoulet and Fargeix (1991), agents see inflation as a signal of economic problems and, thus, of expected low future growth. This reduces their expectation of the return on investment which depends on future demand for output. On the positive side, inflation reduces the real interest rate and stimulates investment, partially compensating for the negative effect of inflation. The investment equation, specified above, incorporates these different effects of inflation on investment.

The investment financing requirement can be met from both internal resources as well as external resources. Internal resources consist of saving of the private corporate sector. Private corporate sector saving, S_p , has already been specified and described earlier in eq.34. External resources, on the other hand, can be in the form of private corporate securities (held by the household sector), and borrowings (from the banking sector, and the OFIs).

The private corporate sector, thus, has to make a decision regarding raising funds by supplying private corporate securities or borrowing. This

16

Also see specification by Taylor (1988), p 90.

decision, i.e. financing of the deficit from the two different sources, responds to real cost of borrowing relative to real cost of supplying securities [eq.66]. As the cost of borrowing increases, this sector would like to supply more securities (eq.64). The remaining financing requirement is met from borrowed funds [eq.65].

Remaining of the requirement for funds is met from borrowed funds from the banking sector [eq.67] and the OFIs [eq.68]. This decision of borrowing from these two sources depends on the real cost of borrowing from the OFIs relative to the real cost of borrowing from the banking sector with an elasticity ϵ_{2p} [eq.69].

4.2.2.3 Deficit Financing Decisions of the Public Sector

The term public sector in this block consists of not only the government sector (as defined in the real block of the model) but also the public sector non-departmental non-financial enterprises (again, as defined in the real block of the model). The reason for combining these two entities has been explained in chapter 3, section 3.3.3.3.

We introduce the public sector in our model in order to see the effect of changes in the level of public sector borrowing requirement on money supply and credit availability to the private corporate sector and through them on the real variables of the economy. In this analysis, we have kept the composition of the government sector expenditure constant.

The public sector, in our model, is both a consumer as well as an investor. It consumes domestic as well as imported goods and services. Total consumption and investment expenditures of the public sector are policy variables and their sectoral distribution is given by fixed proportions.

We have already seen the public sector income (eq. 29 & 30) and saving identity in eq.37. The total deficit of the public sector¹⁷ is shown in eq. 70. To

17

This deficit is inclusive of the fiscal deficit of the government and the borrowing requirement of the public sector non-departmental enterprises

finance its investment, committed exogenous fixed foreign and domestic financial assets and stock of goods, over and above its saving, and other domestic and foreign liabilities, exogenously specified, the government sector borrows from the RBI, the banking sector, and OFIs. The public sector borrows from the banking sector by imposing SLR requirement. Borrowing requirement of the public sector from the RBI and the OFIs is given in the eq. 71 and depends positively on total investment expenditure by the public sector ($\Sigma PK_{i,inv} I_g$), change in stocks (ΔST_g) change in "other assets" of the public sector (ΔOA_g), change in the holding of foreign assets (ΔFA_g) and negatively on investment in government securities by the banking sector, contractual savings and small savings of the household sector with the government sector, saving of the public sector and other domestic and foreign liabilities of the public sector.

Expenditure on investment goods, stocks and other domestic and foreign assets by the public sector are specified as exogenously given policy variables. Investment in the government securities is an endogenous variable and is determined by the behaviour of the banking sector. Investment in small savings is determined by the behaviour of the household sector. On the other hand, other domestic and foreign liabilities are exogenous variables.

The shares of borrowing from the RBI and the OFIs (in eq. 72 and to 73), W_1 , $(1-W_1)$, respectively, are the policy variables for the public sector. By varying these proportions the government sector can affect the availability of credit to the private sector and, hence, also the cost of credit to this sector. This has implication for output, growth and the other real variables of the economy with which we would deal later, below.

4.2.2.4 Reserve Bank of India (Central Bank)

The Reserve Bank of India (RBI) is at the centre of the monetary system in India. The primary objective of the RBI is to regulate the overall volume of money and credit in the economy with a view to ensure a reasonable degree of price stability in the country. Apart from performing the conventional central banking activities, the RBI plays a leading role in development finance in the

economy. This involves additional constraint and responsibilities.

The RBI has also to ensure that the credit allocation by the financial system broadly reflects the national priorities and social concerns.

With the two fold objectives: reasonable price stability with development finance, RBI regulates its credit allocation to the different sectors of the economy with the help of various instruments in hand.

In our country, the RBI does not directly transact with the public and, therefore, in our model also we have specified its transactions with the public sector, the banking sector, the OFIs and the ROW only.

Monetary assets of the RBI which form the Reserve Bank Money (RBM) can be written as $RBM =$

- (1) Net Reserve Bank credit (RBC) to the government sector (GSc).
- + (2) RBC to the banking sector (RBC_b).
- + (3) RBC to the OFIs (RBC_d)
- + (4) net foreign exchange assets of the RBI (FA_c)
- (5) net non monetary liabilities of the RBI (NNML).

$$RBM = GSc + RBC_b + ER(FA_c - FL_c) - NNML$$

where

$$NNML = NML - OA$$

The flow counterpart of this identity has been specified in our model in the equation 74.

In India RBC_g is basically determined by the fiscal deficit of the government sector and, therefore, the RBI does not have any control over it. Since maintaining the fixed exchange rate system (until now) is also the responsibility of the RBI, it does not have control over foreign exchange reserves. The net non-monetary liabilities has been specified as an exogenous variable in the model. So only policy variables remained to be determined by the RBI are RBC_b and RBC_d .

RBC_b and RBC_d are mainly controlled by specifying the discriminatory lending rates /discount rates on the two types of credit. This specification has important implications for the real variables especially for output and growth.

Since this decision would affect the availability of credit for short term vis-a-vis long term, it has an impact on output and growth respectively (as we have already pointed out earlier).

Other instruments in the hands of the RBI are open market operations, cash reserve ratio (CRR) and statutory liquidity ratio (SLR). These instruments mainly affect availability of bank credit to the private sector vis a vis the public sector.

4.2.2.5 Portfolio specification of the Banking Sector

The banking sector's portfolio should also satisfy the flow of funds identity i.e. source of funds (ΔL_b) should equal to uses of funds (ΔA_b) for the banking sector. ΔL_b consists of deposits (ΔDEP_b), Reserve Bank credit to the banking sector (ΔRBC_b), Loans from the OFIs (ΔL_{ob}), other liabilities (ΔOL_b) and the saving of the banking sector (S_b) (eq. 75). On the other hand, change in assets (or uses) of the banking sector consists of reserves [Required Reserves (ΔRR_b) and excess reserves (ΔER_b)] of the banking sector, and the private corporate sector (ΔL_{bp}). In addition, investment in government securities (ΔGS_b) and securities of other financial institutions ($\Delta OFIS_b$), and other miscellaneous assets (ΔOA_b) also constitute the change in total assets of the banking sector. Besides investment (I_b) and change in stocks (ΔST_b) also form a part of total assets of the banking sector (eq. 76).

On the sources side, deposits with the banking sector are either demand determined (by the behaviour of the household sector, the private corporate sector) or exogenously specified. Whereas saving of the banking sector is determined in the real sector (eq. 39). Though the level of RBC is also taken as a policy variable, in some of the simulation exercises demand for Reserve Bank credit by the banking sector depends on the real rate of return on lending to the private corporate sector (r_{bp}) relative to the real cost of borrowing from the RBI (r_{cb}). The response elasticity is ϵ_{lb} and the scaling factor is change in total assets, $[\Delta A_b]$ [eq. 78] Similarly, the demand for loans from the OFIs is some fraction of total assets (here total uses), of the banking sector, the fraction being

dependent on the real rate of return on loans to the private corporate sector (r_{bp}) relative to the real cost of borrowing from the OFIs (r_{alb}) [eq.79].

On the uses side, the required reserves of the banking sector are determined by the cash reserve ratio (g_{sb}) which is a policy variable for the RBI, [eq.80]. On the other hand, the change in excess reserves is specified as a fraction of change in deposits (though it should be specified as a fraction of demand and time liabilities of the banking sector. We have just taken deposits as an explanatory variable because it constitutes more than 90% of the total demand and time liabilities of the banking sector. This also makes the exposition of money multiplier derivation simpler) where the fraction responds to the average real cost of borrowing to the banking sector relative to the real rate of return on the lending to the private corporate sector with an elasticity ϵ_{3b} [eq. 81].

Investment in government securities and securities of OFIs are determined by SLR requirements. Thus, in equation 82, total investment in SLR securities (denoted by SLRS) is shown to be a fixed fraction of deposits where fraction is determined by SLR requirement. However, it is observed that the banking sector also invests in these securities above/below the SLR requirements. Investment above/below SLR requirement in these securities [ESLRS] is assumed to be influenced by the average real rate of return on these securities (r_{SLR}) relative to the real lending rate of the banking sector charged to the private corporate sector [eq.83]. Distribution of this investment in total SLR securities between government securities and securities of OFIs is given by the fixed proportion (g_{7b}) [eq.84 and eq.85 respectively].

Lending to the private corporate sector by the banking sector is residually determined in the model. It is given by the difference between total sources of funds and the uses of funds other than private sector credit by the banking sector (eq.86).¹⁸

18

For loans to the households sector by the banking sector, see [Sen, Roy, Krishnan and Mundlay (1993)] "A major requirement for commercial banks since the bank nationalization of 1969 has been to lend 40% of available funds to the "priority sector" - which consists mainly of agriculture and small industry. Since a large group of the "households" that the commercial banks lend to would fall in the category of the 'priority sector' (agriculture households and small scale

4.2.2.6 Other Financial Institutions Portfolio Determination

The OFIs also satisfy the flow of funds identity i.e. total sources of funds (ΔL_d) are equal to the total uses of funds (ΔA_d).

ΔL_d consists of changes in the securities of the OFIs held by the household sector, and the banking sector, credit from the RBI, (ΔRBC_d), contractual savings of the household sector (ΔCO_h), "other domestic liabilities" (ΔOL_d), foreign liabilities (ΔFL_d) and the saving of the OFIs. [eq.87].

Investment in the securities of the OFIs is demand determined in the model. It depends on the behaviour of the household sector and the banking sector. Investment in contractual savings is also determined by the behaviour of the household sector. Level of credit from the RBI to the OFIs is a policy variable for the RBI. However, in some of the simulations instead of the level of RBI credit we have taken RBI discount rate as a policy variable. In this situation, demand for RBI credit from the OFIs responds to the average real lending rate (r_d) relative to the real cost of credit from the RBI (r_{cid}) with an elasticity ϵ_{ld} . Total change in assets, (ΔA_d), is taken as a scaling factor in eq.89. All "other domestic liabilities" held by various domestic agents with OFIs and foreign liabilities are exogenously specified in the model. As in the case of the banking sector, saving of the OFIs is determined from the real sector of the model.

ΔA_d , as specified in eq.88 for the OFIs consists of changes in money (ΔM_d), investment in government securities (ΔGS_d), loans to the banking sector (ΔL_{db}), the private corporate sector (ΔL_{dp}) and the household sector (ΔL_{dh}), "other domestic assets" (OA_d), foreign assets (ΔFA_d) and investment in physical assets (I_d and ΔST_d).

ΔL_{dh} , ΔM_d , ΔOA_d , ΔFA_d , I_d , ΔST_d are either policy variables or exogenously specified in the model.

After satisfying the requirements for funds for the above assets the OFIs allocate their remaining funds [eq.90] as loans to the banking sector (eq.91) and the private corporate sector (eq.92). This responds to the real rate of return on

enterprises), we will make the assumption that commercial banks loans to households are policy determined (and exogenously given).

lending to the banking sector, (r_{ab}) relative to the real of return on lending to the private corporate sector, (r_{dp}) with an elasticity ϵ_{2d} [eq.93].

4.2.2.7 Rest of the World

The ROW identity is specified in the eq.94. Changes in "other assets" of the ROW brings about equilibrium between the ROW liabilities and assets.

4.2.2.8 Money Supply Analysis

In our model, total money supply is an endogenous variable though the RBI can try to control it by affecting the monetary base of the economy.

In the following analysis, we would see how total money supply is related to the monetary base or reserve bank money.

Monetary base of the economy consists of the currency in circulation (C) and the reserves of the banking sector (R) and other deposits of the RBI (OD). This is also equal to the sum of government currency (GC) and RBM. [RBM forms a large part of the monetary base. The remaining part of the monetary base, i.e. government currency in the hands of public and the banking sector, structurally, constitutes a small proportion. Therefore, for all practical purposes, changes in monetary base amount to changes in RBM]. In flow terms, therefore the identity is:

$$\Delta RBM = \Delta CASH + \Delta R + \Delta OD.$$

Currency, as we have seen, is held by the household sector, the private corporate

sector, the OFIs and the ROW. And, therefore, it is equal to

$$\Delta CASH_h + \Delta CASH_p + \Delta CASH_d + \Delta CASH_w$$

or

$$\Delta CASH = g_{oh} \Delta M_h + g_{op} \Delta M_p + g_{od} \Delta M_d + g_{ow} \Delta M_w$$

However,

$$\Delta M_d^d = \Delta M_h + \Delta M_p + \Delta M_d + \Delta M_w \quad (\text{eq. 95})$$

We assume that $\Delta M_h, \Delta M_p, \Delta M_d, \Delta M_w$ are certain fraction, $g_{mh}, g_{mp}, g_{md}, g_{mw}$ of total money demand (ΔM_d^d). Therefore, we can write

$$\begin{aligned}\Delta \text{CASH} &= g_{oh}g_{mh}\Delta M_d^d + g_{op}g_{mp}\Delta M_d^d + g_{od}g_{md}\Delta M_d^d + g_{ow}g_{mw}\Delta M_d^d \\ &= (g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw})\Delta M_d^d\end{aligned}$$

Other deposits of RBI form a small proportion of total RBM. We assume that $\Delta OD = g_{odo}\Delta M_d^d$

We know that

$$\Delta \text{DEP} = \Delta \text{DEP}_b + \Delta OD$$

Therefore change in bank deposits is equal to

$$\Delta \text{DEP}_b = \Delta M_d^d - \Delta \text{CASH} - \Delta OD$$

$$\Delta \text{DEP}_b = (1 - (g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) - g_{odo})\Delta M_d^d$$

Reserves of the banking sector, on the other hand, consist of both required reserves and excess reserves, i.e.

$$\Delta R_b = \Delta RR_b + \Delta ER_b$$

$$= g_{sh}\Delta \text{DEP}_b + g_{sb}(\text{----})\Delta \text{DEP}_b$$

$$= [g_{sb} + g_{sb}(\text{----})]\Delta \text{DEP}_b$$

$$= [g_{sb} + g_{sb}(\text{----})](1 - (g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) - g_{odo})\Delta M_d^d$$

Substituting for currency and reserves in the monetary base equation we get

$$\Delta \text{RBM} = (g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw})\Delta M_d^d + [g_{sb} + g_{sb}(\dots)](1 - (g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) - g_{odo})\Delta M_d^d + g_{odo}\Delta M_d^d$$

$$= ((g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) + [g_{sb} + g_{sb}(\dots)](1 - (g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) - g_{odo}))\Delta M_d^d + g_{odo}\Delta M_d^d$$

$$g_{ow}g_{mw})-g_{odo})+g_{odo})\Delta M_d^d$$

At equilibrium money demand equal money supply and therefore

$$\Delta M^s = (1 / ((g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) + [g_{sb} + g_{3b}(\dots)])(1 - (g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) - g_{odo}) + g_{odo}) \Delta RBM \quad (\text{eq.96})$$

$$\text{or } \Delta M^s = mm \Delta RBM$$

Where

$$mm = 1 / ((g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) + [g_{sb} + g_{3b}(\dots)])(1 - (g_{oh}g_{mh} + g_{op}g_{mp} + g_{od}g_{md} + g_{ow}g_{mw}) - g_{odo}) + g_{odo})$$

= money multiplier.

4.2.2.9 Interest Rates and Returns: Definitions

Various interest rates and returns used in the model are defined in this block.

The average rate of return received by the household sector, r_h , on its various physical and financial assets, is a weighted average of interest rate on bank deposits and the return on the other assets [eq.97]. On the other hand, the return on the other assets i.e. r_{oh} is a weighted average of the return on capital (r_k) and the return on other financial assets (r_{ofh}) [eq.98]. r_{ofh} defines the weighted average of the return on small savings (r_{gsm}) and the return on various securities (r_{sh}) [eq.99]. Eq.100 defines the return on securities (r_{sh}) as a weighted average of return on private corporate securities (r_{ps}) and return on the securities of the OFIs (r_{ds}). Weights, in all these equations are the shares of different assets in total assets.

For the private corporate sector, r_p , gives the weighted average rate of borrowing. In equation 101, it is a weighted average of the lending rate charged

by the banking sector (r_{blp}) and the OFIs (r_{dip}).

r_b in Eq.102, defines the nominal rate of return on capital as total capital income ($\Sigma KINC_i$) relative to the capital stock of the economy ($\Sigma PK_i K_{i(t-1)}$).

Average borrowing rate faced by the banking sector, r_{lb} , is a weighted average of the lending rate charged by the RBI and the lending rate charged by the OFIs, weights being the shares of two types of borrowings in total borrowing by the banking sector [eq.103].

The OFIs lend to the banking sector and to the private corporate sector. So the average lending rate (r_{dl}) for the OFIs is a weighted average of lending rate charged to the banking sector and lending rate charged to the private corporate sector (r_{dlb}) [eq.104].

The banking sector invests in government securities and OFIs securities which form SLR securities. So the average rate of return on these securities, r_{SLR} , as defined in equation 105, is a weighted average of return on government securities and the return on OFIs securities, the weights being the shares of the two types of securities in total SLR securities.

4.4.2.10 Assets Market Equilibria

Demand for and supply of money is equilibrated by changes in the overall price level in our model [eq.106]. This treatment makes the price level endogenous to the model.

Equilibrium in the private corporate securities market occurs when demand for private corporate securities by the household sector, is equal to the supply of these securities by the private corporate sector. The yield on these securities is determined by this equilibrium condition. [eq.107].

The private corporate sector demands loans from the banking sector and OFIs. The rates charged by the banking sector and OFIs determine the equilibrium in the two types of loan markets respectively [eq.108 and eq.109 respectively]. In both the cases when interest rates hit the officially specified interest rate ceiling, credit rationing takes place in the economy. We assume that when the lending rate charged by the banking sector hits the ceiling, the holding

of working capital is affected. On the other hand, when lending rate charged by the OFIs hits the ceiling, investment in fixed capital stock is affected.

The banking sector borrows from the OFIs. In this loan market, equilibrium between demand and supply is achieved through variations in the call money market interest rate. [eq. 110].

Equilibrium in all the other asset markets [such as deposits, contractual assets, small savings, OFIs securities, government securities etc.] is demand determined. Reserve bank credit to the banking sector and the OFIs, under the assumption of fixed lending rate to these sectors, is also demand determined. On the other hand, under the assumption of a flexible lending rate to these sectors, it is supply determined. In some of the simulation exercises we deregulated even the return on government securities and small savings.

Since the exchange rate is fixed in our model, RBI does not have any control over the foreign exchange reserves. Eq. 111 shows that the excess supply of foreign exchange resulting from current account and capital account foreign exchange transactions results in an equivalent increase in the Central Bank reserves. With a fixed exchange rate, changes in reserves accommodate any excess supply of or demand for foreign exchange.

4.4.2.11 Expectations

At the beginning of the period, people have expectations about the value of certain parameters and variables, the actual values of which depend on the working of the model during the period. These expectations for the beginning of the next period are formed at the end of the current period.

Since nominal interest rates, in our model, are known at the beginning of the period, expectations of real interest rates depend on the expectations of inflation.

Formation of expectation regarding inflation is assumed to follow an adaptive expectation framework¹⁹. Expected rate of inflation for the next year is

19

Alternatively, one can specify expectations in rational expectations framework. However, as pointed out by Bhattacharya and Lodh (1990), the assumption of rational expectation appears to

a weighted average of the rate of inflation for this year and the rate of inflation for the previous year, with a weight σ_3 for the current year and $(1-\sigma_3)$ for the previous year, i.e.

$$\hat{\pi} = \sigma_3((PIND_t/PIND_{t-1})-1)+(1-\sigma_3)((PIND_{t-1}/PIND_{t-2})-1) \quad \text{eq. 112}$$

4.2.3 Interim Period Model: Dynamics

During the formulation of our model we have used a sequential equilibrium concept. Interim period model is built to introduce recursive dynamics in the model.

Change in the values of fixed and exogenous variables and parameters takes place at the end of the current period. The updating procedure links the future periods with the current period and introduces recursive dynamism in the model.

Now we turn to the updating procedure.

Stocks of financial assets are computed, with the stocks of financial assets at the beginning of the period equal to the stocks at the end of the previous period plus change in assets during the period. So, equations 3 to 9 updates the stocks of deposits with the household sector, OFIs securities with the household sector, private corporate securities with the household sector, small savings of the household sector, deposits of the private corporate sector, loans from the banking sector and the OFIs to the private corporate sector respectively. For sectoral capital stocks and the private corporate sector capital stock, the new periods capital stock is the sum of last period's capital stock (net of depreciation) augmented by last periods investment (eq.1 and eq.2); where dk_i and dk_p are the exogenously specified depreciation rates - which is constant over time but varies across sectors.

Actual values will be taken for the interest rates (which are fixed for any

be too strong not only for developing countries but also for developed countries. For expectations to be rational, there should be perfect information to all economic agents. However, in developing countries, information is scanty and limited. Vast unorganized sector is a further obstacle to free flow of information. There is neither homogeneous market nor homogeneous production behaviour.

given period) and for the import co- efficiencies, the indirect tax rates, and the direct tax rates.

4.3 Interlinkages and Conclusion

The model developed here is a micro-macro computable general equilibrium model. Though broadly in neo-classical tradition, it captures the specificities or structural and institutional features of the Indian economy. Structural features are reflected not only in the original distributional characteristics between sectors, between factors of production and between economic agents and in the many parameter values used in the functional forms but also in various closure rules used in the model.

Following interlinkages are explicitly incorporated in the model

4.3.1 Interlinkages from the Financial Side to the Real Side

Portfolio reallocation effect

The model has incorporated the portfolio behaviour of not only the household sector but also various other economic agents. For example, changes in fiscal and policy affects the borrowing requirement of the public sector. The public sector can borrow from various financial institutions by issuing government securities. Issue of government securities other than that to the RBI results in portfolio reallocations by the banking sector as well as the OFIs and affects the availability of bank as well as non-bank credit to the private corporate sector. The portfolio reallocation by the financial institutions not only affect the availability but also the cost of credit to the private corporate sector. The change in the cost of credit from the financial institutions affects the investment as well as the borrowing decisions of the private corporate sector. Thus, the total investment in the economy gets affected and this has further repercussions for the economic activities.

Interest receipt and expenditure effect

Changes in the portfolio as a result of some policy change, affect the relative rates of returns on various assets. Since interest receipts/payments form a differing proportion of the incomes/expenditures of the economic agents, changes in them result in reallocation of income among economic agents. The reallocation of income and saving among economic agents not only affect the consumption and investment decisions of the economic agents but also influence their portfolio decisions.

Investment effect

Changes in money supply due to exogenous changes in the financial sector, affect the overall cost of credit as well as overall price level in the economy. Average cost of credit directly affect the investment decisions of the private corporate sector as the return on capital relative to the cost of credit influence the investment decision of this sector.

Expectations of inflations, being dependent on the past and present level of prices, would get affected by changing price level. The rate of inflation is important for both portfolio and investment decisions. Portfolio decisions of the household sector are based on the real rates of return. At the beginning of the period only the nominal rates of interest are known to it. The higher expected rate of inflation would reduce the real rates of return on all the assets. However, in our model, the demand for physical assets depends not only on the real rate of return on capital but also responds positively to the rate of inflation. Hence, the household sector would divert its saving in the form of financial assets to physical assets. The increased expected rate of inflation not only leads the diversion of funds from financial assets to physical assets but also reduces the total saving of the household sector (because saving is positively related to the average real rate of return). These two effects would reduce the available funds with the financial sector as well as the private sector. Reduced availability of funds with the financial sector results in increased cost and low availability of credit to the private corporate sector and thus reduces the level of investment in the economy.

Expected inflation also affects the desired investment by the private corporate sector positively as well as negatively. Negatively, because agents see inflation as a signal of economic problem (for example, less demand is expected for output due to low real income level in future and, thus, low expected future profits and growth. This reduces expectations of the rate of return to investment, which depends on future demand for output). Positively, because the higher expected rate of inflation reduces the expected average cost of credit (due to fixity of some nominal interest rates in the model, nominal average cost of credit does not increase in the same proportion as the inflation rate) and, thus, encourages investment by reducing the real cost of borrowing. (when nominal interest rates adjust to the inflation rate this might not happen). The exact effect of these two opposite forces depends on the relative strength of interest elasticity of investment, vis-a-vis inflation elasticity of investment.

Variable mark-up decisions

Changes in the overall price level due to change in money supply affect the mark-up in the non-agricultural sector. An increase in money supply (for example), increases the real money holdings (and money incomes) of the economic agents. Finding themselves with excess real money holdings, agents spend more on commodities and, thus, the overall price level increases. This results in the overall increase in the price level.

However, we have seen that the overall price level is also determined from the commodity market (real side).

As is clear from the IS-LM framework, the economy is in equilibrium when both the commodity market and the money market are in equilibrium. The IS-LM framework emphasizes the equilibrium levels of income and the interest rate. A similar approach can also be considered for the determination of the equilibrium price level in our model economy. The economy can remain in equilibrium only when price level determined from the money market (financial sector) is also equal to the price level determined by the commodity market (real sector). Given the rigidities in various markets of the real sector, price of the non-agricultural commodity adjusts in order to bring the price level determined

from the two sides of the economy into equilibrium. Producers price in the non-agricultural sector is based on a variable mark-up (basically this determines the profit margin of the producers of non-agricultural commodity). Thus, variation in the producer price as a result of variation in monetary conditions, leads to variation in the profit margin of the producers of the non-agricultural commodity. Finally, which price level would prevail depends on the strength of the cost push (real side) and demand pull factors (monetary side) though these two factors cannot be separated because they continuously interact in the economy.

However, changes in the profit margins affect the net revenue and the capital income of the producers. Thus, changes in the profit margins result in redistribution of income among economic agents. Even the return to capital changes which influences the investment decisions of the economic agents.

Partial wage indexation

Expected inflation affects the real variables of the economy not only via portfolio and investment decisions of the agents but also by affecting the real wages and thus input cost structure of products.

Wages in our model, are fixed in a given period and change over a period of time via partial indexation method described above. Thus, in a period of higher inflation, real wages will be declining. Declining real wages reduce the cost structure of inputs to the producers and thus increase the capital income. All this stimulates investment by the producers in those sectors where nominal wages are fixed.

4.3.2 Interlinkages from the Real Side to the Financial Side

The exogenous changes in the real side of the economy affect the income and saving levels of the economic agents. These determine the deficit and borrowing requirements (examples, private corporate sector deficit, public sector deficit and borrowing requirements) and lending decisions (examples, household sector investment decisions, financial institutions lending decisions) of the various economic agents.

Various interlinkages affect the economy from various directions and often counteract the impact of each other. Thus, to have an idea about the dominating interlinkages and important factors influencing the economy, we need to have a numerical specification of the model described above.

The model developed, here, is used for policy analysis rather than working counterfactual historical statement. We use it as a policy laboratory, analysing the outcome of a policy option or a policy package against the outcome of another policy option or policy package.

Policy experiments which we have conducted on the basis of the above model, involve simulation and sensitivity analyses. The results and the findings based on our simulation and sensitivity experiments are dealt with and described in chapter 5 to which we turn now.

TABLE 4.1 : EQUATIONS OF THE CGE MODEL

PART I : EQUATIONS OF THE REAL SIDE OF THE MODEL

A. Output Block : Production, Exports And Imports :

$$1. \quad X_1^S = D_1^d + E_1 \quad i=2$$

$$2. \quad X_1^S = AS_1 \left[\gamma_{s1} \left(D_1^S \right)^{-\rho_{s1}} + (1-\gamma_{s1}) \left(E_1 \right)^{-\rho_{s1}} \right] \left(\frac{1}{\rho_{s1}} \right)$$

i=1,2

$$3. \quad \frac{E_1}{D_1^S} = \left\{ \frac{\gamma_{s1} \left[\frac{PD_1(1-\gamma_{s1})}{\overline{PE}_1 \gamma_{s1}} \right] \left(\frac{\rho_{s1}}{1+\rho_{s1}} \right) + (1-\gamma_{s1})}{\gamma_{s1} + (1-\gamma_{s1}) \left[\frac{\overline{PE}_1 \gamma_{s1}}{PD_1(1-\gamma_{s1})} \right] \left(\frac{\rho_{s1}}{1+\rho_{s1}} \right)} \right\} \left(\frac{1}{\rho_{s1}} \right)$$

i=1,2

$$4. \quad N_{j1} = a_{j1} X_1^S \quad i=1,2$$

B. Commodity Demand Block :

$$5. \quad C_{h1} = \theta_1 + \frac{b_1}{p_1} \left[\left[(1-t_h) Y_h - \overline{TRF}_{hw} - \overline{rdlh} \overline{LS}_{dh(t-1)} \right. \right. \\ \left. \left. - \overline{OTRF}_{hf} - \overline{TRF}_{ha} - \sum_j P_j \theta_j \right] \right]$$

i=1,2

$$6. \quad INV_1 = \sum_{1j} \nu_{1j} \left[\text{inv}_j \left(\bar{I}_h + \bar{I}_p + \bar{I}_g + \bar{I}_b + \bar{I}_d + \bar{I}_r \right) \right] \quad i=1,2$$

$$7. \quad DST_1 = \gamma_{st1} \sum_j st_j \frac{\left[\Delta \bar{ST}_h + \Delta \bar{ST}_p + \Delta \bar{ST}_g + \Delta \bar{ST}_b + \Delta \bar{ST}_d + \Delta \bar{ST}_r \right]}{P_j}$$

$i=1,2$

$$8. \quad N_1 = \sum_j N_{ji} \quad i=1,2$$

$$9. \quad Q_1^d = C_{h1} + \bar{C}_{a1} + INV_1 + DST_1 + N_1 \quad i=1,2$$

$$10. \quad Q_1^d = AC_1 \left[\delta_1 \left(D_1^d \right)^{-\rho_{c1} + (1-\delta_1)} \left(M_1 \right)^{-\rho_{c1}} \right]^{\left(\frac{1}{\rho_{c1}} \right)}$$

$i=1,2$

$$11. \quad \frac{M_1}{D_1^d} = \left\{ \frac{\delta_1 \left[\frac{PD_1(1-\delta_1)}{\bar{PM}_1 \delta_1} \right]^{\left(\frac{\rho_{c1}}{1+\rho_{c1}} \right)} + (1-\delta_1)}{\delta_1 + (1-\delta_1) \left[\frac{\bar{PM}_1 \delta_1}{PD_1(1-\delta_1)} \right]^{\left(\frac{\rho_{c1}}{1+\rho_{c1}} \right)}} \right\} \left(\frac{1}{\rho_{c1}} \right)$$

$i=1,2$

$$12. \quad GDP = \sum_1 C_{h1} + \sum_1 \bar{C}_{a1} + \sum_1 INV_1 + \sum_1 DST_1 + \sum_1 E_1 - \sum_1 M_1$$

C. Price Block -Definitions :

$$13. \quad \overline{PM}_1 = \overline{PWM}_1 \overline{ER} (1 + t_{m_1} + t_{r_1}) \quad i=1,2$$

$$14. \quad \overline{PE}_1 \left[1 + t_{e_1} + t_{r_1} \right] = \overline{PWE}_1 \overline{ER} \quad i=1,2$$

OR

$$\overline{PE}_1 = \frac{\overline{PWE}_1 \overline{ER}}{\left[1 + t_{e_1} + t_{r_1} \right]} \quad i=1,2$$

$$15. \quad P_1 = \frac{PD_1 (1 + t_{r_1}) D_1^d + \overline{PM}_1 M_1}{X_1^d} \quad i=1,2$$

$$16. \quad PX_1 = \frac{PD_1 D_1^s + \overline{PE}_1 E_1}{X_1^s} \quad i=1,2$$

$$17. \quad PN_1 = PX_1 - \sum_j a_{j1} P_j \quad i=1,2$$

$$18. \quad PK_1 = \sum_j \nu_{j1} P_j \quad i=1,2$$

$$19. \quad PIND = \sum_1 \mu_1 P_1$$

D. Product Market Equilibrium

$$20. \quad D_1^S = D_1^d \quad 1=1$$

$$21. \quad PD_1 = (1+\tau) \left[\sum_j a_{j1} P_j + \frac{L_1^d}{X_1^S} W_1 + 10w_1 \right] \quad 1=2$$

E. Labour Market Equilibrium :

$$22. \quad L_1^d = \bar{b}_{01} \left(\frac{PX_1}{W_1} \right) X_1^S \quad 1=1,2$$

$$23. \quad \bar{L}_1^S = L_1^d \quad 1=1$$

$$24. \quad W_1 = \alpha_{wa} + \beta_{wa} PIND_t + \gamma_{wa} \overline{PIND}(t-1) \quad 1=2$$

$$25. \quad U_1 = \bar{L}_1^S - L_1^d \quad 1=2$$

F. Income Block :

$$26. \quad Y_h = \sum_i W_i L_i^d + \sum_i \alpha_{hi} KINC_1 + r_{ps} \overline{PCORPS}_{sh(t-1)} + \overline{OTRF}_{ph} \\ + \bar{r}_{bd} \overline{DEP}_{sh(t-1)} + \bar{r}_{ds} \overline{OFIS}_{sh(t-1)} + \overline{OTRF}_{fh} \\ + \bar{r}_{gsm} \overline{SM}_{sh(t-1)} + \overline{OTRF}_{ah} + \overline{TRF}_{wh} - \bar{r}_{dlh} \overline{L}_{sdh(t-1)}$$

$$27. \quad KINC_1 = PN_1 X_1^S - W_1 L_1^d + \overline{NW}_1 - \overline{WB}_{w1} + \overline{W}_{w1} \quad 1=1,2$$

$$28. \quad Y_p = \sum_i \alpha_{pi} KINC_1 + \bar{r}_{bd} \overline{DEP}_{sp(t-1)} + \overline{OTRF}_{fp}$$

$$29. Y_o = \sum \alpha_{oi} KINC_i + \overline{INF}_{co} + \overline{INF}_{po}$$

$$30. Y_a = \sum \alpha_{ai} KINC_i + t_h Y_h + t_p Y_p + t_e Y_e + t_f Y_f \\ + \sum t_{r1} (\overline{FM}_1 \overline{ER} M_1 + \overline{FE}_1 E_1 + PD_1 D_1^d) + \sum t_{n1} \overline{FM}_1 \overline{ER} M_1 \\ + t_{e1} \overline{FE}_1 E_1 + \overline{INF}_{ha} + \overline{INF}_{pa} + \overline{INF}_{ea} + \overline{INF}_{fa}$$

$$31. Y_f = \sum \alpha_{fi} KINC_i + r_{blp} \overline{L}_{cbp}(t-1) + r_{dlp} \overline{L}_{cdp}(t-1) + \\ \overline{OINF}_{pf} + r_{dlh} \overline{L}_{cdh}(t-1) + \overline{OINF}_{hf} + \overline{INF}_{ef} + \overline{TRF}_{af}$$

$$32. Y_v = \sum \alpha_{vi} KINC_i + \sum \overline{FM}_1 M_1 + \sum \overline{W}_1 + \overline{TRF}_{hw}$$

G. SAVING BLOCK

$$33. S_h = s_{oh} \left[\frac{r_h}{1 + \hat{r}} \right]^{\alpha_{1h}} Y_h$$

$$34. S_p = \left[1 - t_p \right] Y_p - r_{ps} \overline{FCOAS}_{sh}(t-1) - \overline{OINF}_{ph} \\ - \overline{INF}_{pe} - \overline{INF}_{pa} - r_{blp} \overline{L}_{cbp}(t-1) - r_{dlp} \overline{L}_{cdp}(t-1) - \overline{OINF}_{pf}$$

$$35. S_e = (1 - t_e) Y_e - \overline{INF}_{ca} - \overline{INF}_{ef}$$

$$36. S_a = Y_a - \sum \alpha_{ai} \overline{C}_i - r_{gca} \overline{CM}_{ch}(t-1) - \overline{OINF}_{ah} - \overline{TRF}_{ae} - \overline{TRF}_{af}$$

$$37. S_o = S_o + S_a$$

38.
$$S_f = (1-t_f)Y_f - \bar{r}_{ds} \overline{OFIS}_{sh(t-1)} - \bar{r}_{bd} \overline{DEP}_{sh(t-1)} - \overline{OTRF}_{fh} - \bar{r}_{bd} \overline{DEP}_{sp(t-1)} - \overline{OTRF}_{fp} - \overline{TRF}_{fa}$$
39.
$$S_b = b S_f$$
40.
$$S_d = d S_f$$
41.
$$S_w = Y_w - \Sigma \overline{PWE}_1 \overline{ER}_1 E_1 - \Sigma \overline{NW}_1 - \overline{TRF}_{wh}$$

Part II : Equations Of The Financial Side Of The Model

H. Household's Portfolio Decisions

42.
$$\log \Delta M_h = \alpha_{2h} + \alpha_{3h} \log Y_h + [1 - \alpha_{3h}] \log \text{PIND} + \alpha_{4h} \left[\frac{\log(1 + \bar{r}_{bd})}{r_{oh}} \right]$$
43.
$$\Delta \text{CASH}_h = g_{oh} \Delta M_h$$
44.
$$\Delta \text{DEP}_h = [1 - g_{oh}] \Delta M_h$$
45.
$$\frac{g_{oh}}{1 - g_{oh}} = \phi_{oh} \left[\frac{1}{\left(\frac{\overline{BB}}{\text{POP}} \right)_{(t-1)}} \right]^{\epsilon_{oh}} [1 + \bar{r}_{bd}]^{-\epsilon_{4h}}$$
46.
$$\Delta \text{CO}_h = \alpha_{5h} Y_h$$
47.
$$\Delta \text{CO}_{hd} = g_0 \Delta \text{CO}_h$$

$$48. \quad \Delta CO_h = (1 - g_0) \Delta CO_h$$

$$49. \quad S_{kh} = \left[S_h - \Delta M_h - \Delta CO_h - \Delta \overline{OA}_h - \Delta \overline{ST}_h + \Delta \overline{L}_{dh} + \Delta \overline{OL}_h \right]$$

$$50. \quad \sum_i PK_i \text{inv}_i I_h = g_{1h} S_{kh}$$

$$51. \quad \Delta OFA_h = \left[1 - g_{1h} \right] S_{kh}$$

$$52. \quad \frac{g_{1h}}{1 - g_{1h}} = \phi_{1h} \left[\frac{r_k}{r_{ofh}} \right]^{\epsilon_{1h}} \left[1 + \hat{r} \right]^{\epsilon_{5h}}$$

$$53. \quad \Delta SM_h = g_{2h} \Delta OFA_h$$

$$54. \quad \Delta SEC_h = \left[1 - g_{2h} \right] \Delta OFA_h$$

$$55. \quad \frac{g_{2h}}{1 - g_{2h}} = \phi_{2h} \left[\frac{1 + \bar{r}_{gsm}}{r_{sh}} \right]^{\epsilon_{2h}}$$

$$56. \quad \Delta PCORS_h = g_{3h} \Delta SEC_h$$

$$57. \quad \Delta FIS_h = \left[1 - g_{3h} \right] \Delta SEC_h$$

$$58. \quad \frac{g_{3h}}{1 - g_{3h}} = \phi_{3h} \left[\frac{1 + r_{ps}}{1 + \bar{r}_{ds}} \right]^{\epsilon_{3h}}$$

I. Private Corporate Firm's Investment Financing Decisions

$$59. \frac{I_p}{\bar{K}_{p(t-1)}} = \alpha_0 \left[\left(\frac{\Sigma KINC_i}{\Sigma PK_i \bar{K}_{i(t-1)}} \right) \setminus \left(\frac{1 + r_p}{1 + \hat{r}} \right) \right]^{\epsilon_{3p}} (1 + \hat{r})^{-\epsilon_{4p}}$$

$$60. \Delta M_p = \bar{K}_p Y_p$$

$$61. \Delta CASH_p = g_{0p} \Delta M_p$$

$$62. \Delta DEP_p = (1 - g_{0p}) \Delta M_p$$

$$63. DEF_p = \Sigma PK_1 inv_1 I_p + \Delta M_p + \Delta \overline{ST}_p + \Delta \overline{OA}_p \\ + \Delta \overline{FA}_p - S_p - \Delta \overline{OL}_p - \Delta \overline{FL}_p$$

$$64. \Delta PCORS^B = g_{1p} DEF_p$$

$$65. \Delta L_p^d = (1 - g_{1p}) DEF_p$$

$$66. \frac{g_{1p}}{1 - g_{1p}} = \phi_{1p} \left[\frac{r_p}{1 + r_{ps}} \right]^{\epsilon_{1p}}$$

$$67. \Delta L_{bp}^d = g_{2p} \Delta L_p^d$$

$$68. \Delta L_{dp}^d = (1 - g_{2p}) \Delta L_p^d$$

$$69. \quad \frac{e_{2p}}{1 - e_{2p}} = \phi_{2p} \left(\frac{1 + r_{d1p}}{1 + r_{b1p}} \right)^{e_{2p}}$$

J. Government's Deficit Financing Decisions :

$$70. \quad FDEF_g = \sum_t PK_1 inv_1 \bar{I}_g + \Delta \bar{ST}_g + \Delta \bar{FA}_g + \Delta \bar{OA}_g - S_g$$

$$71. \quad BREQ_g = \sum_t PK_1 inv_1 \bar{I}_g + \Delta \bar{ST}_g + \Delta \bar{F} \bar{A}_g + \Delta \bar{OA}_g \\ - \Delta GS_b - \Delta \bar{OL}_g - \Delta CO_{hg} - \Delta SM_h - FL_g - S_g$$

$$72. \quad \Delta GS_c = w_1 BREQ_g$$

$$73. \quad \Delta GS_d = \left(1 - w_1 \right) BREQ_g$$

K. Reserve Bank Of India :

$$74. \quad \Delta RBM = \Delta GS_c + \Delta RBC_b + \Delta RBC_d + ER (\Delta \bar{FA}_c - \Delta \bar{FL}_c) - \Delta NNML$$

Where

$$\Delta NNML = \Delta NML - \Delta \bar{OA}_c$$

L. Banking Sector Portfolio Determination :

$$75. \quad \Delta L_b = \Delta DEP_b + \Delta RBC_b + \Delta L_{db}^d + \Delta \overline{OL}_b + S_b$$

$$76. \quad \Delta A_b = \Delta RR_b + \Delta ER_b + \Delta GS_b + \Delta OFIS_b + \Delta L_{bp}^S + \Delta \overline{OA}_b \\ + \Delta \overline{FA}_b + \sum PK_1 inv_1 \overline{I}_b + \Delta \overline{ST}_b$$

$$77. \quad \Delta DEP_b = \Delta DEP_h + \Delta DEP_p + \Delta \overline{DEP}_{db} + \Delta \overline{DEP}_{wb}$$

$$78. \quad \Delta RBC_b = \varepsilon_{1b} \left[\frac{1 + r_{blp}}{1 + \overline{r}_{clb}} \right]^{\varepsilon_{1b}} \Delta A_b$$

OR

$$\Delta RBC_b = \Delta \overline{RBC}_b$$

$$79. \quad \Delta L_{db}^d = \varepsilon_{2b} \left[\frac{1 + r_{blp}}{1 + r_{dlb}} \right]^{\varepsilon_{2b}} \Delta A_b$$

$$80. \quad \Delta RR_b = \varepsilon_{5b} \Delta DEP_b$$

$$81. \quad \Delta ER_b = \varepsilon_{3b} \left[\frac{r_{1b}}{1 + r_{blp}} \right]^{\varepsilon_{3b}} \Delta DEP_b$$

$$82. \quad \Delta SLRS_b = \varepsilon_{6b} \Delta DEP_b$$

$$83. \quad \Delta ESLRS_b = \varepsilon_{4b} \left[\frac{r_{SLR}}{1 + r_{blp}} \right]^{\varepsilon_{4b}} \Delta DEP_b$$

$$84. \quad \Delta GS_b = \varepsilon_{7b} \left[\Delta SLRS_b + \Delta ESLRS_b \right]$$

$$85. \quad \Delta OFIS_b = (1 - \varepsilon_{7b}) \left[\Delta SLRS_b + \Delta ESLRS_b \right]$$

$$86. \quad \Delta L_{bp}^S = \Delta L_b - \left[\Delta RR_b + \Delta ER_b + \Delta GS_b + \Delta OFIS_b + \Delta L_{bg} \right. \\ \left. + \Delta \overline{OA}_b + \Delta \overline{FA}_b + \sum PK_1 inv_1 \overline{I}_b + \Delta \overline{ST}_b \right]$$

M. Other Financial Institutions Portfolio
Determination :

$$87. \quad \Delta L_d = \Delta OFIS_b + \Delta OFIS_h + \Delta CO_{hd} + \Delta RBC_d + \Delta \overline{OL}_d + \Delta \overline{FL}_d + S_d$$

$$88. \quad \Delta A_d = \Delta GS_d + \Delta L_{db}^S + \Delta L_{dp}^S + \Delta \overline{L}_{dh} + \Delta \overline{M}_d + \\ \Delta \overline{OA}_d + \Delta \overline{FA}_d + \sum PK_1 inv_1 \overline{I}_d + \Delta \overline{ST}_d$$

$$89. \quad \Delta RBC_d = \varepsilon_{1d} \left[\frac{r_{dl}}{1 + \overline{r}_{cld}} \right]^{\varepsilon_{1d}} \Delta A_d$$

$$90. \quad \Delta LF_d = \Delta L_d - \Delta L_{dg} - \Delta \overline{M}_d - \Delta \overline{OA}_d - \Delta \overline{FA}_d - \sum PK_1 inv_1 \overline{I}_d - \Delta \overline{ST}_d - \Delta \overline{L}_{dh}$$

$$91. \quad \Delta L_{db}^S = \varepsilon_{2d} \Delta LF_d$$

$$92. \quad \Delta L_{dp}^S = \left[1 - \varepsilon_{2d} \right] \Delta LF_d$$

$$93. \quad \frac{\varepsilon_{2d}}{1 - \varepsilon_{2d}} = \phi_{2d} \left[\frac{1 + r_{dlb}}{1 + r_{dlp}} \right]^{\varepsilon_{2d}}$$

N. Rest of The World :

$$94. \quad \Delta \bar{L}_w + S_w = \Delta \bar{M}_w + \Delta L_{fg} + \Delta OA_w$$

O. Money Supply Analysis :

$$95. \quad \Delta M_d = \Delta M_h + \Delta M_p + \Delta \bar{M}_d + \Delta \bar{M}_w$$

$$96. \quad \Delta M^S = \frac{\Delta RBM}{\left\{ \left[\varepsilon_{0h} \varepsilon_{mh} + \varepsilon_{0p} \varepsilon_{mp} + \varepsilon_{0d} \varepsilon_{md} + \varepsilon_{0w} \varepsilon_{mw} \right] + \left[\varepsilon_{5b} + \varepsilon_{3b} \left(\frac{r_{lb}}{1+r_{blp}} \right)^{\varepsilon_{3b}} \right] \left[1 - \left[\varepsilon_{0h} \varepsilon_{mh} + \varepsilon_{0p} \varepsilon_{mp} + \varepsilon_{0d} \varepsilon_{md} + \varepsilon_{0w} \varepsilon_{mw} \right] - \varepsilon_{0d0} \right] + \varepsilon_{0d0} \right\}}$$

P. Interest Rates And Returns : Definitions

$$97. \quad r_h = m_1 \left(1 + \bar{r}_{bd} \right) + \left(1 - m_1 \right) r_{oh}$$

$$98. \quad r_{oh} = \varepsilon_{1h} r_k + \left(1 - \varepsilon_{1h} \right) r_{ofh}$$

$$99. \quad r_{ofh} = \varepsilon_{2h} \left(1 + \bar{r}_{gsm} \right) + \left(1 - \varepsilon_{2h} \right) r_{sh}$$

100. $r_{sh} = g_{3h} (1 + r_{ps}) + (1 - g_{3h})(1 + \bar{r}_{ds})$
101. $r_p = g_{2p} (1 + r_{blp}) + (1 - g_{2p})(1 + r_{dlp})$
102. $r_k = \left[1 + \left(\frac{\sum_1 KINC_1}{\sum PK_1 K_1(t-1)} \right) \right] [1 + \hat{\pi}]$
103. $r_{lb} = n_1 (1 + \bar{r}_{clb}) + (1 - n_1)(1 + r_{dlb})$
104. $r_{dl} = g_{2d} (1 + r_{dlb}) + (1 - g_{2d})(1 + r_{dlp})$
105. $r_{SLR} = \bar{g}_{7b} (1 + \bar{r}_{gs}) + (1 + \bar{r}_{ds})(1 - \bar{g}_{7b})$

Q. Assets Market Equilibria :

106. $M^s = M^d$
107. $\Delta PCORS_h = \Delta PCORS^s$
108. $\Delta L_{bp}^d = \Delta L_{bp}^s$
109. $\Delta L_{dp}^d = \Delta L_{dp}^s$
110. $\Delta L_{db}^d = \Delta L_{db}^s$
111. $\sum_t \overline{PWE}_1 E_1 - \sum_1 \bar{P} + \Delta \overline{TRF}_{wh} - \Delta \overline{TRF}_{hw} + \Delta \overline{FA}_p$
 $+ \Delta \overline{FA}_g + \Delta \overline{FA}_c + \Delta \overline{FA}_b + \Delta \overline{FA}_d - \Delta \overline{FL}_p - \Delta \overline{FL}_g - \Delta \overline{FL}_c - \overline{FL}_d = \Delta FE$

PART III

R. Expectations :

$$112. \hat{\pi} = \sigma_3 \left[\frac{\text{PIND}_t}{\text{PIND}_{t-1}} - 1 \right] + \left(1 - \sigma_3 \right) \left[\frac{\text{PIND}_{t-1}}{\text{PIND}_{t-2}} - 1 \right]$$

Number of Equations = 126 ; Number of Endogenous Variables = 124

Interim Period Model:

Dynamics :

$$1. \quad K_{1,t} = \bar{K}_1(t-1)(1-\bar{d}k_1) + \text{INV}_1 \quad 1=1,2$$

$$2. \quad K_{p,t} = \bar{K}_p(t-1)(1-\bar{d}kp) + I_p$$

$$3. \quad \text{DEP}_{h,t} = \overline{\text{DEP}}_{h,(t-1)} + \Delta \text{DEP}_{h,t}$$

$$4. \quad \text{OFIS}_{h,t} = \overline{\text{OFIS}}_{h,(t-1)} + \Delta \text{OFIS}_{h,t}$$

$$5. \quad \text{PCORS}_{h,t} = \overline{\text{PCORS}}_{h,(t-1)} + \Delta \text{PCORS}_{h,t}$$

$$6. \quad \text{SM}_{h,t} = \overline{\text{SM}}_{h,(t-1)} + \Delta \text{SM}_{h,t}$$

$$7. \quad \text{DEP}_{p,t} = \overline{\text{DEP}}_{p,(t-1)} + \Delta \text{DEP}_{p,t}$$

$$8. \quad L_{bp,t} = \overline{L}_{bp,(t-1)} + L_{bp,t}$$

$$9. \quad L_{dp,t} = \overline{L}_{dp,(t-1)} + L_{dp,t}$$

Table 4.2 : List of Endogenous Variables and Co-efficients

A_b	total assets of banking sector
A_d	total assets of OFIs
$BREQ_g$	borrowing requirement of public sector
C_{hi}	consumption of composite commodity i by household sector
CO_h	contractual saving of household sector
CO_{hd}	contractual saving of household sector with OFIs
CO_{hg}	contractual saving of household sector with public sector
$CASH_h$	cash holding of household sector
$CASH_p$	cash holding of private corporate sector
D^d_i	domestic demand for domestically produced commodity i
D^s_i	supply of domestically produced commodity i in the domestic market
DEP_b	total deposits with the banking sector
DEF_p	deficit of private corporate sector
DEP_h	deposit of household sector
DEP_p	deposit of private corporate sector
DST_i	demand for composite commodity i in "change in stocks"
E_i	export of domestically produced commodity i
ER_b	excess reserves of banking sector
$ESLRS_b$	excess SLR securities with banking sector
$FDEF_g$	deficit of public sector
FE	foreign exchange reserves of RBI
GS_b	government securities held by banking sector
GS_c	government securities held by RBI
GS_d	government securities held by OFIs
g_{2d}	share of pvt sector in loans from OFIs
g_{oh}	share of cash in money holding of household sector
g_{1h}	share of investment (physical assets) in Skh
g_{2h}	share of small saving in OFAh
g_{3h}	share of PCORSh in SECh

g_{1p}	share of PCORSh in financing DEF_p
g_{2p}	share of banking sector in L_p^d
GDPR	real gross domestic product
I_h	investment by household sector
I_p	investment by private corporate sector
INV_i	total demand for composite commodity i for investment
$KINC_i$	capital income from productive sector i
L_b	total sources of funds of banking sector
L_{bp}^d	loan demand from banking sector by private corporate sector
L_{bp}^s	loans supply from banking sector to private corporate sector
L_d	total sources of funds of OFIs
L_{db}^d	loan demand from OFIs by banking sector
L_{db}^s	loans from OFIs to banking sector
L_{dp}^d	loan demand from OFIs by private corporate sector
L_{dp}^s	loans from OFIs to private corporate sector
L_i^d	total sectoral demand for labour
L_p^d	total borrowing by private corporate sector
LF_d	loanable funds of OFIs
M^d	total money demand in the economy
M_h	money holding of household sector
M_i	import of commodity i
M_p	money holding of private corporate sector
M^s	total money supply in the economy
N_i	intermediate demand for composite commodity i
$N_{j,i}$	use of input j in sector i
OA_w	other assets of ROW
OFA_h	Skh net of investment in physical assets
$OFIS_b$	securities of OFI's held by banking sector
$OFIS_h$	securities of OFI's held by household sector
P_i	price of composite commodity i
PD_i	price of domestically produced commodity i in domestic market
PK_i	price of capital good for investment in sector i

PN_i	net producer price of commodity i
PX_i	average producer price of commodity i
PIND	price index
$PCORS_h$	private corporate securities held by household sector
$PCORS^*$	total supply of private corporate securities
RR_b	required reserves of banking sector
RBC_b	reserve bank credit to banking sector
RBC_d	reserve bank credit to OFIs
RBM	reserve bank money
r_h	average return on assets for household sector
r_k	return on capital
r_p	average cost of funds for private corporate sector
r_{dl}	average return to OFIs on lending
r_{lb}	average cost of borrowing to the banking sector
r_{oh}	average return on non-monetary assets of household sector
r_{ps}	return on private corporate securities
r_{sh}	average return on private corporate securities and securities of OFIs
r_{blp}	lending rate of banking sector to private corporate sector
r_{dlb}	lending rate of OFIs to banking sector
r_{dlp}	lending rate of OFIs to private corporate sector
r_{ofh}	average return on OFA to household sector
r_{slr}	average return to banks on SLR securities
S_a	saving of the government sector
S_b	saving of banking sector
S_d	saving of OFIs
S_e	saving of public sector non-departmental enterprises
S_f	saving of financial intermediaries
S_g	saving of public sector
S_h	saving of household sector
S_p	saving of private corporate sector
S_w	saving of ROW

S_{kh}	saving net of money, contractual saving, other exogenously specified assets and change in stocks but inclusive of borrowed funds.
SM_h	small saving of household sector
SEC_h	total of private corporate securities and securities of OFIs held by household sector
$SLRS_b$	SLR securities with banking sector
U_i	unemployment in non agricultural sector
W_i	Wage of labour in sector i
Q_i^d	total domestic demand for composite commodity i
X_i^s	total output of domestically produced commodity i
Y_g	income of government sector
Y_e	income of public sector non-departmental enterprise
Y_f	income of financial intermediaries
Y_h	income of household sector
Y_p	income of private corporate sector
Y_w	income of ROW
τ	mark up rate
$\dot{\eta}$	expected inflation

Table 4.3: List of Exogenous Variables and Co-efficients

a_o	productivity parameter (constant) in private corporate investment function
a_{ji}	input - output co-efficients
AC_i	constant in Armington CES function
AS_i	constant in CET function
b	fraction of total financial institution saving with banking sector
b_i	marginal budget shares
b_{oi}	constant in labour demand equation
BB	bank branches
d	fraction of total financial institution saving with OFIs
DEP_{db}	deposit of OFIs with banking sector
DEP_{wb}	deposit of ROW with banking sector
$DEP_{sh(t-1)}$	stock of deposits with household sector in period t-1
$DEP_{sp(t-1)}$	stock of deposits with private corporate sector in period t-1
ER	exchange rate
FA_k	foreign assets of agent k ($k=b,d,c,p,g$)
FL_c	foreign liabilities of agent k ($k=c,d,p,g$)
g_0	share of OFIs in COh
g_{1b}	constant in banking sector RBC demand function
g_{2b}	constant in banking sector loan demand from OFIs function
g_{3b}	constant in bank excess reserve demand function
g_{4b}	constant in bank excess SLR securities demand function
g_{7b}	share of government securities in SLR securities
g_{1d}	constant in OFI RBC demand function
g_{0k}	fraction of agent k's ($k=d,p,w$) cash in it's total money holding
$g_{n:k}$	fraction of agent k's money holding in total money holding ($k=h,p,d,w$)
g_{0do}	fraction of "other deposits" in total money holding
I_b	banking sector investment
I_d	OFI's investment

I_t	Error in investment
inv_j	share of sector j in total investment
$K_{i(t-1)}^*$	capital stock in productive sector i in period $t-1$
k_p	money demand co-efficients for private corporate sector
$K_{p(t-1)}$	capital stock of private corporate sector in period $t-1$
L_i^s	total sectoral labour supply
L_w	total liabilities of ROW
l_{owi}	wage to ROW to total domestic output ratio in each sector
L_{dh}	loan to household sector from OFIs
$L_{abp(t-1)}$	stock of loans from banks to private corporate sector in period $(t-1)$
$L_{sdp(t-1)}$	stock of loans from OFIs to private corporate sector in period $(t-1)$
$L_{sdh(t-1)}$	stock of loans from OFIs to household sector in period $(t-1)$
m_1	exogenously specified weight in r_h
M_d	money with OFIs
M_w	money with ROW
n_1	exogenously specified weights in r_{1b}
NW_i	sectoral non wage income from ROW
NML	non monetary liabilities
NNML	net non-monetary liabilities
OA_k	"other assets" of agent k ($k=b,c,d,g,h,p$)
OL_k	"other liabilities" of agent k ($k=b,d,g,h,p$)
$OFIS_{sh(t-1)}$	stock of OFI securities with household sector $(t-1)$
$OTRF_{ah}$	other transfers from government sector to household sector
$OTRF_{fh}$	other transfers from financial intermediaries to household sector
$OTRF_{fp}$	other transfers from financial intermediaries to private corporate sector
$OTRF_{hf}$	other transfers from household sector to financial intermediaries
$OTRF_{pf}$	other transfer from private corporate sector to financial intermediaries
$OTRF_{ph}$	other transfers from private corporate sector to household sector

PE_i	price of exported commodity i in domestic currency.
PM_i	price of imported commodity in domestic currency
POP	population
PWM_i	world price of imported commodity i
PWE_i	world price of exported commodity i
$PCORS_{sh(t-1)}$	stock of private corporate securities with household sector in period $t-1$
$PIND_{(t-1)}$	price index in period $t-1$
$PIND_{(t-2)}$	price index in period $t-2$
s_{oh}	constant in household sector saving function
$SM_{sh(t-1)}$	stock of small savings with household sector in period $t-1$
s_{ij}	fraction of total "change in stock" allocated to sector j
Stk	"change in stock" with agent k ($k=h,p,g,b,d$)
Str	error in the measurement of stocks of physical assets
t_e, t_f, t_h, t_p	tax rates on incomes of non-departmental enterprises, financial intermediaries, household sector and private corporate sector
te_i	export tariff on commodity i
tm_i	import tariff on commodity i
tr_i	indirect tax rate on commodity i
TRF_{ac}	total transfers from government sector to public sector non-departmental enterprises
TRF_{af}	total transfers from government sector to financial intermediaries
TRF_{ea}	total transfers from public sector non-departmental enterprise to government sector
TRF_{ef}	total transfers from non departmental enterprise to financial intermediaries
TRF_{fa}	total transfers from financial intermediaries to government sector
TRF_{ha}	total transfers from household sector to government sector
TRF_{hw}	total transfers from household sector to ROW
TRF_{pa}	total transfers from private corporate sector to government sector

TRF_{pc}	total transfers from private corporate sector to public sector non- departmental enterprise
TRF_{wh}	total transfers from ROW to household sector
WB_{wi}	sectoral wage bill to ROW
W_{wi}	sectoral wage bill from ROW
X_i^a	total domestic output of agricultural sector ($i=1$)
α_{2h}	constant in money demand equation
α_{5h}	constant in contractual asset demand equation
α_{ki}	share of agent k in $KINC_i$ ($k=a,e,f,h,p,w$)
$\alpha_{wa}, \beta_{wa}, \gamma_{wa}$	constants in wage index equations
γ_{si}	share parameter in CET function
γ_{sii}	share of composite commodity i in "change in stock"
δ_i	share parameter in Armington CES function
θ_i	minimum consumption of commodity i in LES consumption function
ϕ_{2d}	constant in OFIs loan supply allocation to banking sector and private sector function
ϕ_{0h}	constant in households sector cash to deposit allocation function
ϕ_{1h}	fraction in household sector investment and "other financial assets" allocation function
ϕ_{2h}	fraction in household sector small saving and securities allocation function
ϕ_{3h}	fraction in household private corporate securities and OFI securities allocation function
ϕ_{1p}	fraction in private corporate sector's deficit funding decision via issuing securities and loans
ϕ_{2p}	fraction in private corporate sector's deficit funding decision via loans from banks and OFIs
u_{ij}	capital composition co-efficient
μ_i	weights in price index
σ_3	weights in expected inflation equation

Policy Variables and Co-efficients

C_{ai}	government sector consumption of commodity i
g_{sb}	required cash reserve requirement
g_{6b}	statutory liquidity ratio (SLR)
I_g	public sector investment
RBC_b	RBI credit to banking sector
RBC_d	RBI credit to OFIs
r_{bd}	interest rate on bank deposits
r_{ds}	return on securities of OFIs
r_{clb}	lending rate of RBI to banking sector
r_{clid}	lending rate of RBI to OFIs
r_{dlh}	lending rate of OFIs to household sector
r_{gs}	return on government securities
r_{gsm}	interest rate on small savings
W_1	financing of public sector deficit by RBI credit

Elasticity Parameters

α_{1h}	interest elasticity in household sector saving function
α_{3h}	income elasticity in money demand function
α_{4h}	interest elasticity in money demand function
ϵ_{1b}	interest rate elasticity in bank RBC demand function
ϵ_{2b}	interest rate elasticity in bank loan demand from OFI function
ϵ_{3b}	interest rate elasticity in bank ER demand function
ϵ_{4b}	interest rate elasticity in bank excess SLR securities demand function
ϵ_{1d}	interest rate elasticity in OFIs RBC demand function
ϵ_{2d}	interest rate elasticity in OFIs loan supply to banking sector-private corporate sector function

ϵ_{0h}	bank branch elasticity in household sector cash to deposit allocation function
ϵ_{1h}	interest rate elasticity in household sector investment to "other financial assets" allocation function
ϵ_{2h}	interest rate elasticity in household sector small saving to securities allocation function
ϵ_{3h}	interest rate elasticity in household sector private corporate securities and OFI securities allocation function
ϵ_{4h}	interest rate elasticity in household sector cash to deposit allocation function
ϵ_{5h}	inflation elasticity in household sector investment to "other financial assets" allocation function
ϵ_{1p}	interest rate elasticity in private corporate sector's deficit funding decision via issuing securities and loans function
ϵ_{2p}	interest rate elasticity in private corporate sector's deficit funding decision via loans from banking sector and OFI function
ϵ_{3p}	interest rate elasticity in private corporate sector investment function
ϵ_{4p}	inflation rate elasticity in private corporate sector investment function
ρ_{ci}	elasticity parameter in Armington CES function
ρ_{si}	elasticity parameter in CET function

ϵ_{0h}	bank branch elasticity in household sector cash to deposit allocation function
ϵ_{1h}	interest rate elasticity in household sector investment to "other financial assets" allocation function
ϵ_{2h}	interest rate elasticity in household sector small saving to securities allocation function
ϵ_{3h}	interest rate elasticity in household sector private corporate securities and OFI securities allocation function
ϵ_{4h}	interest rate elasticity in household sector cash to deposit allocation function
ϵ_{5h}	inflation elasticity in household sector investment to "other financial assets" allocation function
ϵ_{1p}	interest rate elasticity in private corporate sector's deficit funding decision via issuing securities and loans function
ϵ_{2p}	interest rate elasticity in private corporate sector's deficit funding decision via loans from banking sector and OFI function
ϵ_{3p}	interest rate elasticity in private corporate sector investment function
ϵ_{4p}	inflation rate elasticity in private corporate sector investment function
ρ_{ci}	elasticity parameter in Armington CES function
ρ_{si}	elasticity parameter in CET function

Chapter 5

SIMULATION AND SENSITIVITY ANALYSIS

5.1 Parameter Values and Model Calibration

Computable general equilibrium analysis involves a large number of parameters. Econometric estimation of various share and elasticity parameters involved in the model is not possible, mainly, due to non-availability of time series data for most of the variables.

Conventionally, FSAM for a specific year (which in our case is 1983-84) is taken as a base-year solution of the model economy. The model has been calibrated to replicate the base year FSAM. The base-year calibration procedure follows that is common to most of the CGE models: initial prices and quantities are combined with the parameters and elasticities to calculate the share parameters, distribution parameters and exogenous constants (such as direct and indirect tax rates, initial composition of assets and liabilities of various economic agents, wage rates and various other share parameters) that validate the base-year values in the FSAM. Thus, most of the parameters of the model are defined, implicitly, by the base-year FSAM.¹ Elasticities of CET functions, Armington CES functions, elasticities involved in the various financial portfolio functions were pitched at levels that were also used in other, comparable studies.² Given

1

While some of the calibrated parameters (like input-output coefficients) are observed in the economy and are implicit in the FSAM, some of the parameters are implicit in the specified equations in the CET and CES functions.

2

We tried to estimate various interest rate and inflation elasticities involved in the financial sector specification econometrically. However due to fixity in the interest rate structure during the period of analysis we got wrong signs for most of our elasticity parameters. Therefore, we have made use of other comparable studies at the world level for the estimates of these elasticity parameters. Estimates of parameters of LES functions are provided to us by Dr. K.N. Murthy, professor at Central University, Hyderabad. These borrowed estimates would be used for the purpose of policy experimentations.

SIMULATION AND SENSITIVITY ANALYSIS

5.1 Parameter Values and Model Calibration

Computable general equilibrium analysis involves a large number of parameters. Econometric estimation of various share and elasticity parameters involved in the model is not possible, mainly, due to non-availability of time series data for most of the variables.

Conventionally, FSAM for a specific year (which in our case is 1983-84) is taken as a base-year solution of the model economy. The model has been calibrated to replicate the base year FSAM. The base-year calibration procedure follows that is common to most of the CGE models: initial prices and quantities are combined with the parameters and elasticities to calculate the share parameters, distribution parameters and exogenous constants (such as direct and indirect tax rates, initial composition of assets and liabilities of various economic agents, wage rates and various other share parameters) that validate the base-year values in the FSAM. Thus, most of the parameters of the model are defined, implicitly, by the base-year FSAM.¹ Elasticities of CET functions, Armington CES functions, elasticities involved in the various financial portfolio functions were pitched at levels that were also used in other, comparable studies.² Given

1

While some of the calibrated parameters (like input-output coefficients) are observed in the economy and are implicit in the FSAM, some of the parameters are implicit in the specified equations in the CET and CES functions.

2

We tried to estimate various interest rate and inflation elasticities involved in the financial sector specification econometrically. However due to fixity in the interest rate structure during the period of analysis we got wrong signs for most of our elasticity parameters. Therefore, we have made use of other comparable studies at the world level for the estimates of these elasticity parameters. Estimates of parameters of LES functions are provided to us by Dr. K.N. Murthy, professor at Central University, Hyderabad. These borrowed estimates would be used for the purpose of policy experimentations.

the elasticity parameters, all other parameters are chosen such that solving the equation set with exogenous variables at 1983-84 levels replicates the FSAM. Thus, this sort of calibration boils down to setting key "slope" coefficients such as elasticities of substitution or income elasticities of demand and accounting identities to compute intercepts, distribution parameters in the CES, and so on. The values of the elasticity parameters and some of the calibrated parameters are given in Table 4a.

The base year solution values serve as the bench-mark in the analysis of the outcomes of the simulations. The simulations undertaken in this study are simple: in each of the simulations only one of the exogenous variables is changed.

Formally, the performance of the model in responding to policy changes could be validated by examining the Jacobian matrix that relates changes in endogenous variables to changes in both exogenous variables and certain policy parameters. Instead of observing actual results, one could examine the elements of the Jacobian directly and test them against real-world (or theoretically plausible) values.

In general, it is impossible to determine the Jacobian matrix analytically from the model structure. However, the elements of the Jacobian can be explored numerically by perturbing the model. In this sense, all our experiments and sensitivity tests can be seen as perturbations to explore the nature of the responses in the model.

5.2 Policy Simulations

As mentioned in the earlier chapters, the model presented in this study is used as a laboratory for policy experiments.

Policy experiments which we have conducted, treating the model as the policy laboratory, include simulation and sensitivity analysis. In the simulation experiments, we have examined how financial perturbations (such as a change in the high powered money or monetary base, through various policy instruments in the hands of the central bank) can affect the real variables in the economy,

the elasticity parameters, all other parameters are chosen such that solving the equation set with exogenous variables at 1983-84 levels replicates the FSAM. Thus, this sort of calibration boils down to setting key "slope" coefficients such as elasticities of substitution or income elasticities of demand and accounting identities to compute intercepts, distribution parameters in the CES, and so on. The values of the elasticity parameters and some of the calibrated parameters are given in Table 4a.

The base year solution values serve as the bench-mark in the analysis of the outcomes of the simulations. The simulations undertaken in this study are simple: in each of the simulations only one of the exogenous variables is changed.

Formally, the performance of the model in responding to policy changes could be validated by examining the Jacobian matrix that relates changes in endogenous variables to changes in both exogenous variables and certain policy parameters. Instead of observing actual results, one could examine the elements of the Jacobian directly and test them against real-world (or theoretically desirable) values.

In general, it is impossible to determine the Jacobian matrix analytically from the model structure. However, the elements of the Jacobian can be explored numerically by perturbing the model. In this sense, all our experiments and sensitivity tests can be seen as perturbations to explore the nature of the responses in the model.

2 Policy Simulations

As mentioned in the earlier chapters, the model presented in this study is used as a laboratory for policy experiments.

Policy experiments which we have conducted, treating the model as the policy laboratory, include simulation and sensitivity analysis. In the simulation experiments, we have examined how financial perturbations (such as a change in high powered money or monetary base, through various policy instruments at the hands of the central bank) can affect the real variables in the economy.

namely consumption, investment, employment, distribution of income, saving made in the form of different assets, etc. Sensitivity analysis is conducted for examining the impact of plausible variations in parameter values.

Four sets of simulation exercises were carried out.

The first set of simulation exercises studies the impact of different monetary and credit policy measures and financial sector reforms, such as a change in the administered structure of interest rates. The policy changes considered in all three illustrative simulation exercises, carried out in this set, aim at enhancing the supply of credit to the private corporate sector at a lower cost. These measures include a reduction in the bank deposit rate, a reduction in the SLR and a reduction in the CRR.

The second set of simulations explores the effects of different measures of budgetary policy all aiming at achieving the reduction in the public sector borrowing requirement³: reduction of public investment (I_g), non-investment expenditure and then fiscal reform, concerning the reduction in indirect taxes on production.

The third set of simulation exercises aims at exploring the impact of an exogenous change in the amount of agricultural output.

The model formulation is flexible enough to take into account the effect of regime change. We simulated the model for a partially liberalized regime⁴

3

Since public sector non-departmental enterprises are a part of the public sector, in the financial block of our model, total public sector borrowing requirement is the sum of fiscal deficit and borrowing requirement of the non-departmental public sector enterprises. However, since capital receipts and capital expenditures of the non-departmental public enterprises are specified to be exogenously given and constant in our model, change in fiscal deficit of the government forms a large proportion of the change in total public sector borrowing requirement.

4

Strictly speaking, even the simulations carried out in the first three sets of exercises are under a partially liberalized regime as we have market determined rates on the borrowings of the private

where we removed the restriction on the interest rates on government securities and small savings. Under this regime, interest sensitive supply and demand equations are introduced for government securities and small savings. SLR is completely abolished in this scenario. It is assumed that the government borrowing from the RBI still remains a policy variable. Demand for government securities by the banking sector becomes interest sensitive rather than being determined by statutory liquidity requirements in this regime. The fourth set of simulation exercises analyses the impact of reduction in real investment of the public sector in a partially liberalized regime.

The results of our simulation exercises (for the regulated regimes) are presented in Table 5.2. Absolute differences in the values of various variables from the base year values are presented in Table 5.3 while percentage change in them are available from Table 5.4. Simulation and sensitivity results for the partially liberalized regime are available from Table 5.5. Figures 5.1 to 5.6 provide the diagrammatic presentation of various inter-linkages as available from the simulation results.

As the simulations carried out here are illustrative, the changes in various policy variables are not equal to those observed historically. These simulation results, thus, would be helpful to gain insights into the working of the model. Thus, we would be mainly talking about the changes in the direction rather than the magnitudes of the changes in various variables due to the changes in policy stance and other exogenous changes.

corporate sector from the financial institutions i.e. banking sector and OFIs. The degree of liberalization increases as we deregulate the rate of interest on government securities and small savings which are demanded by the government sector to meet its borrowing requirement.

5.2.1 Monetary Policy Adjustments

5.2.1.1 Impact of a Reduction in the Interest Rate on Bank Deposits

A ten per cent reduction in the interest rate on bank deposits adversely affects the total supply of deposits from the household sector. Total investment in government securities by the banking sector declines because of decline in the total deposits with them.

As can be seen from Table 5.2, a lower interest rate on deposits lowers the interest income on deposits of the household sector by Rs 367 crores and, hence, household consumption expenditure on both the commodities declines. Though interest earning on deposits forms just 2 percent of the total income of the household sector, it is one asset on which the absolute amount of interest earning is quite large (Rs. 3671 crores in the base year). Interest payment on deposits forms approximately 26 percent of the current account expenditure of the financial institutions. Therefore, when there are no other shocks in the economy, interest earnings are expected to affect the economy significantly.

Domestic output of the non-agricultural commodity declines in response to the decline in demand for it which lowers down overall real GDP by Rs.1,310 crores. However, since output of the agricultural commodity is exogenously given, reduction in demand for it results in lower domestic price⁵ for this commodity. Overall price level declines in the product market as a result of decline in the price of agricultural commodity. The fall in the price of agricultural commodity, finally, increases the household consumption of this commodity.

A decline in the domestic price of agricultural commodity has an adverse impact on the net revenue of producers of this commodity. Net revenue of

5

The model differentiates various prices such as prices faced by the consumers (prices of composite commodities), prices faced by the producers, domestic prices of domestic commodities, import, export prices in domestic currency and world price of these commodities, prices of capital goods, etc. From the results of our simulation exercises we see that the prices faced by the producers move in the same direction as the prices of composite commodities which are faced by the consumers. In our exposition, while describing the findings based on simulations, we have dropped these qualifying words as in most of the cases it is clear from the context as to which prices we are referring to. In cases where there is likely to be an ambiguity, we have tried to use the qualifying words.

producers of non-agricultural commodity also declines because of reduction in the output of this commodity. Hence, incomes of various economic agents decline.

The decline in the net revenue of producers of both the commodities reduces the level of capital incomes and lowers down the rate of return on capital. The lower level of the rate of return on capital, to start with, discourages investment by the private corporate sector and reduces demand for borrowed funds. This lowers down the return on private corporate securities and the cost of credit from the financial institutions by more than ten percent. The reduction in the cost of credit, however, reduces the total interest payment by the private corporate sector and, hence, increases its saving by Rs. 1,044 crores. The lowering of cost of borrowing also results, finally, in higher investment by this sector. However, increase in nominal investment of private corporate sector is just Rs. 231 crores. Thus, though there is, finally, a higher investment by this sector it is financed basically from internal sources.

Overall contractionary situation also adversely affects the tax revenue of the public sector and, hence, public sector borrowing requirement increases.

Overall contractionary situation resulting from the lowering of real household consumption demand reduces the real GDP as well as the incomes of the various economic agents. Demand for money declines and the economy faces excess money supply. Overall price level increases as a consequence. Price of the non-agricultural commodity and, hence, the profit margin of producers increases. Overall price level in this scenario is, finally, brought back to the base solution level.⁶

Thus, we have a scenario in which demand side effects outweighed supply-side effects. Even in the presence of a lower level of interest rate (resulting from the decline in the borrowed funds) and a higher level of investment (financed from internal sources) the economy settles at lower levels of real GDP, incomes of economic agents and household consumption.

6

For the mechanism of adjustment in price level see chapter 4, section 4.3.1.

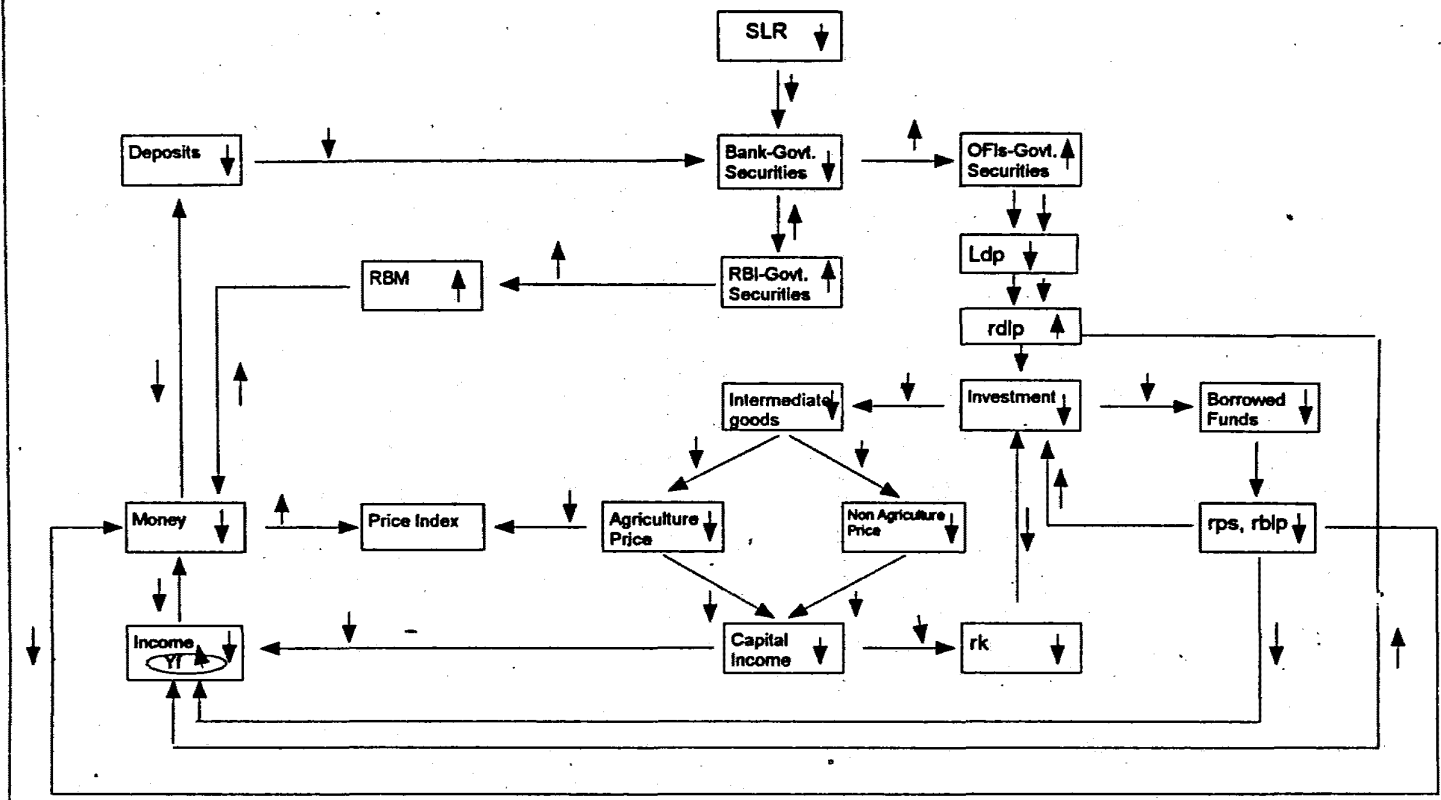
The implication of this result is that unless lowering of the cost of funds for the banking sector is accompanied by some other policy measures/exogenous shocks, which favourably affect the demand side and prevent the economy from falling in a contractionary situation, the economy would settle at lower levels of output and consumption, which would decrease the demand for credit by the private corporate sector.

Another implication is that the economy can have a lower level of borrowed funds but still a higher level of investment financed, primarily, from internal resources. Interest payments on loans from the financial institutions and on private corporate securities are estimated to form almost 43 percent of the current account expenditure of the private corporate sector in the base year. Therefore, changes in interest payments due to changes in the interest rates on loans and securities would substantially affect the saving (and, hence, availability of internal resources) with the private corporate sector. The issue of increasing cost of public debt resulting in higher borrowing requirement of the public sector is often raised in the literature. In the event of interest payments forming a substantial proportion of the current account expenditure of the private corporate sector, the same issue becomes relevant even for the deficit/ borrowing requirement of the private corporate sector.

5.2.1.2 Impact of a Reduction in the Statutory Liquidity Ratio

The immediate impact of a ten percent reduction in SLR (from the base year value of 0.35) is the reduction in holding of government securities by the banking sector. The supply of credit to the private corporate sector increases, initially, and the cost of credit to the private corporate sector from the banking sector declines. However, to finance the given level of borrowing requirement, the public sector resorts to the RBI and the OFIs. As the public sector borrowing from the OFIs increases, it reduces the supply of credit from the OFIs to the private corporate sector and the banking sector which increases the cost of credit to these sectors. Higher cost of credit from the OFIs adversely affects the investment by the private corporate sector. However, in response to the increasing cost of credit from the OFIs to the banking sector and the decline in

Figure 5.2 : Flow Chart For A Ten Per Cent Reduction In the Statutory Liquidity Ratio (SLR)



Notations: ↑ Increase
↓ Decrease

Arrows in the boxes show the direction of final impact on a particular variable.

the lending rate to the private corporate sector, excess reserves of the banking sector increase.⁷

Intermediate demand for both agricultural and non-agricultural commodities declines as a consequence of a decline in investment by the private corporate sector. Supply of non-agricultural commodity adjusts to the lower level of demand for this commodity. On the other hand, price of agricultural commodity adjusts in order to equilibrate lower level of demand for this commodity with the given level of its supply. These developments have an adverse impact on the net revenue of producers of both the commodities and, hence, total capital income declines which reduces the income and, hence, savings of various economic agents. However, incomes of the financial institutions increase as a consequence of the increase in the lending rate of the OFIs to the private corporate sector.

The decline in the incomes of the various institutions reduces the demand for money and, hence, supply of deposits to the banking sector declines which reduces the availability of funds with the banking sector. This further reduces the investment by this sector in the assets, which are held to satisfy SLR and even the supply of credit to the private corporate sector declines further. Thus, the ten per cent reduction in SLR reduces the demand for these assets (and, hence, investment in government securities) by the banking sector by 11 per cent.

As in the earlier scenario, the decline in the net revenue of producers of both the commodities reduces the level of capital incomes and the rate of return on capital. The lowering of the rate of return on capital discourages investment by the private corporate sector further. Thus, demand for borrowed funds declines. This reduces the rate of return on private corporate securities and the

7

Excess holding of government securities by the banking sector would have increased in the presence of the decline in return on alternative assets. However, this does not happen in our model economy, probably, due to following two reasons. First, total assets of the banking sector decline because of the decline in resources with the banking sector. Second, base year value of the excess SLR assets is negative which has affected the influence on the demand for excess government securities in an unexpected way in our simulation exercises. The calibrated value of the multiplicative term in the demand function for excess government securities turns out to be with wrong sign due to negative holding of excess SLR assets in the base year. However, this does not affect the direction of change in the values of various variables in the model economy.

cost of borrowing from the banking sector. However, the average cost of borrowing from the OFI increases to such an extent that the final impact on the investment by the private corporate sector is unfavourable.

Thus, reduction in the SLR does not have a favourable impact on the total cost of borrowing to the private corporate sector. The level of investment and output in the economy is, therefore, adversely affected. This result is against conventional wisdom based on a partial equilibrium analysis because existing macro-models and CGE models ignore the borrowing of the government sector in the form of government securities from the non-banking sector, i.e. OFIs. The FSAM, presented in chapter 3, Table 3.1, points out that the government borrowing from the OFIs is approximately 39 percent of the total borrowing by the government sector in the form of government securities in the base year 1983-84.

Even after removing the somewhat unrealistic assumption of market determined rate of interest on the credit to the private corporate sector from the financial sector in the regulated regime⁸ the economy is expected to move in the manner described above. For the given level of fiscal deficit, a reduction in SLR would result in a higher demand for credit by the government sector from the RBI and OFIs. This would adversely affect the supply of credit to the private corporate sector and the banking sector from the OFIs. The cost of credit to the banking sector would increase as this is market determined⁹. As the cost of lending to the private corporate sector remains the same, the banking sector would find it beneficial to increase the excess reserves. Supply of credit to the private corporate sector from the banking sector would decline as well. To meet its requirement for funds, the private corporate sector would turn to the private

8

Even in the liberalized regime, inspite of no restriction on the lending rate to the private corporate sector, lending rate to the private corporate sector moves sluggishly as the Indian Banks Association still operates more or less as a cartel. Competition is limited to the financial innovations and services provided to the clients.

9

The assumption of market determined interest rate on the borrowing of the banking sector from the OFIs is realistic as interest rate in the call money market is determined by the supply and demand pressures

corporate securities market. Consequently, the rate of return on private corporate securities would increase as the burden of adjustment is then expected to be mainly on the rate of interest on private corporate securities. This would have a detrimental impact on the investment by the private corporate sector. In the event of lowering in investment, the economy would face a contractionary situation.

The above result would hold a fortiori under the assumption of market determined interest rate on the government liabilities and sluggish (or even market determined) lending rates of the financial intermediaries. In the case of market determined interest rates on government securities and more or less exogenous nature of government securities the gap between return on bank advances to the private corporate sector and its investment in government securities would narrow down (as the initial return on banking sector advances is higher than the return on government securities). The interest rate on government securities are likely to increase in the presence of market determined interest rates on government securities. As public sector borrowing requirements are more or less autonomous¹⁰ the government would be required to shift to either the non bank sources of finance (in which case non-bank source of finance to the private corporate sector would decline) or the interest rate on government securities would rise to such an extent that banking sector would find it attractive to accumulate the government securities over and above what is required statutorily.

The implication of this finding is that unless somehow the cost of funds to the banking sector is reduced, SLR reduction would not succeed in reducing the cost of funds to the private corporate sector. Reduction in the cost of funds as well increase in the availability of funds with the sector can be achieved by combination of reduction in bank deposit rate , CRR, and even the RBI lending.

10

Government investment and consumption expenditure are almost fixed and, because of various political and social commitments, do not have downward flexibility. On the other hand, tax revenue, forming the large part of government income, is depended on the prevailing economic conditions. In a contractionary situation when tax revenue is falling while expenditure commitment can not be reduced it becomes almost impossible for the government to reduce its borrowing requirement even in the presence of high cost of raising funds.

rate to the financial institutions.¹¹ However, one needs to ensure that the redistribution of income as a result of interest receipts and payments do not affect the demand for commodities and assets in an undesired direction.

5.2.1.3 Impact of a Reduction in the Cash Reserve Ratio

A ten per cent reduction in CRR reduces the required reserves of the banking sector by Rs. 137 crores. As a result, availability of funds with the banking sector for the purpose of lending to the private corporate sector increases. This reduces the cost of credit to the private corporate sector and encourages investment by them. The increase in investment has a favourable impact on the intermediate demand for both agricultural and non-agricultural commodities. Hence, supply of non-agricultural commodity increases which increases the level of real GDP by Rs. 370. On the other hand, price of agricultural commodity increases in order to equilibrate demand for and supply of agricultural commodity and puts upward pressure on the overall price index. Net revenue of producers of both the commodities increases as a result of an increase in the supply of non-agricultural commodity and the price of the agricultural commodity. This favourably affects the capital income of producers of both the commodities. As a result, the income and saving of the private corporate sector increases. Thus, its demand for borrowed funds declines and this leads to decline in the cost of borrowing for the private corporate sector from the financial institutions and the rate of return on private corporate securities further. The increase in saving (Rs. 770 crores) due to reduction in interest payment on its liabilities is larger than the increase in investment (Rs. 349 crores) of the private corporate sector and, hence, greater proportion of the investment by the private corporate sector is financed from internal sources. This, finally, reduces the borrowing of the private corporate sector from the financial institutions.

Dependence of the private corporate sector on internal sources reduces

¹¹

Rakshit (1997) has also advanced a similar view point on the basis of his pertinent analysis of recent monetary trends.

the supply of private corporate securities and, hence, interest component of the household sector income decline by Rs. 313 crores. Decline in interest component of the household sector income outweighs the increase in wage and capital income components of the household sector income (the two together increase by only Rs. 199 crores). Thus, income of the household sector declines. Investment in various physical and financial assets by the household sector declines as a consequence of decline in its income and saving. However, demand for money increases due to decline in average interest earning on other assets. Thus, total demand for money (and, therefore, deposits) in the economy increases. The decline in total required reserves of the banking sector, finally, turns out to be less than ten per cent because of an increase in total deposits with this sector. Price of the non-agricultural commodity declines in order to equilibrate price index determined from the real sector and that determined from the financial sector. This encourages the consumption of this commodity by the household sector. However, total household sector consumption expenditure declines because of decline in consumption of agricultural commodity on account of a decline in its income. The decline in the profit margin as a consequence of a decline in the price of non-agricultural commodity has a slightly dampening impact on the incomes of the various economic agents.

Income of the financial institutions is adversely affected on account of a reduction in the interest payments from the private corporate sector on borrowed funds.

Thus, the reduction in the CRR has a favourable impact on the total real output in the economy via reduction in the cost of credit and increased availability of internal funds with the private corporate sector.

Another result, which is in line with our earlier findings, is that the interest component of income and expenditure of various agents can crucially affect the outcome of various policy measures. We have seen above that the increased availability of funds has resulted in lower demand for borrowed funds and lower cost of borrowing. Again the demand side factors (increasing availability of internal funds) have dominated the supply affects (availability of borrowed funds). The banking sector accumulates excess reserves. Thus, inspite

of an expansion in the real GDP the banking sector faces excess liquidity.¹²

5.2.2 Fiscal Policy Adjustments

5.2.2.1 Impact of a Reduction in the Indirect Tax Rates

A ten percent reduction in indirect tax rates on both the commodities reduces the prices of agricultural and non-agricultural composite commodities as well as the prices of capital goods. This has a favourable impact on consumption expenditure as well as investment expenditure in the economy. The output of non-agricultural commodity increases in response to an increase in demand for this commodity. However, increase in consumption and intermediate demand for agricultural commodity, ultimately, results in higher prices for this commodity because supply of it is taken as exogenously given. Overall price level increases.

Real GDP increases by Rs 5,310 crores in response to an increase in the supply of non-agricultural commodity.

12

We tried to carry out a similar simulation exercise in a partially liberalized scenario where interest rates on government securities and small savings are market determined. However, we could get a feasible solution only for a negligible change in the CRR. Therefore, we have not reported those results in this thesis. The results indicate the same direction for change in output and investment as that found in the regulated regime. However, impact on the economy is found to be too favourable in the liberalized regime. In the presence of market determined interest rates on the government liabilities, the reduction in CRR diverts some of the resources of the banking sector to the government sector and, hence, the initial increase in the supply of credit to the private corporate sector is not as large as that in the regulated regime. Hence, saving of the private corporate sector on account of reduction in interest payments are less than that in the regulated regime. However, still the change in the saving of the private corporate sector turns out to be higher than the investment by the private corporate sector. Therefore, dependence of the private corporate sector on borrowed funds declines.

In this scenario, increase in interest rate on government securities (as these rates are market determined) increases the interest payment by the public sector. This has a favourable impact on incomes of the household sector and the financial institutions. In contrast to the regulated regime, consumption expenditure of the household sector is favourably affected by these changes. Therefore, in this scenario the increase in real GDP is much larger than that in the regulated regime. These favourable impacts increase the return on capital even further which encourages the economic agents to invest more. Thus, finally, we have larger investment as well as larger consumption and larger GDP in the liberalized scenario than that in the regulated regime.

of an expansion in the real GDP the banking sector faces excess liquidity.¹²

5.2.2 Fiscal Policy Adjustments

5.2.2.1 Impact of a Reduction in the Indirect Tax Rates

A ten percent reduction in indirect tax rates on both the commodities reduces the prices of agricultural and non-agricultural composite commodities as well as the prices of capital goods. This has a favourable impact on consumption expenditure as well as investment expenditure in the economy. The output of non-agricultural commodity increases in response to an increase in demand for this commodity. However, increase in consumption and intermediate demand for agricultural commodity, ultimately, results in higher prices for this commodity because supply of it is taken as exogenously given. Overall price level increases.

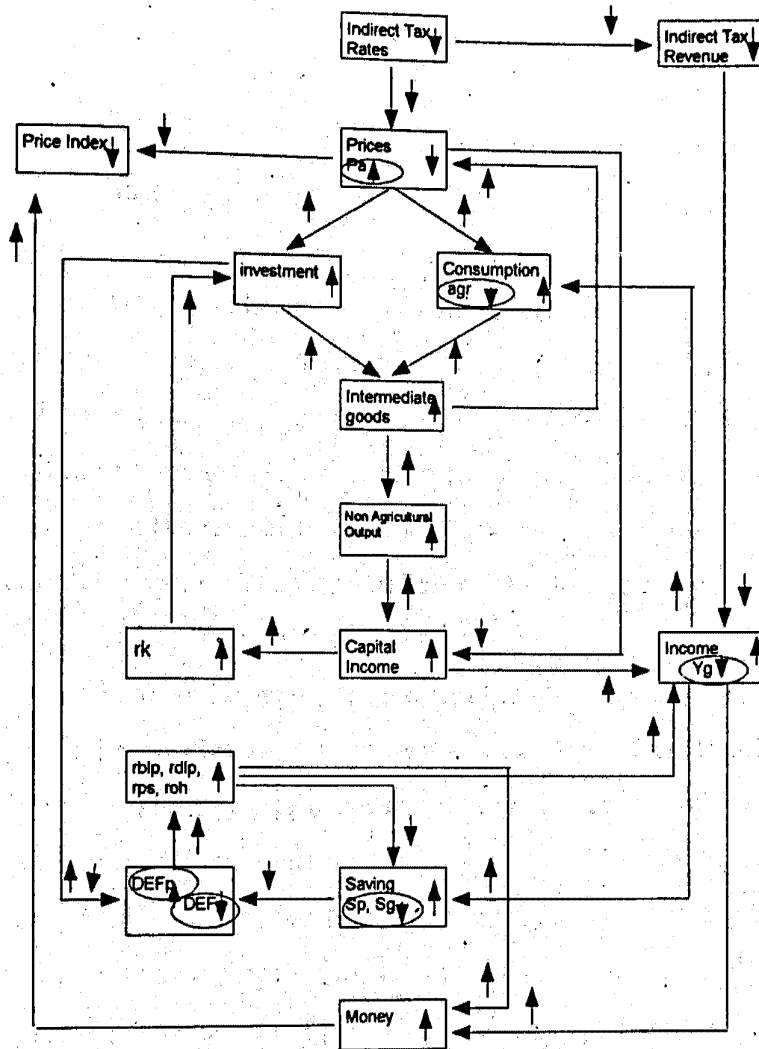
Real GDP increases by Rs 5,310 crores in response to an increase in the supply of non-agricultural commodity.

12

We tried to carry out a similar simulation exercise in a partially liberalized scenario where interest rates on government securities and small savings are market determined. However, we could get a feasible solution only for a negligible change in the CRR. Therefore, we have not reported those results in this thesis. The results indicate the same direction for change in output and investment as that found in the regulated regime. However, impact on the economy is found to be too favourable in the liberalized regime. In the presence of market determined interest rates on the government liabilities, the reduction in CRR diverts some of the resources of the banking sector to the government sector and, hence, the initial increase in the supply of credit to the private corporate sector is not as large as that in the regulated regime. Hence, saving of the private corporate sector on account of reduction in interest payments are less than that in the regulated regime. However, still the change in the saving of the private corporate sector turns out to be higher than the investment by the private corporate sector. Therefore, dependence of the private corporate sector on borrowed funds declines.

In this scenario, increase in interest rate on government securities (as these rates are market determined) increases the interest payment by the public sector. This has a favourable impact on incomes of the household sector and the financial institutions. In contrast to the regulated regime, consumption expenditure of the household sector is favourably affected by these changes. Therefore, in this scenario the increase in real GDP is much larger than that in the regulated regime. These favourable impacts increase the return on capital even further which encourages the economic agents to invest more. Thus, finally, we have larger investment as well as larger consumption and larger GDP in the liberalized scenario than that in the regulated regime.

Figure 5.4: Flow Chart For A Ten Per Cent Reduction In the Indirect Tax Rates (tr)



Notations: ↑ Increase;
↓ Decrease

Arrows in the boxes show the final impact on various variables

The increase in the output of non-agricultural commodity and the price of agricultural commodity increases the capital income and the return to capital. As this capital income is distributed to the various economic agents by the productive units, income of these agents except that of the public sector increases. In spite of an increase in the direct tax revenue by Rs.108 crores, the total tax revenue collection of the government sector declines by Rs.996 crores due to a reduction in the indirect tax revenue. Income of the public sector declines because of the decline in the tax revenue from the indirect taxes.

Prices of capital goods also decline as a consequence of decline in indirect tax rates. This reduces the nominal value of public sector investment to such an extent (Rs. 467 crores) that in spite of the decline in the income and the saving (Rs.333 crores) the borrowing requirement of this sector declines.

The increase in the rate of return on capital encourages investment by the private corporate sector. Thus, the deficit of the private corporate sector increases which positively affects the supply of private corporate securities and demand for loans from the private corporate sector. Therefore, the rate of return on private corporate securities and the interest rates on loans from the financial institutions increase. Thus, in spite of an increase in the income of the private corporate sector, the increased interest payment burden decreases the saving of this sector. The increase in the investment by the private corporate sector (Rs 539 crores) turns out to be higher than the increase in its saving (Rs. 524 crores). In this scenario, dependence of the private corporate sector on the borrowed funds, hence, increases. As a result, supply of credit to the private corporate sector from the financial institutions increases but at a higher cost. Increase in the rate of return on credit to the private corporate sector induces the banking sector to reduce its excess reserves.

An overall expansionary situation in the economy favourably affects the incomes of the various economic agents and, hence, demand for money increases. In the presence of excess money demand, overall price level declines. Price of the non-agricultural commodity declines in order to equilibrate the price level determined from the real sector and that determined from the financial sector. In this scenario, the financial sector factors dominate the real sector factors and,

hence, overall price level settles at a lower level than that in the base scenario.

Thus, a reduction in indirect tax rates has a favourable impact on the economy. The economy reaches a higher level of real GDP and overall a lower level of prices, but a higher level of interest rates. The impact on the investment is so favourable that the internal sources of finance of the private corporate sector turn out to be insufficient to finance this investment expenditure. Therefore, dependence of the private corporate sector on borrowed funds increases which increases the cost of credit to the private corporate sector.

In order to reduce the cost of credit to the private corporate sector as well as to have a favourable impact on the economy the policy makers can think of combining the reduction in indirect taxes with the measures, which reduce the cost of funds to the private corporate sector. This is possible by a combination of reduction in the CRR, the interest rate on deposits as well as the lending rate of the RBI to the financial institutions.

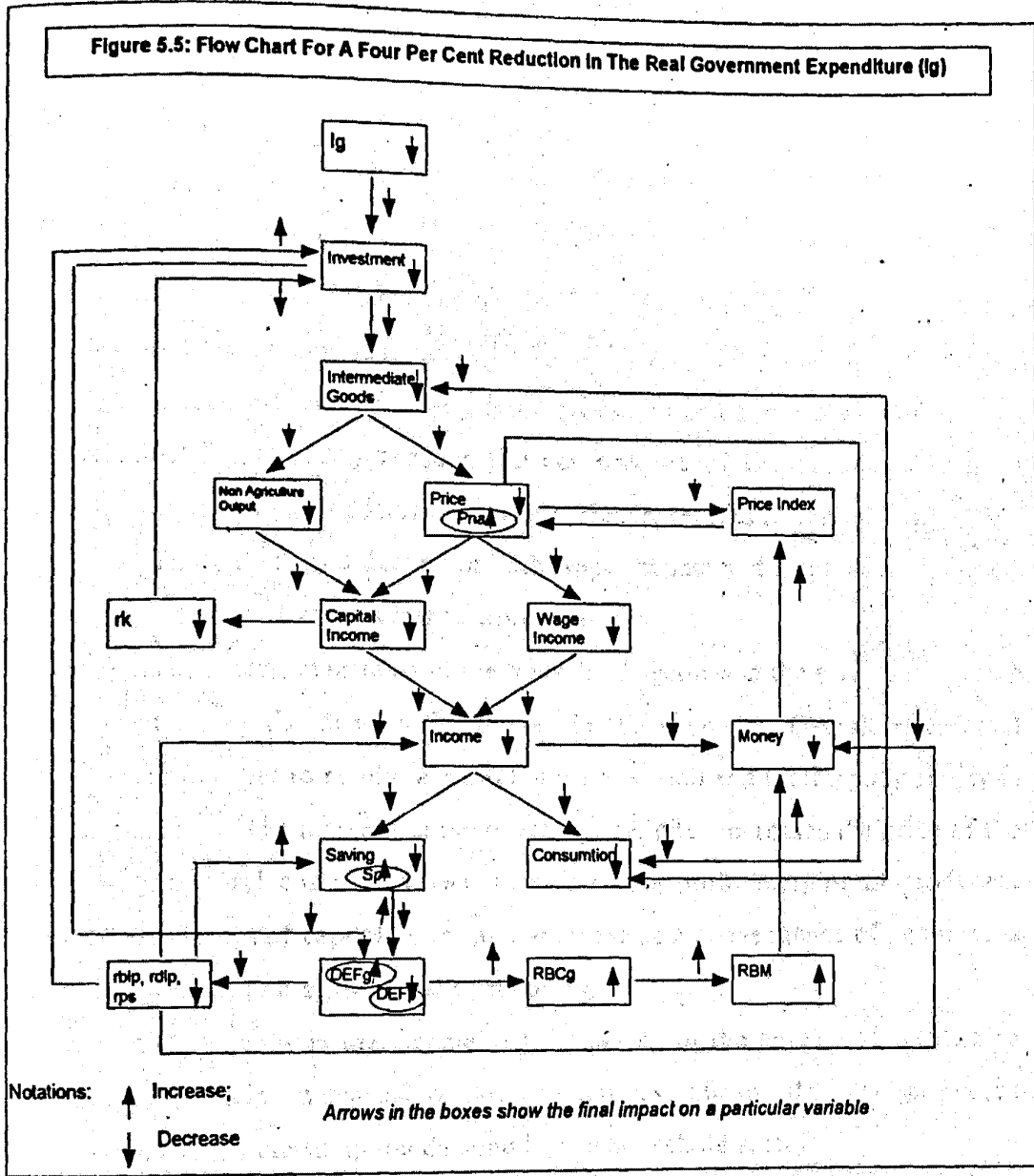
5.2.2.2 Impact of a Reduction in the Public Sector Real Investment Expenditure

A four percent¹³ reduction in the public sector real investment expenditure (i.e. Rs.810 crores) sets in a contractionary situation in the economy. A lowering of public sector investment reduces the intermediate demand for both agricultural and non-agricultural commodities. Since output in the non-agricultural sector is demand determined, the supply of non-agricultural commodity declines. On the

13

In this simulation exercise, the real government expenditure was reduced by only four percent. This was done so that a comparable exercise could be carried out in a partially liberalized regime. In a partially liberalized regime, number of non-linear terms, due to introduction of interest sensitive supply and demand equations, increases. This leads to infeasible model solution when the real government expenditure is increased by more than four percent. Increase in the non linear terms result in larger changes in the values of various variables compared to the model where such non linearities are comparatively less. It, perhaps, implies that the changes in the economy resulting from the more than 4 percent reduction in real public sector investment can not be sustained by the economy because of rigidities in adjustment of various sectors and markets (for example fixed supply of agriculture output.. It is our conjecture that by increasing the degree of financial sector liberalization (for example deregulating other interest rates beside the interest rate on government securities) and /or changing some of the parameter values and introducing some exogenous changes, one can move towards a feasible solution. However, it remains an exercise to be done in future to see whether incorporation of such changes gives us a feasible solution for a higher degree of perturbations in the model.

Figure 5.5: Flow Chart For A Four Per Cent Reduction In The Real Government Expenditure (I_g)



other hand, since supply of agricultural commodity is exogenously given, the price in this sector declines in order to equilibrate supply of and demand for agricultural commodity.

Real wage rate, thus, initially, increases in the agriculture sector, which has an adverse impact on the demand for labour. As the supply of labour is fixed, nominal wage rate in this sector declines. Thus, wage component of the household sector income falls.

A reduced level of non-agricultural output and a lower level of price of agricultural commodity reduces the net revenue of the producers in both agricultural and non-agricultural sectors. Hence, returns to capital fall.

Thus, there is a decline in both wage income and capital income. As a result, incomes of various institutions decline.

The decline in incomes of the household sector and the private corporate sector reduces the demand for money in the economy. Overall price level increases in order to equilibrate total money demand and total money supply in the economy. The increase in the overall price index increases the price of the non-agricultural commodity and, therefore, the profit margins of producers increase. Prices of capital goods also increase as a consequence of an increase in the price of non-agricultural commodity.

The decline in the income and the saving of the household sector also results in lowering in demand for various physical and financial assets besides the decline in total consumption demand by the household sector.

The demand for loans by the private corporate sector declines because of decline in investment, which is reduced due to decline in return to capital. Hence, lending rates charged to the private corporate sector from the banking sector and the OFIs decline. A decline in investment by the private sector further reduces the intermediate demand for goods and reduces total output in the economy.

The decline in the bank lending rate increases its holding of excess reserves and hence money multiplier in the economy declines.

The decline in the income (Rs.544 crores) of the public sector also reduces the saving of this sector (Rs. 706 crores). Due to an increase in the price of non-agricultural commodity the nominal consumption expenditure of the

government sector increases to such an extent that the decline in saving of the public sector turns out to be higher than the the decline in the income of this sector. The decline in nominal value of the government investment is lower than the decline in the real government investment. Decline in the government saving (Rs. 706 crores) turns out to be higher than the decline in nominal value of investment (Rs. 656 crores) in this scenario. Hence, public sector borrowing requirement increases, though marginally, by 0.3 percent.

To meet a higher level of borrowing requirement public sector resorts to the RBI and the OFIs. Hence, supply of funds to the public sector from these institutions increases. Reserve bank money increases as a consequence of an increase in the RBI credit to the public sector. However, total money supply in the economy declines because of decline in the money multiplier.

On the other hand, the demand for government securities, being determined by SLR requirement, by the banking sector declines because of decline in deposits.

Thus, we see that, *even in the absence of supply (or productivity) effect*, the reduction in public sector investment does not have a favourable impact on its deficit. Even after neglecting the productivity effect, the reduction in the public sector investment sets in a contractionary situation in the economy. In a sense this result is counter intuitive. In the literature, it is advocated that the reduction in the public sector investment would reduce borrowing requirement of the public sector, which would, in turn, reduce the overall price level in the economy. However, the expected results are not confirmed by our simulation results. Incorporation of productivity effect, as advocated by structuralist economists, would lead to a further decline in production and incomes of various economic agents. That would reduce the demand for money and, hence, increase the overall price level in the economy. The contractionary situation in the economy would adversely affect the total revenue (direct as well indirect) collection by the government sector and, hence, combined with the increase in the nominal value of its consumption as well investment expenditure would increase the total borrowing requirement of the public sector.

5.2.2.3 Impact of a Reduction in the Public Sector Real Consumption Expenditure

The impact of a four percent reduction in public sector real consumption expenditure is in the same direction as that in the case of a four percent reduction in public sector real investment expenditure except that the public sector saving increases in this scenario. The decline in the public sector consumption expenditure increases this sector's saving in this scenario. However, nominal value of the public sector investment increases due to increase in the prices of capital goods in the economy. Increase in the saving of the public sector turns out to be less than the nominal value of its investment. Therefore, reduction in public sector real consumption expenditure does not result in a lower level of its borrowing requirement.

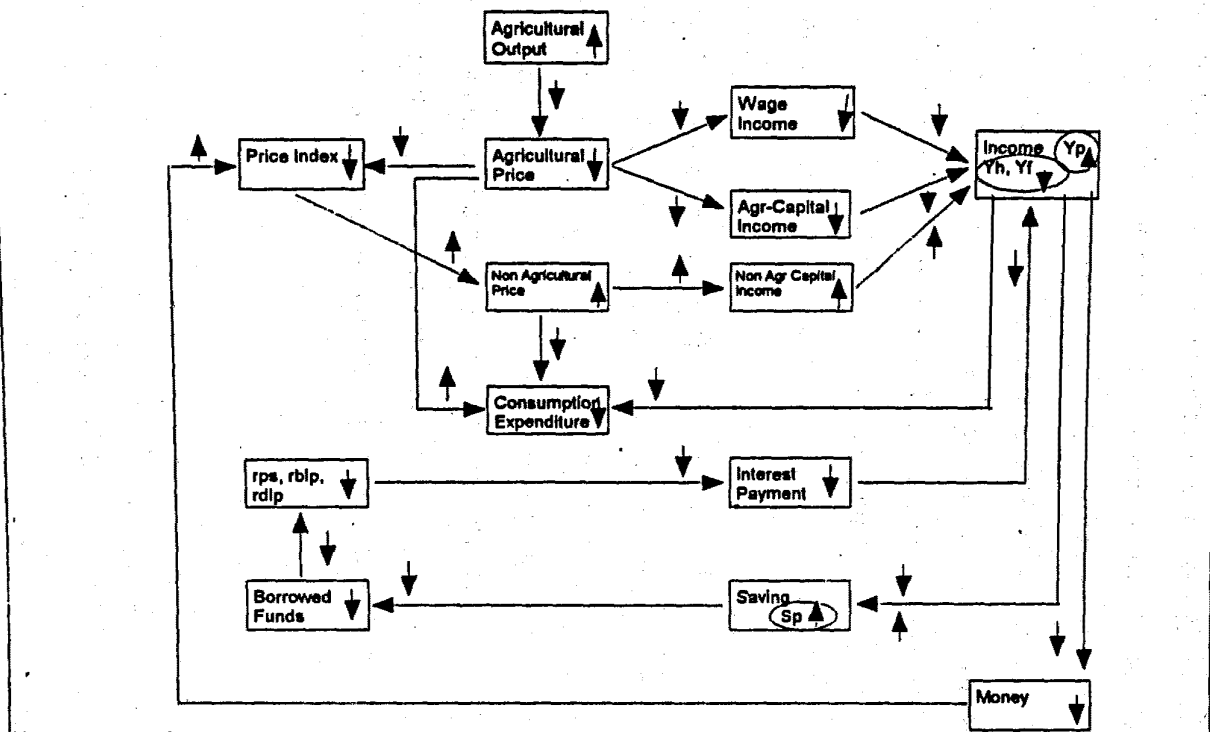
As we have not taken into account the productivity effect of government investment the direction of change in the values of various variables as a result of change in public sector investment and non-investment expenditure remains the same in our simulation exercises.

5.2.3 Exogenous Change

5.2.3.1 Impact of an Increase in the Agricultural Output

The model was simulated for a two percent increase in exogenously given agricultural output. The immediate impact of an increase in agricultural output by Rs.1,932 crores is the reduction in price of agricultural commodity and, hence, overall price level in the economy. Real GDP increases as a consequence of an increase in the output of agricultural commodity. However, decline in price of agricultural commodity increases the real wage rate in the agricultural sector. Therefore, demand for labour declines. In the face of fixed supply of labour in the agricultural sector, finally, nominal wage rate declines in order to equilibrate demand for and supply of labour in this sector. A lower level of price in the agricultural sector also adversely affects the net revenue of this sector. These two factors reduce the income of the household sector and lower the demand for

Figure 5.6: Flow Chart For A Two Per Cent Increase In The Agricultural Output (X_{Sa})



Notations: ↑ Increase ;
 ↓ Decrease

Arrows in the boxes show the final impact on various variables

non-agricultural commodity. The decline in the level of income of the household sector reduces the demand for money and, hence, price level increases. To equilibrate the price index determined from the real sector and that determined from the financial sector, price of the non-agricultural commodity increases. Thus, consumption demand of household sector for non-agricultural commodity declines, which also reduces the output of non-agricultural sector. However, due to an increase in the price of non-agricultural commodity, net revenue of producer of the non-agricultural commodity increases which has a favourable impact on the income of the private corporate sector. As a result, saving of the private corporate sector increases, which reduces its requirement for borrowed funds. Therefore, supply of private corporate securities declines which reduces the return on private corporate securities. The decline in the demand for credit from the financial institutions also lowers down the cost of credit to the private corporate sector, which further reduces the income of the household sector and financial institutions.

Thus, we have a scenario where there are lower level of prices and interest rates and higher real GDP. However, this is at the cost of lower non-agricultural output and investment in the economy. Therefore, the total increase in the real GDP (Rs. 370 crores) turns out to be much less than the increase in total agricultural output (Rs.1,932 crores). In a demand determined system, to have a balanced growth in the various sectors of the economy one needs to increase the exogenous component of demand for the non-agricultural commodity as well.

5.2.4 Simulations in a Partially Liberalized Regime

5.2.4.1 Impact of a Reduction in the Public Sector Real Investment Expenditure

Under a partially liberalized regime, the following picture emerged from a four percent reduction in the public sector real investment expenditure from

the base year value.

As in the regulated regime, a four percent decline in the public sector real investment sets in a contractionary situation in the economy. The impact on the output, consumption investment and prices is in the same direction as that observed in the earlier comparable scenario. However, in contrast to the regulated regime the public sector borrowing requirement declines in this scenario. Even the magnitude of change in real consumption and real GDP is moderated in this scenario because of the following reasons.

The decline in public sector real investment reduces the borrowing requirement of the public sector. As both small savings and government securities are used to meet borrowing requirement, the supply of government securities and the demand for small savings by the public sector declines. This reduces the returns on these assets.

Major portion of the income of the financial institutions is in the form of interest income.¹⁴ The interest income on government securities and lending to the private corporate sector (for which we have explicit accounts in the income equation of the financial institutions) formed more than 28 percent of the income of the financial institutions in the base year. Even the interest earnings on government securities formed around 7 percent of income of the financial institutions. Therefore, in a scenario where we have a deregulated interest rates on government securities, the impact on the incomes of the financial institutions would be substantial. As we have seen earlier, in the presence of more or less autonomous (inelastic) nature of public sector borrowing requirement, the impact on the interest rates on government securities would be much larger than the impact on the lending rates to the private corporate sector because borrowing by the private corporate sector does adjust to the cost of financing. Hence, the change in the income of the financial institutions would be primarily determined by the change in the interest rate on government securities.

On the other hand, the income on small savings forms only a very small

¹⁴

The interest income component of financial institutions is estimated to be around 80 percent of it's total income.

proportion (0.37%) of the income of the household sector.

In this setting when the return on government securities decline, the income of the financial institutions declines which shifts the demand curve for government securities to such a large extent that the demand for these securities declines (Rs.330 crores) more than the decline in the borrowing requirement of the government sector (Rs.180 crores). Thus, from the fallen level, the interest rates on both the assets start increasing. However, finally, we have a situation where supply of government securities as well as return on these securities is low.

Hence, the public sector, to meet its borrowing requirement, demands more of the small savings. The return on government securities start increasing which leads to a portfolio reallocation by the household sector. Had we kept the interest rate fixed on small savings then the impact would have been completely on the quantity of small savings and not on the interest rate. However, in the event of fixed interest rate on small savings, public sector would find it difficult to induce the household sector to supply more of small savings. Therefore, government would increase the interest rate on small savings. The same effect is achieved by us by deregulating the interest rate on small savings.

Hence, interest rates on government securities and small savings moved in opposite directions.

As a result of an increase in the interest rate on small savings, the demand for private corporate securities by the household sector declines and, therefore, even the return on these securities increases. As a result of an increase in the returns on small savings and private corporate securities, the fall in the total income of the household sector on account of contractionary situation is mitigated. This also reduces the impact on real consumption expenditure due to initial fall in the income of the household sector. Thus, we see that due to changes in the interest component of income, distribution shifted in favour of household sector, which mitigated the impact of initial decline in the public sector investment expenditure on real consumption and real GDP.

5.3 Sensitivity Analysis

We have seen, above, that the reduction in the real government investment, instead of decreasing the borrowing requirement of the public sector, increases it in the regulated regime. On the other hand, impact of such a reduction on the public sector borrowing requirement is found to be favourable in the partially liberalized regime. In order to analyze the impact of various elasticity parameters on the borrowing requirement of the public sector we carried out a simulation exercise where we increased the values of various interest rate elasticity parameters from two (which we refer to as low elasticity regime) to three (which we refer to as high elasticity regime)¹⁵. The results of this sensitivity exercise are also presented in Table 5.5

The impact of reduction in real public sector investment on the deficit of public sector is found to be sensitive to the interest rate elasticities. With higher interest rate elasticities, a decline in investment increases the deficit of the public sector. In this scenario the burden of interest payment on its borrowing increases to such an high extent that the initial fall in borrowing requirement as a result of a decline in real investment is outweighed by the decline in the savings of the public sector on account of increase in interest payment.

As in the earlier comparable scenarios, a reduction in the real public investment expenditure sets in a contractionary situation in the economy and total consumption, investment and, therefore, real GDP declines. As a result of this, incomes of various economic agents declines initially.

The initial impact of reduction in the real investment by the public sector is favourable on its borrowing requirement. As in the earlier comparable scenario, interest rates on government securities and small savings start falling. However, due to reduction in incomes of various institutions demand for

¹⁵

For the different set of elasticity values used in the simulation experiment refer to Table 5.1.

government securities falls, initially, more than the supply of government securities. Similarly, supply of small savings fall more than the demand for small savings and, therefore, return on these assets start increasing. The impact on interest rates on government securities and small savings is very large. The return on government securities increases by around 23 percent while return on small savings increases by 205 percent. The increase in interest earnings on small savings by Rs.1,930 crores outweighed the initial fall in the incomes of household sector and the financial institutions on account of reduction in income on account of wage income (Rs.416) crores and capital income(Rs487 crores). The distribution of income shifts in favour of the household sector and the financial institutions. Shift of income in favour of the household sector reduces the amount of initial fall in consumption expenditure. Though the real consumption is still lower (Rs. 149,258 crores) in this scenario compared to base scenario (149,307 crores) the nominal consumption expenditure in this scenario (Rs.149,343 crores) turns out to be higher than the base year. Even the fall in total investment expenditure is slightly lower in this scenario than that in other comparable scenario. Therefore, the fall in real GDP in this scenario turns out to be lower than that in the other two comparable scenarios. However, the increasing cost burden of interest payment increases the public sector borrowing requirement by 18 percent.

5.4 Summary and Highlights

1. Interest receipts/payments not only affect the level but also the redistribution of income among economic agents. Redistribution of income away from the household sector adversely affects the consumption in the economy. On the other hand, redistribution of income away from the private corporate sector

basically affect the investment in the economy. This fact came out clearly in the policy experiment with a 10 percent reduction in the rate of interest on deposits. As a result of decline in income on account of decline in interest receipts on the deposits, consumption expenditure in the economy declined and the economy faced a declining situation. In this scenario though the cost of credit to the private corporate sector declines it occurs because of decline in the demand for borrowed funds.

2. The frequently discussed issue of burden of interest payments on the public sector deficit (borrowing requirement) is also relevant for the private corporate sector deficit. As the interest payments on credit from the financial institutions and private corporate sector securities form 46 percent of the total current account expenditure of the private corporate sector, changes in it substantially affect the saving (internal resources), deficit and hence borrowing requirement of this sector. In the presence of lower cost of credit (as we have seen in the case where the CRR was reduced), saving of the private corporate sector increases and, thus, deficit and dependence on the borrowed funds declines. Therefore, even in the presence of excess funds (excess liquidity) with the financial sector, supply of funds to the private corporate sector will not increase.

3. Differentiation of OFIs from the banking sector (and hence differentiation of non-bank credit from the bank credit) has resulted in outcomes, that cannot be explained by the models which have very aggregated treatment of the financial sector. Conventional wisdom, based on a partial equilibrium analysis and even CGE analysis (based on the highly aggregated treatment of the financial institutions) points out that the reduction in SLR will result in higher supply of credit to the private corporate sector. However, the results of our simulation exercises point out that this type of outcome is possible only when the public sector reduces its borrowing not only from the banking sector but also from the OFIs. A ten per cent reduction in SLR in our model economy results in higher borrowing by the public sector from the OFIs because borrowing requirement of the public sector is more or less autonomous. This reduces the supply of credit

to the private corporate sector. Hence, the cost of credit from the OFIs to private corporate sector increases and adversely affects the investment by this sector. The economy faces a contraction in GDP.

4. On the other hand, a ten percent reduction in CRR produces a favourable impact on the economy by increasing the availability of loanable funds with the banking sector, reducing the cost of credit to the private corporate sector and promoting investment by it. The overall impact on the real GDP is positive in this scenario. However, reduction in the cost of credit increases the saving (and, thus, internal availability of funds) of the private corporate sector and, therefore, dependence on borrowed funds declines. Banking sector accumulates excess reserves and we have a scenario where in the presence of an expansionary situation there is an excess liquidity with the banking sector.

5. The fiscal adjustment in the form of reduction in indirect tax rates on both the commodities produces a favourable impact on the economy by increasing the real GDP, consumption and investment expenditure and by decreasing the overall price level in the economy. It also succeeds in reducing the public sector borrowing requirement. However, due to increased dependence of the private corporate sector, the cost of funds to the private corporate sector increases.

6. However, fiscal adjustment in the form of reduction in the real investment by the public sector does not produce the desired impact on the economy. Contrary to expectations, the borrowing requirement of the public sector increases in some of the scenarios considered by us. In the regulated regime, the increase in the price of non-agricultural commodity increases the nominal value of government consumption expenditure to such an high extent that the fall in its saving turns out to be higher than fall in its income. Due to an increase in the prices of capital goods, decline in the nominal value of investment is less than the decline in the real value of investment by the public sector.

7. In a partially liberalized scenario, the fiscal adjustment in the form of reduction in the real government investment expenditure, succeeds in reducing the borrowing requirement of the public sector because the impact on prices is

moderated in this scenario. The impact on interest rates and, consequently, on the interest income of the various economic agents leads to redistribution of income in favour of the household sector. Hence, fall in the consumption expenditure, real GDP and prices is moderated. Redistribution of incomes of various economic agents shifts the demand for various financial assets by different extent. Therefore, there is an asymmetric impact on the interest rates on the liabilities of the same agent.

8. However, the impact of reduction in real investment by the public sector on its borrowing requirement is found to be sensitive to the assumed values of various interest rate elasticity parameters involved in the model. The higher values of interest elasticity parameters, (for example, when various interest elasticities were increased from two to three), increased the borrowing requirement of the public sector in a partially liberalized regime because of an increase in the interest payment on the liabilities. Interest component of incomes of various economic agents becomes even more crucial and results in higher income for the household sector (in the face of lower wage income and capital income) and financial institutions.

9. Though the impact on the public sector borrowing requirement due to reduction in the real public sector investment depends on the nature of regime (regulated regime, partially liberalized regimes and the assumed values of the various interest rate elasticities in the model), in all the scenarios reduction in real public sector investment sets in a contractionary situation in the economy.

10. The Impact of reduction in real consumption and real investment by the public sector is in the same direction because our model neglects the supply side (or the productivity effect) of the investment by the public sector.

11. Though the impact of an increase in the agricultural output is favourable on real GDP, the increase in real GDP turns out to be less than the increase in agricultural output. An increase in agricultural output reduces the price and the nominal wage rate in the economy and, therefore, income of the household sector is adversely affected. Demand for money declines which increases the overall price level. Non-agricultural price (and the profit margin of the

producers) increases in order to equilibrate the overall price level determined from the real sector and the price level determined from the financial sector. Household consumption of non-agricultural commodity declines as a result of higher price of this commodity. Therefore, non-agricultural output declines. Thus, the impact of the increase in agricultural output on real GDP is moderate.

Table 5.1 : Values of Parameters
Values of Elasticity Parameters

	Low Elasticities	High Elasticities
α_{1h}	0.7	1.5
α_{3h}	0.65	0.7
α_{4h}	0.65	0.7
ϵ_{1b}	2	3
ϵ_{2b}	2	3
ϵ_{3b}	2	3
ϵ_{4b}	2	3
ϵ_{1d}	2	3
ϵ_{2d}	2	3
ϵ_{0h}	0.65	0.7
ϵ_{1h}	2	3
ϵ_{2h}	2	3
ϵ_{3h}	2	3
ϵ_{4h}	0.65	0.65
ϵ_{5h}	2	3
ϵ_{1p}	2	3
ϵ_{2p}	2	3
ϵ_{3p}	2	3
ϵ_{4p}	2	3

CET Function Exponent

	Agriculture	Non-agriculture
ρ_{si}	-1.99	-1.96

Armington Function Exponent

	Agriculture	Non-agriculture
ρ_{ci}	-0.33	1

Calibrated Values of Some of the Distribution and Share Parameters

a_{ij}	Input Output Co-efficients	
	Agriculture	Non-agriculture
Agriculture	0.174	0.064
Non-agriculture	0.115	0.415

v_{ij}	Capital Consumption Co-efficient	
	Agriculture	Non-agriculture
Agriculture	0.006	0.006
Non-agriculture	0.994	0.994

CET Function Share & Shift Parameters

	Agriculture	Non-agriculture
	γ_i	0.014
AS_i	8.691	4.697

Armington Function Share & Shift Parameters

	Agriculture	Non-agriculture
	δ_{ej}	0.933
AC_i	1.187	1.161

Weights in Price Index

	Agriculture	Non-agriculture
	μ_i	0.262

Marginal Budget Shares in Household LES Function

	Agriculture	Non-agriculture
	b_i	0.411

Share of different economic agents in the capital income

	Agriculture	Non-agriculture
α_{pi}	0.017	0.113
α_{zi}	0.011	0.035
α_{ci}	0.002	0.123
α_{hi}	0.969	0.666
α_{fi}		0.044
α_{wi}		0.019

Tax Rates on Commodities:

	Agriculture	Non-agriculture
tr_i	0.008	0.055
tm_i	0.327	0.309

Direct Tax Rates

th	0.016
te	0.128
tf	0.050
tp	0.054

Cash Reserve Ratio

$g5b$	0.15
-------	------

Statutory Liquidity Ratio

$g6b$	0.35
-------	------

Note: For notations see the list of variables and Co-efficients in chapter 4, Table 4.3.

Table 5.2: Simulation results in regulated regime for change in various exogenous variables and policy variables

Variables	Base Year	rbd		slr		crr		Ca		lg		lr		XS("AGR")
		10% reduction	10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	4% reduction	10% reduction	2% increase				
Real Sector Block														
GDP														
GDPR	207590.00	206280.00	206100.00	207960.00	204100.00	204240.00	212900.00	207960.00						
NGDP	207590.00	206282.15	206105.79	207958.88	204097.64	204243.74	212902.42	207962.94						
Commodity Block														
Ds														
AGR	95322.00	95302.98	95307.62	95322.29	95289.74	95291.06	95364.00	97183.24						
NAGR	254610.00	252280.00	251950.00	255270.00	248350.00	248610.00	264040.00	252880.00						
Dd														
AGR	95322.00	95302.98	95307.62	95322.29	95289.74	95291.06	95364.00	97183.24						
NAGR	254610.00	252260.00	251930.00	255280.00	248310.00	248580.00	264120.00	252860.00						
Xs														
AGR	96596.00	96596.00	96596.00	96596.00	96596.00	96596.00	96596.00	98527.92						
NAGR	266870.00	264380.00	264030.00	267580.00	260190.00	260470.00	277040.00	264990.00						
Qd														
AGR	96509.00	96454.82	96467.93	96509.83	96417.82	96421.49	96633.51	98312.35						
NAGR	271300.00	268850.00	268500.00	272010.00	264700.00	264980.00	281190.00	269500.00						
E														
AGR	1274.00	1292.80	1288.24	1273.71	1305.73	1304.45	1231.46	1343.74						
NAGR	12262.00	12100.50	12084.33	12303.53	11846.03	11863.35	12993.07	12112.82						
M														
AGR	1187.00	1161.01	1167.23	1187.40	1143.67	1145.37	1249.45	1150.96						
NAGR	16696.00	16574.37	16553.19	16733.74	16358.62	16372.78	17141.76	16624.71						
INT														
AGR-AGR	16776.00	16776.00	16776.00	16776.00	16776.00	16776.00	16776.00	17111.52						
AGR-NAGR	17088.00	16928.28	16906.31	17133.36	16660.41	16678.30	17739.05	16967.75						
NAGR-AGR	11153.00	11153.00	11153.00	11153.00	11153.00	11153.00	11153.00	11376.06						
NAGR-NAGR	110860.00	109820.00	109680.00	111150.00	108090.00	108200.00	115080.00	110080.00						
NT														
AGR	33864.00	33704.28	33682.31	33909.36	33436.41	33454.30	34515.05	34079.27						
NAGR	122010.00	120980.00	120830.00	122310.00	119240.00	119350.00	126240.00	121460.00						
INV														
AGR	239.00	239.03	235.54	241.49	235.11	230.24	247.52	237.92						
NAGR	38291.00	38295.09	37735.83	38689.73	37668.08	36886.89	39656.63	38118.47						
DST														
AGR	992.00	989.55	989.31	992.61	985.63	985.90	1012.43	989.57						
NAGR	1966.00	1961.15	1960.67	1967.22	1953.37	1953.90	2006.50	1961.18						
Consumption Block														
Ch														
AGR	61359.00	61466.96	61505.78	61311.37	61707.88	61696.06	60803.51	62950.60						
NAGR	87948.00	86530.45	86884.54	87958.36	85601.74	85699.11	92200.52	86882.31						
NCh	149307.00	147423.99	148032.55	149224.23	146554.88	146669.21	152864.83	148200.84						
Ca														
AGR	55.00	55.00	55.00	55.00	52.80	55.00	55.00	55.00						
NAGR	21086.00	21086.00	21086.00	21086.00	20242.56	21086.00	21086.00	21086.00						
NCa	21141.00	21215.42	21216.36	21126.83	20465.70	21310.89	20649.36	21239.97						

Continued...

Table 5.2:

Simulation results in regulated regime for change in various exogenous variables and policy variables

Variables	Base Year	rbd	slr	crr	Ca	lg	tr	XS("AGR")
		10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% increase
Price Block								
P								
AGR	1.00	0.99	0.99	1.00	0.98	0.98	1.03	0.97
NAGR	1.00	1.00	1.00	1.00	1.01	1.01	0.98	1.01
PD								
AGR	0.99	0.97	0.98	0.99	0.96	0.96	1.02	0.96
NAGR	0.93	0.93	0.93	0.93	0.93	0.93	0.91	0.93
PIND	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00
PK								
AGR	1.00	1.00	1.00	1.00	1.01	1.01	0.98	1.01
NAGR	1.00	1.00	1.00	1.00	1.01	1.01	0.98	1.01
PN								
AGR	0.70	0.69	0.69	0.70	0.68	0.68	0.73	0.67
NAGR	0.45	0.45	0.45	0.45	0.45	0.45	0.44	0.45
PX								
AGR	0.99	0.97	0.98	0.99	0.96	0.97	1.02	0.96
NAGR	0.93	0.93	0.93	0.93	0.94	0.93	0.91	0.93
MUP	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.40
Labour Block								
LDD								
AGR	25.10	25.10	25.10	25.10	25.10	25.10	25.10	25.10
NAGR	6.20	6.16	6.16	6.21	6.10	6.10	6.29	6.19
Ls								
AGR	25.10	25.10	25.10	25.10	25.10	25.10	25.10	25.10
NAGR	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
U	0.80	0.84	0.84	0.79	0.90	0.90	0.71	0.81
Wage Income								
W(wage rate)								
AGR	525.74	518.19	520.00	525.85	513.12	513.62	543.19	518.81
NAGR	7867.42	7867.42	7867.42	7867.42	7867.42	7867.42	7867.42	7867.42
WAGEa	13196.00	13006.63	13052.09	13198.95	12879.42	12891.94	13634.08	13022.19
WAGEa	48778.00	48494.45	48433.20	48874.59	47960.59	47994.94	49451.41	48666.18
Total Wage Bill	61974.00	61501.08	61485.29	62073.52	60840.00	60886.88	63085.49	61688.37
Capital Income								
KINC								
AGR	54264.00	53281.14	53507.05	54286.13	52593.25	52659.57	56791.57	53116.09
NAGR	70891.00	70822.03	70675.83	71008.13	70338.90	70363.59	71860.10	71412.67
TKINCa	3074.00	3060.43	3057.94	3078.31	3035.87	3037.48	3136.33	3079.03
TKINCe	8831.00	8820.33	8802.87	8845.44	8759.44	8762.62	8955.70	8892.54
TKIN Cf	3126.00	3122.96	3116.51	3131.16	3101.65	3102.74	3168.73	3149.00
TKINCh	99788.00	98789.71	98911.25	99887.44	97801.44	97882.15	102882.47	99023.11
TKIN Cp	8986.00	8961.04	8948.40	8999.67	8894.26	8898.21	9139.97	9025.15
TKIN Cw	1350.00	1348.69	1345.90	1352.23	1339.49	1339.96	1368.45	1359.93
Transfer Payments								
INTPgsm	678.26	678.26	678.26	678.26	678.26	678.26	678.26	678.26
INTPds	89.38	89.37	89.37	89.37	89.37	89.37	89.37	89.37
INTPDEPh	3671.40	3304.26	3671.40	3671.40	3671.40	3671.40	3671.40	3671.40
INTDEPP	199.25	179.32	199.25	199.25	199.25	199.25	199.25	199.25
INTPps	858.99	289.66	624.83	546.03	532.74	548.35	1225.90	534.34
INTPbp	2389.37	2128.47	1983.87	2173.52	2380.73	2379.96	2479.81	2332.02
INTPdp	807.10	550.88	1280.65	578.58	649.41	657.62	929.81	702.50

Table 5.2: Simulation results in regulated regime for change in Various exogenous variables and policy variables

Variables	Base Year	rbd	slr	crr	Ca	lg	tr	XS("AGR")
		10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% increase
Taxes								
tr								
AGR	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NAGR	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06
TAXRe	1239.00	1237.64	1235.41	1240.84	1229.86	1230.26	1254.93	1246.86
TAXRf	754.00	728.14	756.91	732.17	744.52	744.95	766.72	747.09
TAXRh	2862.00	2824.40	2837.02	2860.22	2808.17	2810.41	2933.42	2840.52
TAXRp	500.00	497.60	497.99	500.73	495.09	495.30	508.24	502.10
TDIR	5355.00	5287.78	5327.32	5333.96	5277.64	5280.92	5463.31	5336.58
TAXm	5547.00	5500.92	5496.41	5558.79	5428.59	5433.52	5705.15	5513.19
TINDR	15319.00	15222.79	15207.43	15347.91	15056.10	15067.09	14056.71	15274.66
TTAXR	26221.00	26011.49	26031.17	26240.67	25762.32	25781.53	25225.17	26124.42
Institutional Income								
Yg	41685.00	41451.26	41450.98	41723.42	41116.63	41140.63	40876.20	41654.99
Ya	31987.00	31763.92	31781.10	32010.98	31490.19	31511.01	31053.50	31895.45
Ye	9698.00	9687.33	9669.88	9712.44	9626.44	9629.62	9822.70	9759.54
Yf	15168.00	14647.85	15226.57	14728.81	14977.33	14985.86	15423.89	15029.06
Yh	183260.00	180850.00	181660.00	183140.00	179810.00	179950.00	187830.00	181880.00
Yp	9338.00	9293.12	9300.40	9351.67	9246.26	9250.21	9491.97	9377.15
Yw	19316.00	19167.06	19149.32	19356.38	18924.77	18941.10	19842.66	19218.60
Saving								
Sa	1879.00	1581.50	1597.74	1917.15	2057.50	1233.11	1437.14	1688.48
Sb	1236.00	1180.22	1264.95	1018.89	1141.74	1145.96	1362.50	1167.32
Sd	1140.00	1088.55	1166.71	939.75	1053.07	1056.95	1256.67	1076.65
Se	2930.00	2920.70	2905.47	2942.60	2867.58	2870.36	3038.77	2983.67
Sf	2376.00	2268.77	2431.66	1958.64	2194.81	2202.91	2619.17	2243.97
Sg	4809.00	4502.20	4503.21	4859.74	4925.08	4103.47	4475.91	4672.16
Sh	29018.00	28530.94	28717.82	28988.56	28377.15	28403.77	29961.63	28770.47
Sp	2768.00	3811.96	2898.51	3538.25	3173.74	3154.44	2333.66	3291.64
Sw	2517.00	2510.77	2513.76	2516.13	2510.01	2510.30	2355.13	2499.04

Table 5.2: Simulation results in regulated regime for change in various exogenous variables and policy variables

Variables	Base Year	rbd	sir	crr	Ca	lg	tr	XS("AGR")
		10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% Increase
Financial Sector Block								
Household Sector								
Mh	10743.00	10630.30	10705.18	10745.00	10657.89	10661.46	10828.10	10714.39
CASHh	2776.00	2757.00	2766.23	2776.52	2754.01	2754.93	2797.99	2768.61
COh	4430.00	4371.80	4391.33	4427.24	4346.68	4350.14	4540.54	4396.76
COhd	3275.00	3231.97	3246.41	3272.96	3213.40	3215.96	3356.72	3250.42
COhg	1155.00	1139.83	1144.92	1154.28	1133.28	1134.18	1183.82	1146.33
DEPh	7967.00	7873.30	7938.95	7968.48	7903.89	7906.53	8030.11	7945.78
g0h	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
g1h	0.82	0.83	0.82	0.83	0.82	0.82	0.82	0.82
g2h	0.63	0.67	0.65	0.65	0.65	0.65	0.61	0.65
g3h	0.74	0.70	0.72	0.72	0.72	0.72	0.76	0.72
lh	12809.00	12604.95	12621.09	12863.33	12363.18	12381.39	13646.46	12635.22
Nlh	12809.00	12648.51	12665.43	12854.75	12465.50	12479.50	13331.89	12692.67
OFAh	2792.00	2636.33	2711.89	2717.56	2663.09	2668.68	3017.11	2722.66
OFISH	268.00	266.23	265.63	268.05	262.99	263.18	280.84	268.84
PCORSh	759.00	615.49	693.77	680.75	664.72	668.92	897.37	679.89
SECh	1027.00	881.72	959.40	948.80	927.72	932.10	1178.21	948.72
SKh	15601.00	15284.85	15377.31	15572.32	15128.58	15148.17	16348.99	15415.33
SMh	1765.00	1754.61	1752.49	1768.76	1735.37	1736.58	1838.89	1773.94
Private Corporate Sector								
CASHp	39.00	38.81	38.84	39.06	38.62	38.63	39.64	39.16
DEFp	2992.00	2177.19	2510.50	2564.77	2453.18	2476.54	3807.55	2500.56
DEPp	470.00	467.74	468.11	470.69	465.38	465.58	477.75	471.97
g1p	0.25	0.28	0.28	0.27	0.27	0.27	0.24	0.27
g2p	0.52	0.51	0.57	0.51	0.51	0.51	0.53	0.52
lp	6573.00	6781.17	6202.27	6919.89	6392.02	6398.06	7109.70	6573.18
Nlp	6573.00	6804.60	6224.06	6915.28	6444.91	6448.76	6945.81	6603.07
TLDp	2233.00	1561.70	1816.73	1884.02	1788.46	1807.61	2910.18	1820.68
LDbp	1167.00	797.31	1033.97	963.44	913.44	924.42	1539.99	940.03
LDdp	1066.00	764.39	782.76	920.59	875.02	883.19	1370.19	880.65
Mp	509.00	506.55	506.95	509.75	504.00	504.22	517.39	511.13
PCORSp	759.00	615.49	693.77	680.75	664.72	668.92	897.37	679.89
Government Sector								
BREQg	2635.00	3063.79	3270.64	2571.25	2753.32	2748.32	2380.81	2869.06
FDEFg	16557.00	16933.81	16933.95	16492.75	16608.58	16606.31	16423.11	16785.95
lg	20258.00	20258.00	20258.00	20258.00	20258.00	19447.68	20258.00	20258.00
Nlg	20258.00	20328.01	20329.16	20244.49	20425.65	19601.78	19791.02	20350.11
GSd	1841.00	2140.58	2285.11	1796.46	1923.67	1920.17	1663.40	2004.53
Reserve Bank Of India								
GSc	794.00	923.21	985.54	774.79	829.65	828.15	717.41	864.53
RBCb	680.00	645.80	637.94	649.58	668.39	668.80	702.41	667.71
RBCd	533.00	527.12	624.92	499.96	522.44	522.87	542.98	533.70
RBM	6209.00	6298.13	6450.40	6126.32	6222.48	6221.82	6164.80	6267.94

Table 5.2: Simulation results in regulated regime for change in various exogenous variables and policy variables

Variables	Base Year	rbd	slr	crr	Ca	lg	tr	XS("AGR")
		10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% increase
Banking Sector								
Ab	14743.00	14444.88	14520.66	14450.78	14506.13	14516.29	15066.89	14575.48
DEPb	9204.00	9108.04	9174.06	9206.17	9136.27	9139.11	9274.86	9184.76
ERb	1567.00	1690.65	1823.54	1621.82	1614.22	1612.16	1488.68	1636.25
ESLRSb	-223.00	-228.07	-233.78	-229.28	-221.98	-222.07	-222.73	-224.46
Gsb	2070.00	2043.59	1833.90	2066.46	2054.61	2055.24	2087.59	2064.62
Lb	14743.00	14444.88	14520.66	14450.78	14506.13	14516.29	15066.89	14575.48
Lbp	1167.00	797.31	1033.97	963.44	913.44	924.42	1539.99	940.03
LDdb	794.00	681.81	614.72	747.14	730.73	733.42	898.13	726.70
OFISb	928.00	916.16	822.15	926.41	921.10	921.38	935.89	925.59
RRb	1380.00	1366.21	1376.11	1242.83	1370.44	1370.87	1391.23	1377.71
SLRSb	3221.00	3187.82	2889.83	3222.16	3197.69	3198.69	3246.20	3214.66
Other Financial Institutions								
Ad	7975.00	7861.03	7956.83	7738.14	7803.99	7811.34	8204.11	7886.20
g2d	0.43	0.47	0.44	0.45	0.46	0.45	0.40	0.45
Ld	7975.00	7861.03	7956.83	7738.14	7803.99	7811.34	8204.11	7886.20
Ldb	794.00	681.81	614.72	747.14	730.73	733.42	898.13	726.70
Ldp	1066.00	764.39	782.76	920.59	875.02	883.19	1370.19	880.65
Lfd	1860.00	1446.21	1397.48	1667.73	1605.75	1616.62	2268.32	1607.35
Rest of the World								
OAw	840.00	833.77	836.76	839.13	833.01	833.30	678.13	822.04
FE	-2822.00	-2817.08	-2822.86	-2818.90	-2825.53	-2825.35	-2641.67	-2794.10
Monetary Block								
Md	12465.00	12349.85	12425.13	12467.74	12374.89	12378.68	12558.49	12438.52
Ms	12465.00	12349.85	12425.13	12467.74	12374.89	12378.68	12558.49	12438.52
Interest Rate Block								
rbd	0.08	0.07	0.08	0.08	0.08	0.08	0.08	0.08
rds	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
rgs	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
rbfp	0.17	0.15	0.14	0.15	0.16	0.16	0.17	0.16
rcfb	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
rcfd	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
rdff	1.13	1.13	1.22	1.11	1.13	1.13	1.12	1.13
rdlb	0.11	0.16	0.22	0.11	0.14	0.14	0.06	0.15
rdlp	0.14	0.10	0.22	0.10	0.11	0.11	0.16	0.12
rh	1.26	1.25	1.26	1.26	1.25	1.25	1.27	1.25
rk	1.40	1.40	1.40	1.40	1.39	1.39	1.41	1.39
rib	1.10	1.13	1.16	1.11	1.12	1.12	1.08	1.12
roh	1.35	1.34	1.35	1.35	1.34	1.34	1.36	1.34
rofh	1.12	1.09	1.11	1.10	1.10	1.10	1.14	1.10
rp	1.15	1.12	1.17	1.13	1.14	1.14	1.17	1.14
rps	0.17	0.06	0.12	0.11	0.11	0.11	0.24	0.11
rsh	1.15	1.07	1.12	1.11	1.11	1.11	1.21	1.11
rgsm	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
rslr	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Price Expectations								
PEXP	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

Note: Notations used in this table as well as in tables 5.3 to 5.5 are similar to those used in the list of equations in chapter 4, Table 4.1. Lists of variables are given in Table 4.2 and 4.3. Hence, one can make use of those tables while reading the above referred tables. However in these tables we have dropped the subscript *i* and *j* for convenience. In addition, we have used the following symbols:

AGR	agriculture
GDP	gross domestic product
INTPbp	total interest payment/receipt on loans from the banking sector to private corporate sector
INTPdp	total interest payment/receipt on loans from the OFIs to private corporate sector
INTPds	total interest payment/receipt on OFI securities
INTPgs	total interest payment/receipt on government securities
INTPgsm	total interest payment/receipt on small savings
INTPps	total interest payment/receipt on private corporate sector
INTPDEPh	total interest payment/receipt on deposits of household sector
INTPDEPp	total interest payment/receipt on deposits of private corporate sector
NAGR	non-agriculture
NCa	total nominal consumption of government sector
NCh	total nominal consumption of household sector
NGDP	nominal GDP
NIg	nominal investment expenditure by public sector
NIh	nominal investment expenditure by household sector
NIp	nominal investment expenditure by private corporate sector
NWAGEa	total wage received from non-agriculture sector
TAXRe	total income tax from public sector non-departmental enterprises
TAXRf	total income tax from financial institutions
TAXRh	total income tax from household sector
TAXRp	total income tax from private corporate sector
TAXm	total tariff revenue
TDIR	total direct tax receipts
TINDR	total indirect tax receipts
TKINCa	total capital income received by government sector
TKINCe	total capital income received by public sector non-departmental enterprises
TKIN Cf	total capital income received by financial institutions
TKINCh	total capital income received by household sector
TKIN Cp	total capital income received by private corporate sector
TKIN Cw	total capital income received by rest of the world
TTAXR	total tax receipts
WAGEa	total wage received from agriculture sector
Yg	total income of public sector

Table 6.3: Difference Between Values of Various Variables from Base Year Values

Variables	rbd	air	ctr	Ca	Ig	tr	Xs("AGR")
	10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% increase
Real Sector Block							
GDP							
GDPR	-1310.0000	-1490.0000	370.0000	-3490.0000	-3350.0000	5310.0000	370.0000
NGDP	-1307.8500	-1484.2058	368.8801	-3492.3619	-3346.2574	5312.4207	372.9351
Commodity Block							
Ds							
AGR	-19.0160	-14.3760	0.2880	-32.2630	-30.8420	42.0020	1861.2360
NAGR	-2330.0000	-2660.0000	880.0000	-6260.0000	-6000.0000	8430.0000	-1730.0000
Dd							
AGR	-19.0160	-14.3760	0.2880	-32.2630	-30.9420	42.0020	1861.2360
NAGR	-2350.0000	-2680.0000	870.0000	-6300.0000	-6030.0000	9510.0000	-1750.0000
Xs							
AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1831.9200
NAGR	-2490.0000	-2840.0000	710.0000	-6680.0000	-6400.0000	10170.0000	-1880.0000
Qd							
AGR	-54.1760	-41.0750	0.8320	-91.1780	-87.5140	124.5120	1803.3530
NAGR	-2450.0000	-2800.0000	710.0000	-6600.0000	-6320.0000	9890.0000	-1800.0000
E							
AGR	18.7970	14.2360	-0.2870	31.7320	30.4480	-42.5390	69.7370
NAGR	-181.5000	-177.8750	41.5320	-415.9720	-398.8500	731.0710	-149.1760
M							
AGR	-25.9870	-19.7670	0.4040	-43.3350	-41.6320	62.4460	-36.0430
NAGR	-121.6350	-142.8110	37.7430	-337.3770	-323.2250	445.7590	-71.2930
INT							
AGR-AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	335.5200
AGR-NAGR	-159.7160	-181.8940	45.3570	-427.5940	-409.7050	651.0500	-120.2510
NAGR-AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	223.0800
NAGR-NAGR	-1040.0000	-1180.0000	280.0000	-2770.0000	-2660.0000	4220.0000	-780.0000
NT							
AGR	-159.7160	-181.8940	45.3570	-427.5940	-409.7050	651.0500	215.2690
NAGR	-1030.0000	-1180.0000	300.0000	-2770.0000	-2680.0000	4230.0000	-550.0000
INV							
AGR	0.0260	-3.4650	2.4890	-3.8880	-8.7640	8.5240	-1.0770
NAGR	4.0940	-555.1670	398.7320	-622.9180	-1404.1120	1365.8300	-172.5280
DST							
AGR	-2.4480	-2.6910	0.8140	-6.3750	-6.1040	20.4330	-2.4340
NAGR	-4.8510	-5.3330	1.2170	-12.8350	-12.0980	40.4950	-4.8230
Consumption Block							
Ch							
AGR	107.8820	146.7750	-47.8280	348.8790	337.0800	-555.4940	1591.5880
NAGR	-1417.5510	-1063.4640	10.3580	-2346.2580	-2248.8940	4252.5150	-1065.6920
NCh	-1883.0090	-1274.4464	-82.7748	-2752.1214	-2637.7886	3557.9270	-1106.1646
Ca							
AGR	0.0000	0.0000	0.0000	-2.2000	0.0000	0.0000	0.0000
NAGR	0.0000	0.0000	0.0000	-843.4400	0.0000	0.0000	0.0000
NCa	74.4223	75.3817	-14.1664	-875.3035	189.8928	-491.8410	98.9870

continued

Table 5.3: Difference Between Values Of Various Variables From Base Year Values

Variables	rbd	slr	crr	Ca	lg	tr	XS("AGR")
	10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% Increase
Price Block							
P							
AGR	-0.0140	-0.0110	0.0000	-0.0240	-0.0230	0.0330	-0.0330
NAGR	0.0040	0.0040	-0.0010	0.0080	0.0080	-0.0230	0.0050
PD							
AGR	-0.0140	-0.0100	0.0010	-0.0240	-0.0230	0.0350	-0.0320
NAGR	0.0040	0.0040	0.0000	0.0090	0.0090	-0.0190	0.0050
PIND	-0.0010	0.0000	0.0000	0.0000	0.0000	-0.0090	-0.0050
PK							
AGR	0.0030	0.0040	-0.0010	0.0080	0.0080	-0.0230	0.0050
NAGR	0.0030	0.0040	-0.0010	0.0080	0.0080	-0.0230	0.0050
PN							
AGR	-0.0120	-0.0090	0.0010	-0.0200	-0.0190	0.0310	-0.0270
NAGR	0.0030	0.0030	0.0000	0.0060	0.0060	-0.0110	0.0050
PX							
AGR	-0.0150	-0.0110	0.0000	-0.0240	-0.0230	0.0330	-0.0330
NAGR	0.0040	0.0040	0.0000	0.0090	0.0080	-0.0180	0.0050
MUP	0.0030	0.0020	-0.0010	0.0050	0.0050	-0.0040	0.0050
Labour Block							
LDD							
AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NAGR	-0.0360	-0.0440	0.0120	-0.1040	-0.1000	0.0860	-0.0140
Ls							
AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NAGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
U							
U	0.0360	0.0440	-0.0120	0.1040	0.1000	-0.0860	0.0140
Wage Income							
W							
AGR	-7.5440	-5.7330	0.1170	-12.6130	-12.1140	17.4530	-6.9250
NAGR	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0040	-0.0020
WAGEa	-189.3656	-143.9099	2.9537	-316.5824	-304.0610	438.0768	-173.8105
WAGEa	-283.5517	-344.7957	96.5851	-817.4132	-783.0625	673.4095	-111.8209
TWAGE	-472.9173	-488.7056	99.5208	-1133.9956	-1087.1235	1111.4863	-285.6315
Capital Income							
KINC							
AGR	-982.8570	-756.9470	22.1260	-1670.7490	-1604.4320	2527.5670	-1147.9120
NAGR	-68.9720	-215.1740	117.1250	-552.1040	-527.4080	969.0970	521.6740
TKINCa	-13.5659	-16.0644	4.3110	-38.1323	-36.5223	62.3271	5.0285
TKINCe	-10.6659	-28.1251	14.4398	-71.5596	-68.3774	124.7038	61.5357
TKINcf	-3.0414	-9.4883	5.1647	-24.3455	-23.2565	42.7332	23.0037
TKINCh	-998.2858	-876.7453	99.4352	-1986.5588	-1905.8546	3094.4725	-764.8930
TKINCP	-24.9568	-37.5997	13.6692	-91.7427	-87.7857	153.9725	39.1531
TKINcw	-1.3135	-4.0976	2.2304	-10.5139	-10.0436	18.4548	9.9344
Transfer Payments							
INTPgsm							
INTPgsm	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
INTPds							
INTPds	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
INTPDEPh							
INTPDEPh	-367.1403	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
INTDEPP							
INTDEPP	-19.9245	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
INTPPs							
INTPPs	-569.3254	-234.1549	-312.9525	-326.2423	-310.6325	366.9150	-324.6448
INTPbp							
INTPbp	-260.8920	-405.4909	-215.8419	-8.6316	-9.4062	90.4463	-57.3420
INTPdp							
INTPdp	-256.2217	473.5488	-228.5172	-157.6915	-149.4818	122.7119	-104.6049

continued

Table 5.3: Difference Between Values Of Various Variables From Base Year Values

Variables	rbd	slr	crr	Ca	lg	tr	XS("AGR")
	10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% increase
Taxes							
tr							
AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NAGR	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0060	0.0000
TAXRe	-1.3627	-3.5932	1.8448	-9.1423	-8.7358	15.9320	7.8617
TAXRf	-25.8569	2.9115	-21.8323	-9.4781	-9.0544	12.7203	-6.9065
TAXRh	-37.6014	-24.9816	-1.7803	-53.8298	-51.5936	71.4161	-21.4765
TAXRp	-2.4014	-2.0133	0.7319	-4.9123	-4.7005	8.2444	2.0964
TOIR	-67.2241	-27.6766	-21.0359	-77.3625	-74.0842	108.3128	-18.4248
TAXm	-46.0794	-50.5895	11.7946	-118.4133	-113.4837	158.1501	-33.8107
TINDR	-96.2090	-111.5675	28.9088	-262.9007	-251.9053	-1262.2933	-44.3415
TTAXR	-209.5124	-189.8336	19.6674	-458.6766	-439.4732	-995.8305	-96.5771
Institutional Income							
Yg	-233.7442	-234.0232	38.4182	-568.3684	-544.3729	-808.7996	-30.0129
Ya	-223.0780	-205.8980	23.9780	-496.8090	-475.9950	-933.5030	-91.5490
Ye	-10.6660	-28.1250	14.4400	-71.5600	-68.3770	124.7040	61.5360
Yf	-520.1550	58.5700	-439.1940	-190.6690	-182.1440	255.8910	-138.9360
Yh	-2410.0000	-1600.0000	-120.0000	-3450.0000	-3310.0000	4570.0000	-1380.0000
Yp	-44.8820	-37.6000	13.6690	-91.7430	-87.7860	153.9730	39.1530
Yw	-148.9360	-166.6760	40.3780	-391.2260	-374.9010	526.6610	-97.4010
Saving							
Sa	-297.5010	-281.2600	38.1450	178.4950	-645.8880	-441.8620	-190.5160
Sb	-55.7830	28.9540	-217.1130	-94.2560	-90.0420	126.4980	-68.6820
Sd	-51.4500	26.7050	-200.2490	-86.9350	-83.0480	116.6730	-63.3480
Se	-9.3030	-24.5320	12.5950	-62.4170	-59.6420	108.7720	53.6740
Sf	-107.2330	55.6580	-417.3620	-181.1910	-173.0900	243.1710	-132.0300
Sg	-306.8040	-305.7920	50.7400	116.0770	-705.5300	-333.0910	-136.8420
Sh	-487.0590	-300.1780	-29.4420	-640.8460	-614.2280	943.6300	-247.5290
Sp	1043.9610	130.5110	770.2490	405.7350	386.4360	-434.3450	523.6420
Sw	-6.2330	-3.2370	-0.8680	-6.9860	-6.6980	-161.8720	-17.9630

continued

Table 5.3: Difference Between Values Of Various Variables From Base Year Values

Variables	rbd	sir	crr	Ca	lg	tr	XS("AGR")
	10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% increase
Financial Sector Block							
Household Sector							
Mh	-112.7030	-37.8230	1.9990	-85.1070	-81.5390	85.0960	-28.6110
CASHh	-19.0030	-9.7730	0.5160	-21.9920	-21.0700	21.9890	-7.3930
COh	-58.2020	-38.6680	-2.7560	-83.3210	-79.8600	110.5430	-33.2430
COhd	-43.0270	-28.5870	-2.0370	-61.5980	-59.0390	81.7220	-24.5760
COhg	-15.1750	-10.0820	-0.7180	-21.7240	-20.8210	28.8210	-8.6670
DEPh	-93.6990	-28.0490	1.4820	-63.1150	-60.4690	63.1070	-21.2180
g0h	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
g1h	0.0070	0.0030	0.0040	0.0030	0.0030	-0.0060	0.0020
g2h	0.0340	0.0140	0.0190	0.0200	0.0190	-0.0230	0.0200
g3h	-0.0410	-0.0160	-0.0220	-0.0220	-0.0210	0.0230	-0.0220
lh	-204.0480	-187.9060	54.3300	-445.8210	-427.6140	837.4560	-173.7850
Nlh	-160.4881	-143.5746	45.7523	-343.5042	-329.5047	522.8850	-116.3334
OFAh	-155.6660	-80.1130	-74.4370	-128.9140	-123.3240	225.1070	-69.3410
OFISh	-1.7710	-2.3680	0.0530	-5.0080	-4.8240	12.8420	0.8360
PCORSh	-143.5070	-65.2340	-78.2490	-94.2770	-90.0790	138.3710	-79.1150
SECh	-145.2780	-67.6020	-78.1970	-99.2850	-94.9020	151.2130	-78.2790
SKh	-316.1540	-223.6870	-28.6850	-472.4180	-452.8290	747.9920	-185.6740
SMh	-10.3880	-12.5110	3.7600	-29.6280	-28.4210	73.8940	8.9380
Private Corporate Sector							
CASHp	-0.1870	-0.1570	0.0570	-0.3830	-0.3670	0.6430	0.1640
DEFp	-814.8060	-481.5010	-427.2280	-538.8210	-515.4640	815.5460	-491.4370
DEPp	-2.2590	-1.8920	0.6880	-4.6180	-4.4180	7.7500	1.9710
g1p	0.0290	0.0220	0.0110	0.0170	0.0160	-0.0180	0.0180
g2p	-0.0120	0.0460	-0.0120	-0.0120	-0.0120	0.0060	-0.0070
lp	208.1670	-370.7260	346.8900	-180.9850	-174.9420	536.6970	0.1830
Nlp	231.6010	-348.9407	342.2758	-128.0853	-124.2438	372.8083	30.0706
TLDp	-671.2990	-416.2670	-348.9790	-444.5450	-425.3860	677.1750	-412.3220
LDbp	-369.6910	-133.0280	-203.5640	-253.5610	-242.5790	372.9880	-226.9750
LDdp	-301.6080	-283.2390	-145.4150	-190.9830	-182.8070	304.1860	-185.3470
Mp	-2.4460	-2.0500	0.7450	-5.0010	-4.7850	8.3930	2.1340
PCORSp	-143.5070	-65.2340	-78.2490	-94.2770	-90.0790	138.3710	-79.1150
Government Sector							
BREQg	428.7870	635.6410	-63.7530	118.3190	113.3190	-254.1910	234.0640
FDEFg	376.8110	376.9470	-64.2490	51.5770	49.3120	-133.8870	228.9540
lg	0.0000	0.0000	0.0000	0.0000	-810.3200	0.0000	0.0000
Nlg	70.0067	71.1556	-13.5094	167.6541	-656.2175	-466.9771	92.1122
GSD	299.5820	444.1050	-44.5430	82.6660	79.1730	-177.5960	163.5340
Reserve Bank Of India							
GSc	129.2060	191.5370	-19.2110	35.6530	34.1460	-76.5950	70.5300
RBCb	-34.1980	-42.0640	-30.4240	-11.6100	-11.2030	22.4110	-12.2890
RBCd	-5.8800	91.9230	-33.0420	-10.5650	-10.1260	9.9840	0.6990
RBM	89.1280	241.3960	-82.6770	13.4780	12.8170	-44.2000	58.9410

continued

Table 5.3: Difference Between Values Of Various Variables From Base Year Values

Variables	rbd	slr	crr	Ca	lg	tr	XS("AGR")
	10% reduction	10% reduction	10% reduction	4% reduction	4% reduction	10% reduction	2% increase
Banking Sector							
Ab	-298.1250	-222.3370	-292.2240	-236.8660	-226.7100	323.8940	-167.5230
DEPb	-95.9580	-29.9420	2.1700	-67.7330	-64.8880	70.8570	-19.2430
ERb	123.6450	256.5440	54.8170	47.2190	45.1590	-78.3200	69.2540
ESLRSb	-5.0700	-10.7760	-6.2820	1.0170	0.9270	0.2750	-1.4560
GSb	-26.4140	-236.1010	-3.5370	-15.3900	-14.7640	17.5890	-5.3800
Lb	-298.1250	-222.3370	-292.2240	-236.8660	-226.7100	323.8940	-167.5230
Lbp	-369.6910	-133.0280	-203.5640	-253.5610	-242.5790	372.9880	-226.9750
LDdb	-112.1860	-179.2850	-46.8570	-63.2680	-60.5770	104.1290	-67.3050
OFISb	-11.8420	-105.8460	-1.5860	-6.8990	-6.6190	7.8850	-2.4120
RRb	-13.7940	-3.8910	-137.1670	-9.5600	-9.1330	11.2290	-2.2870
SLRSb	-33.1850	331.1720	1.1600	-23.3060	-22.3110	25.2000	-6.3370
Other Financial Institutions							
Ad	-113.9700	-18.1730	-236.8610	-171.0060	-163.6560	229.1060	-88.8000
g2d	0.0440	0.0130	0.0210	0.0280	0.0270	-0.0310	0.0250
Ld	-113.9700	-18.1730	-236.8610	-171.0060	-163.6560	229.1060	-88.8000
Ldb	-112.1860	-179.2850	-46.8570	-63.2680	-60.5770	104.1290	-67.3050
Ldp	-301.6080	-283.2390	-145.4150	-190.9830	-182.8070	304.1860	-185.3470
Lfd	-413.7940	-462.5240	-192.2720	-254.2510	-243.3840	408.3150	-252.6520
Rest of the World							
OAw	-6.2330	-3.2370	-0.8680	-6.9860	-6.6980	-161.8720	-17.9630
FE	4.9200	-0.8610	3.0980	-3.5280	-3.3450	180.3270	27.8970
Monetary Block							
Md	-115.1490	-39.8720	2.7440	-90.1080	-86.3240	93.4890	-26.4770
Ms	-115.1490	-39.8720	2.7440	-90.1080	-86.3240	93.4890	-26.4770
Interest Rate Block							
rbd	-0.0080	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rds	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rgs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rbip	-0.0180	-0.0280	-0.0150	-0.0010	-0.0010	0.0060	-0.0040
rclb	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rclid	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rdl	0.0020	0.0950	-0.0190	0.0010	0.0010	-0.0050	0.0070
rdlb	0.0570	0.1110	0.0080	0.0370	0.0350	-0.0490	0.0400
rdlp	-0.0440	0.0820	-0.0400	-0.0270	-0.0260	0.0210	-0.0180
rh	-0.0080	-0.0030	-0.0010	-0.0060	-0.0060	0.0070	-0.0060
rk	-0.0050	-0.0040	0.0000	-0.0090	-0.0080	0.0090	-0.0070
rib	0.0300	0.0600	0.0040	0.0200	0.0190	-0.0270	0.0210
roh	-0.0070	-0.0040	-0.0010	-0.0090	-0.0090	0.0110	-0.0080
rofh	-0.0290	-0.0130	-0.0170	-0.0170	-0.0170	0.0240	-0.0170
rp	-0.0310	0.0210	-0.0270	-0.0140	-0.0130	0.0140	-0.0110
rps	-0.1130	-0.0460	-0.0620	-0.0640	-0.0610	0.0730	-0.0640
rsh	-0.0810	-0.0340	-0.0460	-0.0480	-0.0450	0.0570	-0.0470
rgsm	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rslr	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Price Expectations							
PEXP	-0.0010	-0.0010	-0.0010	0.0000	0.0000	-0.0060	-0.0040

For notations refer to Table 5.2
290

Table 5.4: Percentage Change in Simulation Results in Regulated Regime From Base Year Values

Variables	rbd	slr	crr	Ca	lg	tr	XS("AGR")
Real Sector Block							
GDP							
GDP	-0.6311	-0.7178	0.1782	-1.6812	-1.6138	2.5579	0.1782
NGDP	-0.6300	-0.7150	0.1777	-1.6823	-1.6120	2.5591	0.1796
Commodity Block							
Ds							
AGR	-0.0199	-0.0151	0.0003	-0.0338	-0.0325	0.0441	1.9526
NAGR	-0.9151	-1.0447	0.2592	-2.4587	-2.3565	3.7037	-0.6795
Dd							
AGR	-0.0199	-0.0151	0.0003	-0.0338	-0.0325	0.0441	1.9526
NAGR	-0.9230	-1.0526	0.2631	-2.4744	-2.3683	3.7351	-0.6873
Xs							
AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.0000
NAGR	-0.9330	-1.0642	0.2660	-2.5031	-2.3982	3.8108	-0.7045
Qd							
AGR	-0.0561	-0.0426	0.0009	-0.0945	-0.0907	0.1290	1.8686
NAGR	-0.9031	-1.0321	0.2617	-2.4327	-2.3295	3.6454	-0.6635
E							
AGR	1.4754	1.1174	-0.0225	2.4907	2.3900	-3.3390	5.4739
NAGR	-1.3171	-1.4490	0.3387	-3.3924	-3.2511	5.9621	-1.2166
M							
AGR	-2.1893	-1.6653	0.0340	-3.6508	-3.5073	5.2608	-3.0365
NAGR	-0.7285	-0.8554	0.2261	-2.0207	-1.9359	2.6699	-0.4270
INT							
AGR-AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.0000
AGR-NAGR	-0.9347	-1.0633	0.2654	-2.5023	-2.3976	3.8100	-0.7037
NAGR-AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.0000
NAGR-NAGR	-0.9381	-1.0644	0.2616	-2.4986	-2.3994	3.8066	-0.7036
NT							
AGR	-0.4716	-0.5365	0.1339	-1.2627	-1.2099	1.9225	0.6357
NAGR	-0.8442	-0.9671	0.2459	-2.2703	-2.1801	3.4669	-0.4508
INV							
AGR	0.0109	-1.4498	1.0414	-1.6268	-3.6669	3.5665	-0.4506
NAGR	0.0107	-1.4499	1.0413	-1.6268	-3.6670	3.5665	-0.4506
DST							
AGR	-0.2468	-0.2713	0.0619	-0.6426	-0.6153	2.0598	-0.2454
NAGR	-0.2467	-0.2713	0.0619	-0.6427	-0.6154	2.0598	-0.2453
Consumption Block							
Ch							
AGR	0.1760	0.2392	-0.0776	0.5686	0.5493	-0.9053	2.5939
NAGR	-1.6118	-1.2092	0.0118	-2.6678	-2.5571	4.8353	-1.2117
NCh	-1.2612	-0.8536	-0.0554	-1.8433	-1.7667	2.3829	-0.7409
Ca							
AGR	0.0000	0.0000	0.0000	-4.0000	0.0000	0.0000	0.0000
NAGR	0.0000	0.0000	0.0000	-4.0000	0.0000	0.0000	0.0000
NCa	0.3520	0.3565	-0.0670	-3.1943	0.8036	-2.3255	0.4681

continued...

Table 5.4:

Percentage Change in Simulation Results in Regulated Regime From Base Year Values

Variables	rbd	slr	crr	Ca	lg	tr	XS("AGR")
Price Block							
P							
AGR	-1.4000	-1.1000	0.0000	-2.4000	-2.3000	3.3000	-3.3000
NAGR	0.4000	0.4000	-0.1000	0.8000	0.8000	-2.3000	0.5000
PD							
AGR	-1.4184	-1.0132	0.1013	-2.4316	-2.3303	3.5461	-3.2421
NAGR	0.4324	0.4324	0.0000	0.9730	0.9730	-2.0541	0.5405
PIND	-0.1000	0.0000	0.0000	0.0000	0.0000	-0.9000	-0.5000
PK							
AGR	0.3000	0.4000	-0.1000	0.8000	0.8000	-2.3000	0.5000
NAGR	0.3000	0.4000	-0.1000	0.8000	0.8000	-2.3000	0.5000
PN							
AGR	-1.7192	-1.2894	0.1433	-2.8653	-2.7221	4.4413	-3.8682
NAGR	0.6711	0.6711	0.0000	1.3423	1.3423	-2.4609	1.1186
PX							
AGR	-1.5182	-1.1134	0.0000	-2.4291	-2.3279	3.3401	-3.3401
NAGR	0.4320	0.4320	0.0000	0.9719	0.8639	-1.9438	0.5400
MUP	0.7557	0.5038	-0.2519	1.2594	1.2594	-1.0076	1.2594
Labour Block							
LDD							
AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NAGR	-0.5806	-0.7097	0.1935	-1.6774	-1.6129	1.3871	-0.2258
Ls							
AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NAGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
U	4.5000	5.5000	-1.5000	13.0000	12.5000	-10.7500	1.7500
Wage Income							
W							
AGR	-1.4349	-1.0905	0.0223	-2.3991	-2.3042	3.3197	-1.3172
NAGR	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0001	-0.0000
WAGEa	-1.4350	-1.0906	0.0224	-2.3991	-2.3042	3.3198	-1.3171
WAGEa	-0.5813	-0.7069	0.1980	-1.6758	-1.6054	1.3806	-0.2292
TWAGE	-0.7631	-0.7886	0.1606	-1.8298	-1.7542	1.7935	-0.4609
Capital Income							
KINC							
AGR	-1.8113	-1.3949	0.0408	-3.0789	-2.9567	4.6579	-2.1154
NAGR	-0.0973	-0.3035	0.1652	-0.7788	-0.7440	1.3670	0.7359
TKINCa	-0.4413	-0.5226	0.1402	-1.2405	-1.1881	2.0276	0.1636
TKINCe	-0.1208	-0.3185	0.1635	-0.8103	-0.7743	1.4121	0.6968
TKIN Cf	-0.0973	-0.3035	0.1652	-0.7788	-0.7440	1.3670	0.7359
TKINCh	-1.0004	-0.8786	0.0996	-1.9908	-1.9099	3.1010	-0.7665
TKIN Cp	-0.2777	-0.4184	0.1521	-1.0210	-0.9769	1.7135	0.4357
TKIN Cw	-0.0973	-0.3035	0.1652	-0.7788	-0.7440	1.3670	0.7359
Transfer Payments							
INTPgsm	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
INTPds	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
INTPDEPh	-10.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
INTDEPp	-9.9998	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
INTPps	-66.2788	-27.2595	-36.4328	-37.9799	-36.1627	42.7149	-37.7940
INTPbp	-10.9189	-16.9707	-9.0334	-0.3613	-0.3937	3.7854	-2.3999
INTPdp	-31.7460	58.6729	-28.3134	-19.5380	-18.5209	15.2041	-12.9606

continued ...

Table 5.4: Percentage Change in Simulation Results in Regulated Regime From Base Year Values

Variables	rbd	slr	crr	Ca	lg	tr	XS("AGR")
Taxes							
tr							
AGR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NAGR	0.0000	0.0000	0.0000	0.0000	0.0000	-10.9091	0.0000
TAXRe	-0.1100	-0.2900	0.1489	-0.7379	-0.7051	1.2859	0.6345
TAXRf	-3.4293	0.3861	-2.8955	-1.2570	-1.2008	1.6870	-0.9160
TAXRh	-1.3138	-0.8729	-0.0622	-1.8808	-1.8027	2.4953	-0.7504
TAXRp	-0.4803	-0.4027	0.1464	-0.9825	-0.9401	1.6489	0.4193
TDIR	-1.2554	-0.5168	-0.3928	-1.4447	-1.3835	2.0226	-0.3441
TAXm	-0.8307	-0.9120	0.2126	-2.1347	-2.0459	2.8511	-0.6095
TINDR	-0.6280	-0.7283	0.1887	-1.7162	-1.6444	-8.2401	-0.2895
TTAXR	-0.7990	-0.7240	0.0750	-1.7493	-1.6760	-3.7978	-0.3683
Institutional Income							
Yg	-0.5607	-0.5614	0.0922	-1.3635	-1.3059	-1.9403	-0.0720
Ya	-0.6974	-0.6437	0.0750	-1.5532	-1.4881	-2.9184	-0.2862
Ye	-0.1100	-0.2900	0.1489	-0.7379	-0.7051	1.2859	0.6345
Yf	-3.4293	0.3861	-2.8955	-1.2570	-1.2008	1.6870	-0.9160
Yh	-1.3151	-0.8731	-0.0655	-1.8826	-1.8062	2.4937	-0.7530
Yp	-0.4806	-0.4027	0.1464	-0.9825	-0.9401	1.6489	0.4193
Yw	-0.7710	-0.8629	0.2090	-2.0254	-1.9409	2.7266	-0.5043
Saving							
Sa	-15.8329	-14.9686	2.0301	9.4995	-34.3740	-23.5158	-10.1392
Sb	-4.5132	2.3426	-17.5658	-7.6259	-7.2850	10.2345	-5.5568
Sd	-4.5132	2.3425	-17.5657	-7.6259	-7.2849	10.2345	-5.5568
Se	-0.3175	-0.8373	0.4299	-2.1303	-2.0356	3.7124	1.8319
Sf	-4.5132	2.3425	-17.5657	-7.6259	-7.2849	10.2345	-5.5568
Sg	-6.3798	-6.3587	1.0551	2.4137	-14.6710	-6.9264	-2.8455
Sh	-1.6785	-1.0345	-0.1015	-2.2084	-2.1167	3.2519	-0.8530
Sp	37.7154	4.7150	27.8269	14.6581	13.9608	-15.6917	18.9177
Sw	-0.2476	-0.1286	-0.0345	-0.2776	-0.2661	-6.4311	-0.7137

continued . . .

Table 5.4:

Percentage Change in Simulation Results in Regulated
Regime From Base Year Values

Variables	rbd	slr	crr	Ca	lg	tr	XS("AGR")
Financial Sector Block							
Household Sector							
Mh	-1.0491	-0.3521	0.0186	-0.7922	-0.7590	0.7921	-0.2663
CASHh	-0.6845	-0.3521	0.0186	-0.7922	-0.7590	0.7921	-0.2663
COh	-1.3138	-0.8729	-0.0622	-1.8808	-1.8027	2.4953	-0.7504
COhd	-1.3138	-0.8729	-0.0622	-1.8809	-1.8027	2.4953	-0.7504
COhg	-1.3139	-0.8729	-0.0622	-1.8809	-1.8027	2.4953	-0.7504
DEPh	-1.1761	-0.3521	0.0186	-0.7922	-0.7590	0.7921	-0.2663
g0h	0.3876	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
g1h	0.8526	0.3654	0.4872	0.3654	0.3654	-0.7308	0.2436
g2h	5.3797	2.2152	3.0063	3.1646	3.0063	-3.6392	3.1646
g3h	-5.5480	-2.1651	-2.9770	-2.9770	-2.8417	3.1123	-2.9770
lh	-1.5930	-1.4670	0.4242	-3.4805	-3.3384	6.5380	-1.3567
Nlh	-1.2529	-1.1209	0.3572	-2.6817	-2.5724	4.0822	-0.9082
OFAh	-5.5754	-2.8694	-2.6661	-4.6173	-4.4170	8.0626	-2.4836
OFISH	-0.6608	-0.8836	0.0198	-1.8687	-1.8000	4.7918	0.3119
PCORSh	-18.9074	-8.5947	-10.3095	-12.4212	-11.8681	18.2307	-10.4236
SECh	-14.1459	-6.5825	-7.6141	-9.6675	-9.2407	14.7238	-7.6221
SKh	-2.0265	-1.4338	-0.1839	-3.0281	-2.9026	4.7945	-1.1901
SMh	-0.5886	-0.7088	0.2130	-1.6786	-1.6103	4.1866	0.5064
Private Corporate Sector							
CASHp	-0.4795	-0.4026	0.1462	-0.9821	-0.9410	1.6487	0.4205
DEFp	-27.2328	-16.0929	-14.2790	-18.0087	-17.2281	27.2576	-16.4250
DEPp	-0.4806	-0.4026	0.1464	-0.9826	-0.9400	1.6489	0.4194
g1p	11.4173	8.6614	4.3307	6.6929	6.2992	-7.0866	7.0866
g2p	-2.2945	8.7954	-2.2945	-2.2945	-2.2945	1.1472	-1.3384
lp	3.1670	-5.6401	5.2775	-2.7535	-2.6615	8.1652	0.0028
Nlp	3.5235	-5.3087	5.2073	-1.9487	-1.8902	5.6718	0.4575
TLDP	-30.0627	-18.6416	-15.6283	-19.9080	-19.0500	30.3258	-18.4649
LDbp	-31.6787	-11.3991	-17.4434	-21.7276	-20.7865	31.9613	-19.4494
LDdp	-28.2934	-26.5703	-13.6412	-17.9159	-17.1489	28.5353	-17.3871
Mp	-0.4806	-0.4028	0.1464	-0.9825	-0.9401	1.6489	0.4193
PCORSp	-18.9074	-8.5947	-10.3095	-12.4212	-11.8681	18.2307	-10.4236
Government Sector							
BREQg	16.2728	24.1230	-2.4195	4.4903	4.3005	-9.6467	8.8829
FDEFg	2.2758	2.2767	-0.3880	0.3115	0.2978	-0.8086	1.3828
lg	0.0000	0.0000	0.0000	0.0000	-4.0000	0.0000	0.0000
Nlg	0.3456	0.3512	-0.0667	0.8276	-3.2393	-2.3051	0.4547
GSD	16.2728	24.1230	-2.4195	4.4903	4.3005	-9.6467	8.8829
Reserve Bank Of India							
GSc	16.2728	24.1230	-2.4195	4.4903	4.3005	-9.6467	8.8829
RBCb	-5.0291	-6.1859	-4.4741	-1.7074	-1.6475	3.2957	-1.8072
RBCd	-1.1032	17.2463	-6.1992	-1.9822	-1.8998	1.8732	0.1311
RBM	1.4355	3.8878	-1.3316	0.2171	0.2064	-0.7119	0.9493

continued...

Table 6.4: Percentage Change in Simulation Results in Regulated Regime From Base Year Values

Variables	rbd	elr	ert	Ca	lg	tr	XS("AGR")
Banking Sector							
Ab	-2.0221	-1.5081	-1.8621	-1.8088	-1.5377	2.1989	-1.1383
DEPb	-1.0428	-0.3253	0.0238	-0.7359	-0.7050	0.7899	-0.2091
ERb	7.8808	18.3717	3.4882	3.0133	2.8819	-4.9981	4.4185
ESLRSb	2.2735	4.8323	2.8170	-0.4581	-0.4157	-0.1233	0.8528
GSb	-1.2780	-11.4058	-0.1709	-0.7435	-0.7132	0.8487	-0.2598
Lb	-2.0221	-1.5081	-1.8621	-1.8088	-1.5377	2.1989	-1.1383
Lbp	-31.8787	-11.3991	-17.4434	-21.7278	-20.7865	31.9813	-19.4494
LDb	-14.1282	-22.5800	-5.9014	-7.8683	-7.8283	13.1145	-8.4767
OFISb	-1.2781	-11.4058	-0.1709	-0.7434	-0.7133	0.8497	-0.2599
Rb	-0.9998	-0.2820	-9.8388	-0.8828	-0.8818	0.8137	-0.1857
SLRSb	-1.0303	-10.2817	0.0360	-0.7238	-0.6927	0.7824	-0.1867
Other Financial Institutions							
Ad	-1.4291	-0.2278	-2.9700	-2.1443	-2.0521	2.8728	-1.1135
g2d	10.3044	3.0445	4.8180	8.5574	8.3232	-7.2800	6.8548
Ld	-1.4291	-0.2278	-2.9700	-2.1443	-2.0521	2.8728	-1.1135
Ldb	-14.1282	-22.5800	-5.9014	-7.8683	-7.8283	13.1145	-8.4767
Ldp	-28.2934	-28.5703	-13.8412	-17.8159	-17.1489	28.5353	-17.3871
Ltd	-22.2470	-24.8689	-10.3372	-13.6894	-13.0952	21.8624	-13.6834
Rest of the World							
CAW	-0.7420	-0.3864	-0.1033	-0.8317	-0.7874	-19.2705	-2.1365
FE	-0.1743	0.0305	-0.1088	0.1250	0.1165	-8.3800	-0.8888
Monetary Block							
Md	-0.8238	-0.3199	0.0220	-0.7229	-0.8825	0.7500	-0.2124
Ma	-0.8238	-0.3199	0.0220	-0.7229	-0.8825	0.7500	-0.2124
Interest Rate Block							
rbd	-9.7581	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rbs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rbs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rbs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rbs	-10.8091	-18.8897	-9.8898	-8.8081	-8.8081	3.6384	-2.4242
rbs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rbs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rbs	0.1778	8.4444	-1.8888	0.8888	0.8888	-0.4444	0.8222
rbs	64.2857	105.7143	7.8180	35.2381	33.3333	-48.8887	38.8862
rbs	-31.4288	58.5714	-28.5714	-18.2857	-18.5714	15.0000	-12.8571
rbs	-0.8349	-0.2381	-0.0784	-0.4782	-0.4782	0.5558	-0.4782
rbs	-0.3588	-0.2855	0.0000	-0.8424	-0.5710	0.8424	-0.4898
rbs	2.7188	5.4397	0.3828	1.8132	1.7228	-2.4478	1.9038
rbs	-0.5185	-0.2863	-0.0741	-0.8887	-0.8887	0.8148	-0.6828
rbs	-2.5839	-1.1828	-1.5208	-1.5208	-1.5208	2.1487	-1.5208
rbs	-2.8888	1.8213	-2.3417	-1.2142	-1.1275	1.2142	-0.9540
rbs	-88.4708	-27.0588	-38.4708	-37.8471	-35.8824	42.8412	-37.8471
rbs	-7.0252	-2.8488	-3.8888	-4.1831	-3.8028	4.8438	-4.0783
rbs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
rbs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Price Expectations							
PEXP	-1.2185	-1.2185	-1.2185	0.0000	0.0000	-7.3171	-4.8780

For notations refer to Table 5.2

Table 5.5: Simulation and sensitivity results in liberalized regime for change in real government investment expenditure under different elasticity values

Variables	Base Year	low elasticity	high elasticity	low elasticity	high elasticity	low elasticity	high elasticity
		value	value	value	value	value	value
				difference	difference	% change	% change
				from base value	from base value	from base value	from base value
Real Sector Block							
GDP							
GDPR	207590.00	205140.00	206110.00	-2450.0000	-1480.0000	-1.1802	-0.7129
NGDP	207590.00	205141.02	206110.48	-2448.9770	-1479.5170	-1.1797	-0.7127
Commodity Block							
Ds							
AGR	95322.00	95304.99	95318.44	-17.0140	-3.5560	-0.0178	-0.0037
NAGR	254610.00	250210.00	251940.00	-4400.0000	-2670.0000	-1.7281	-1.0487
Dd							
AGR	95322.00	95304.99	95318.44	-17.0140	-3.5560	-0.0178	-0.0037
NAGR	254610.00	250190.00	251930.00	-4420.0000	-2680.0000	-1.7360	-1.0526
Xs							
AGR	96596.00	96596.00	96596.00	0.0000	0.0000	0.0000	0.0000
NAGR	266870.00	262180.00	264030.00	-4690.0000	-2840.0000	-1.7574	-1.0642
Qd							
AGR	96509.00	96460.47	96498.77	-48.5320	-10.2290	-0.0503	-0.0106
NAGR	271300.00	266660.00	268480.00	-4640.0000	-2820.0000	-1.7103	-1.0394
E							
AGR	1274.00	1290.83	1277.54	16.8310	3.5360	1.3211	0.2776
NAGR	12262.00	11974.45	12093.65	-287.5480	-168.3460	-2.3450	-1.3729
M							
AGR	1187.00	1163.69	1182.04	-23.3130	-4.9610	-1.9640	-0.4179
NAGR	16696.00	16455.71	16546.21	-240.2950	-149.7950	-1.4392	-0.8972
INT							
AGR-AGR	16776.00	16776.00	16776.00	0.0000	0.0000	0.0000	0.0000
AGR-NAGR	17088.00	16787.80	16906.23	-300.2030	-181.7740	-1.7568	-1.0638
NAGR-AGR	11153.00	11153.00	11153.00	0.0000	0.0000	0.0000	0.0000
NAGR-NAGR	110860.00	108910.00	109860.00	-1950.0000	-1000.0000	-1.7590	-0.9020
NT							
AGR	33864.00	33563.80	33682.23	-300.2030	-181.7740	-0.8865	-0.5368
NAGR	122010.00	120070.00	120830.00	-1940.0000	-1180.0000	-1.5900	-0.9671
INV							
AGR	239.00	229.96	230.23	-9.0400	-8.7660	-3.7824	-3.6678
NAGR	38291.00	36842.70	36886.59	-1448.2960	-1404.4090	-3.7823	-3.6677
DST							
AGR	992.00	987.64	989.48	-4.3650	-2.5200	-0.4400	-0.2540
NAGR	1966.00	1957.35	1961.01	-8.6510	-4.9940	-0.4400	-0.2540
Consumption Block							
Ch							
AGR	61359.00	61624.08	61541.83	265.0750	182.8310	0.4320	0.2980
NAGR	87948.00	86711.41	87716.39	-1236.5920	-231.6060	-1.4060	-0.2633
NCh	149307.00	148023.18	149343.25	-1283.8190	36.2520	-0.8599	0.0243
Ca							
AGR	55.00	55.00	55.00	0.0000	0.0000	0.0000	0.0000
NAGR	21086.00	21086.00	21086.00	0.0000	0.0000	0.0000	0.0000
NCh	21141.00	21257.19	21201.69	116.1860	60.6910	0.5496	0.2871

continued ...

Table 5.5: Simulation and sensitivity results in liberalized regime for change in real government investment expenditure under different elasticity values

Variables	Base Year	low elasticity	high elasticity	low elasticity	high elasticity	low elasticity	high elasticity
		value	value	value	value	value	value
				difference	difference	% change	% change
				from base value	from base value	from base value	from base value
Price Block							
P							
AGR	1.00	0.99	1.00	-0.0130	-0.0030	-1.3000	-0.3000
NAGR	1.00	1.01	1.00	0.0060	0.0030	0.6000	0.3000
PD							
AGR	0.99	0.98	0.99	-0.0120	-0.0020	-1.2158	-0.2026
NAGR	0.93	0.93	0.93	0.0060	0.0030	0.6486	0.3243
PIND	1.00	1.00	1.00	0.0010	0.0010	0.1000	0.1000
PK							
AGR	1.00	1.01	1.00	0.0050	0.0030	0.5000	0.3000
NAGR	1.00	1.01	1.00	0.0050	0.0030	0.5000	0.3000
PN							
AGR	0.70	0.69	0.70	-0.0110	-0.0020	-1.5759	-0.2865
NAGR	0.45	0.45	0.45	0.0040	0.0020	0.8949	0.4474
PX							
AGR	0.99	0.98	0.99	-0.0130	-0.0030	-1.3158	-0.3036
NAGR	0.93	0.93	0.93	0.0060	0.0030	0.6479	0.3240
MUP	0.40	0.40	0.40	0.0030	0.0010	0.7557	0.2519
Labour Block							
LDD							
AGR	25.10	25.10	25.10	0.0000	0.0000	0.0000	0.0000
NAGR	6.20	6.13	6.15	-0.0750	-0.0480	-1.2097	-0.7742
Ls							
AGR	25.10	25.10	25.10	0.0000	0.0000	0.0000	0.0000
NAGR	7.00	7.00	7.00	0.0000	0.0000	0.0000	0.0000
U							
AGR	0.80	0.88	0.85	0.0750	0.0480	9.3750	6.0000
Wage Income							
W(wage rate)							
AGR	525.74	518.97	524.30	-6.7650	-1.4360	-1.2868	-0.2731
NAGR	7867.42	7867.42	7867.42	0.0010	0.0010	0.0000	0.0000
WAGEa	13196.00	13026.19	13159.96	-169.8110	-36.0380	-1.2868	-0.2731
WAGEa	48778.00	48186.72	48398.37	-591.2770	-379.6300	-1.2122	-0.7783
Total Wage Bill	61974.00	61212.91	61558.33	-761.0880	-415.6680	-1.2281	-0.6707
Capital Income							
KINC							
AGR	54264.00	53356.45	54052.28	-907.5520	-211.7170	-1.6725	-0.3902
NAGR	70891.00	70403.57	70467.62	-487.4350	-423.3830	-0.6876	-0.5972
TKINCa	3074.00	3046.79	3056.92	-27.2130	-17.0810	-0.8853	-0.5557
TKINCe	8831.00	8769.09	8778.51	-61.9120	-52.4910	-0.7011	-0.5944
TKIN Cf	3126.00	3104.51	3107.33	-21.4940	-18.6690	-0.6876	-0.5972
TKINCh	99788.00	98584.02	99300.91	-1203.9820	-487.0870	-1.2065	-0.4881
TKIN Cp	8986.00	8914.90	8934.29	-71.1030	-51.7080	-0.7913	-0.5754
TKIN Cw	1350.00	1340.72	1341.94	-9.2820	-8.0630	-0.6876	-0.5973
Transfer Payments							
INTPgs	678.26	1070.19	2068.39	391.9290	1390.1350	57.7846	204.9567
INTPds	89.38	89.38	89.38	0.0000	0.0000	0.0000	0.0000
INTPDEPh	3671.40	3671.40	3671.40	0.0000	0.0000	0.0000	0.0000
INTDEPp	199.25	199.25	199.25	0.0000	0.0000	0.0000	0.0000
INTPps	858.99	869.55	816.87	10.5670	-42.1180	1.2302	-4.9032
INTPbp	2389.37	2456.06	2282.23	66.6970	-107.1380	2.7914	-4.4840
INTPdp	807.10	856.79	744.78	49.6930	-62.3240	6.1570	-7.7220
INTPgs	1062.04	668.31	1307.11	-393.7270	245.0730	-37.0727	23.0757

Table 5.5: Simulation and sensitivity results in liberalized regime for change in real government investment expenditure under different elasticity values

Variables	Base Year	low elasticity	high elasticity	low elasticity	high elasticity	low elasticity	high elasticity
		value	value	value	value	value	value
				difference	difference	% change	% change
				from base value	from base value	from base value	from base value
Taxes							
tr							
AGR	0.01	0.01	0.01	0.0000	0.0000	0.0000	0.0000
NAGR	0.06	0.06	0.06	0.0000	0.0000	0.0000	0.0000
TAXRe	1239.00	1231.09	1232.29	-7.9100	-6.7060	-0.6384	-0.5412
TAXRf	754.00	739.15	756.83	-14.8550	2.8310	-1.9702	0.3755
TAXRh	2862.00	2837.60	2868.95	-24.4030	6.9540	-0.8527	0.2430
TAXRp	500.00	496.19	497.23	-3.8070	-2.7690	-0.7614	-0.5538
TDIR	5355.00	5304.03	5355.31	-50.9750	0.3090	-0.9519	0.0058
TAXm	5547.00	5456.13	5499.09	-90.8710	-47.9080	-1.6382	-0.8637
TINDR	15319.00	15132.52	15203.85	-186.4770	-115.1550	-1.2173	-0.7517
TTAXR	26221.00	25901.68	26058.25	-319.3230	-162.7530	-1.2178	-0.6207
Institutional Income							
Yg	41685.00	41276.55	41452.68	-408.4480	-232.3250	-0.9798	-0.5573
Ya	31987.00	31640.46	31807.17	-346.5360	-179.8340	-1.0834	-0.5622
Ye	9698.00	9636.09	9645.51	-61.9120	-52.4910	-0.6384	-0.5413
Yf	15168.00	14869.17	15224.94	-298.8310	56.9400	-1.9701	0.3754
Yh	183260.00	181700.00	183700.00	-1560.0000	440.0000	-0.8512	0.2401
Yp	9338.00	9266.90	9286.29	-71.1030	-51.7080	-0.7614	-0.5537
Yw	19316.00	19043.11	19153.18	-272.8900	-162.8180	-1.4128	-0.8429
Saving							
Sa	1879.00	1418.08	3.27	-460.9230	-1875.7330	-24.5302	-99.8261
Sb	1236.00	1088.28	1264.15	-147.7250	28.1480	-11.9519	2.2773
Sd	1140.00	1003.75	1165.96	-136.2510	25.9620	-11.9518	2.2774
Se	2930.00	2876.00	2884.22	-54.0020	-45.7850	-1.8431	-1.5626
Sf	2376.00	2092.02	2430.11	-283.9770	54.1100	-11.9519	2.2774
Sg	4809.00	4294.08	2887.11	-514.9250	-1921.8900	-10.7075	-39.9644
Sh	29018.00	28763.65	29420.06	-254.3520	402.0550	-0.8765	1.3855
Sp	2768.00	2573.75	2930.64	-194.2530	162.6410	-7.0178	5.8758
Sw	2517.00	2514.83	2518.99	-2.1730	1.9920	-0.0863	0.0791

continued ...

Table 5.5: Simulation and sensitivity results in liberalized regime for change in real government investment expenditure under different elasticity values

Variables	Base Year	low elasticity	high elasticity	low elasticity	high elasticity	low elasticity	high elasticity
		value	value	value	value	value	value
				difference	difference	% change	% change
				from base value	from base value	from base value	from base value
Financial Sector Block							
Household Sector							
Mh	10743.00	10685.41	10677.51	-57.5900	-65.4890	-0.5361	-0.6096
CASHh	2776.00	2761.12	2759.08	-14.8810	-16.9220	-0.5361	-0.6096
COh	4430.00	4392.23	4440.76	-37.7730	10.7640	-0.8527	0.2430
COhd	3275.00	3247.08	3282.96	-27.9250	7.9570	-0.8527	0.2430
COhg	1155.00	1145.15	1157.81	-9.8480	2.8060	-0.8526	0.2429
DEPh	7967.00	7924.29	7918.43	-42.7090	-48.5660	-0.5361	-0.6096
g0h	0.26	0.26	0.26	0.0000	0.0000	0.0000	0.0000
g1h	0.82	0.81	0.76	-0.0100	-0.0590	-1.2180	-7.1864
g2h	0.63	0.66	0.74	0.0230	0.1110	3.6392	17.5633
g3h	0.74	0.74	0.74	0.0010	-0.0040	0.1353	-0.5413
lh	12809.00	12448.65	12206.45	-360.3500	-602.5530	-2.8133	-4.7041
Nlh	12809.00	12516.24	12241.24	-292.7610	-567.7580	-2.2856	-4.4325
OFAh	2792.00	2925.77	3816.54	133.7720	1024.5390	4.7913	36.6955
OFISH	268.00	263.01	259.93	-4.9860	-8.0720	-1.8604	-3.0119
PCORSh	759.00	747.55	720.49	-11.4510	-38.5150	-1.5087	-5.0744
SECh	1027.00	1010.56	980.41	-16.4380	-46.5880	-1.6006	-4.5363
SKh	15601.00	15442.01	16057.78	-158.9890	456.7810	-1.0191	2.9279
SMh	1765.00	1915.21	2836.13	150.2100	1071.1260	8.5105	60.6870
Private Corporate Sector							
CASHp	39.00	38.70	38.78	-0.2970	-0.2160	-0.7615	-0.5538
DEFp	2992.00	2929.84	2844.97	-62.1570	-147.0260	-2.0774	-4.9140
DEPp	470.00	466.42	467.40	-3.5790	-2.6030	-0.7615	-0.5538
g1p	0.25	0.26	0.25	0.0010	-0.0010	0.3937	-0.3937
g2p	0.52	0.52	0.52	0.0010	-0.0030	0.1912	-0.5736
lp	6573.00	6286.34	6572.70	-286.6650	-0.3020	-4.3613	-0.0046
Nlp	6573.00	6320.47	6591.43	-252.5340	18.4340	-3.8420	0.2805
TLDp	2233.00	2182.30	2124.49	-50.7050	-108.5110	-2.2707	-4.8594
LDbp	1167.00	1144.41	1105.27	-22.5940	-61.7310	-1.9361	-5.2897
LDdp	1066.00	1037.89	1019.22	-28.1110	-46.7800	-2.6371	-4.3884
Mp	509.00	505.12	506.18	-3.8760	-2.8190	-0.7615	-0.5538
PCORSp	759.00	747.55	720.49	-11.4510	-38.5150	-1.5087	-5.0744
Government Sector							
g1g	0.73	0.70	0.63	-0.0310	-0.0990	-4.2641	-13.6176
BREQg	6470.00	6290.04	7633.83	-179.9560	1163.8290	-2.7814	17.9881
FDEFg	16557.00	16367.20	17723.64	-189.8050	1166.6350	-1.1464	7.0462
GSg	4705.00	4374.83	4797.70	-330.1670	92.7020	-7.0174	1.9703
lg	20258.00	19447.68	19447.68	-810.3200	-810.3200	-4.0000	-4.0000
Nlg	20258.00	19553.27	19503.12	-704.7300	-754.8830	-3.4788	-3.7263
SMg	1841.00	1915.21	2836.13	74.2100	995.1260	4.0310	54.0536
Reserve Bank Of India							
RBCb	680.00	675.19	664.76	-4.8120	-15.2420	-0.7076	-2.2415
RBCd	533.00	511.05	540.22	-21.9490	7.2190	-4.1180	1.3544
RBM	6209.00	6182.24	6200.98	-26.7610	-8.0240	-0.4310	-0.1292

continued...

Table 5.5: Simulation and sensitivity results in liberalized regime for change in real government investment expenditure under different elasticity values

Variables	Base Year	low elasticity	high elasticity	low elasticity	high elasticity	low elasticity	high elasticity
		value	value	value	value	value	value
				difference	difference	% change	% change
				from base value	from base value	from base value	from base value
Banking Sector							
Ab	14743.00	14523.60	14690.65	-219.3990	-52.3550	-1.4882	-0.3551
DEPb	9204.00	9157.71	9152.83	-46.2880	-51.1690	-0.5029	-0.5559
ERb	1567.00	1563.37	1584.69	-3.6270	17.6850	-0.2315	1.1286
GSb	2070.00	1907.76	2101.09	-162.2400	31.0940	-7.8377	1.5021
Lb	14743.00	14523.60	14690.65	-219.3990	-52.3550	-1.4882	-0.3551
Lbp	1167.00	1144.41	1105.27	-22.5940	-61.7310	-1.9361	-5.2897
LDdb	794.00	773.43	779.91	-20.5740	-14.0920	-2.5912	-1.7748
OFAb	2095.00	2047.29	2001.14	-47.7140	-93.8600	-2.2775	-4.4802
OFISb	928.00	902.88	895.87	-25.1200	-32.1290	-2.7069	-3.4622
RRb	1380.00	1373.66	1372.93	-6.3430	-7.0750	-0.4596	-0.5127
Other Financial Institutions							
Ad	7975.00	7758.77	7975.94	-216.2320	0.9370	-2.7114	0.0117
g2d	0.22	0.22	0.21	0.0070	-0.0040	3.2558	-1.8605
g3d	0.63	0.62	0.65	-0.0160	0.0180	-2.5276	2.8436
GSd	1841.00	1673.07	1902.61	-167.9270	61.6080	-9.1215	3.3464
Ld	7975.00	7758.77	7975.94	-216.2320	0.9370	-2.7114	0.0117
Ldb	794.00	773.43	779.91	-20.5740	-14.0920	-2.5912	-1.7748
Ldp	1066.00	1037.89	1019.22	-28.1110	-46.7800	-2.6371	-4.3884
Lfd	3701.00	3484.39	3701.74	-216.6120	0.7370	-5.8528	0.0199
OFAd	2907.00	2710.96	2921.83	-196.0380	14.8290	-6.7437	0.5101
Rest of the World							
OAw	840.00	837.83	841.99	-2.1730	1.9920	-0.2587	0.2371
FE	-2822.00	-2829.00	-2831.06	-7.0000	-9.0550	0.2481	0.3209
Monetary Block							
Md	12465.00	12403.53	12396.69	-61.4660	-68.3070	-0.4931	-0.5480
Ms	12465.00	12403.53	12396.69	-61.4660	-68.3070	-0.4931	-0.5480
Interest Rate Block							
rbd	0.08	0.08	0.08	0.0000	0.0000	0.0000	0.0000
rds	0.11	0.11	0.11	0.0000	0.0000	0.0000	0.0000
rgs	0.08	0.05	0.10	-0.0280	0.0180	-36.3636	23.3766
rbip	0.17	0.17	0.16	0.0050	-0.0070	3.0303	-4.2424
rclb	0.10	0.10	0.10	0.0000	0.0000	0.0000	0.0000
rclid	0.09	0.09	0.09	0.0000	0.0000	0.0000	0.0000
rdi	1.10	1.09	1.11	-0.0080	0.0050	-0.7266	0.4541
rdib	0.11	0.12	0.10	0.0110	-0.0020	10.4762	-1.9048
rdip	0.14	0.15	0.13	0.0090	-0.0110	6.4286	-7.8571
rh	1.26	1.26	1.27	0.0000	0.0100	0.0000	0.7937
rk	1.40	1.40	1.40	-0.0050	-0.0020	-0.3569	-0.1428
rib	1.10	1.11	1.10	0.0050	-0.0010	0.4533	-0.0907
roh	1.35	1.35	1.37	0.0000	0.0160	0.0000	1.1852
rofh	1.12	1.16	1.26	0.0370	0.1420	3.3095	12.7013
rofab	1.14	1.14	1.13	0.0030	-0.0040	0.2636	-0.3515
rofad	1.10	1.09	1.11	-0.0130	0.0070	-1.1818	0.6364
rp	1.15	1.16	1.14	0.0070	-0.0090	0.6071	-0.7806
rps	0.17	0.17	0.16	0.0020	-0.0080	1.1765	-4.7059
rsh	1.15	1.16	1.15	0.0020	-0.0060	0.1735	-0.5204
rgsm	0.10	0.16	0.30	0.0570	0.2010	58.1633	205.1020
Price Expectations							
PEXP	0.08	0.08	0.08	0.0000	0.0000	0.0000	0.0000

For notations refer to Table 5.2.

Chapter 6

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

6.1 Contribution of the Study

A CGE model with real and financial linkages has been constructed with the aim of assessing the impact on the economy of the monetary and credit policy changes and the financial sector and fiscal sector reforms which are undertaken over the past few years and are likely to take place in the near future.

With this objective in mind, the literature on various aspects relating to the subject of the study has been surveyed. It covers topics such as concepts used in general equilibrium models, types of general equilibrium models (Walrasian general equilibrium model, non-Walrasian general equilibrium models), numerical counterparts of these models, i.e. CGE models, financial CGE models, applications of financial CGE models to various developed and developing countries and techniques used in the numerical specification of applied general equilibrium models [for example, econometric techniques, Social Accounting Matrix (SAM) approach, calibration, etc.]. Theoretical and empirical problems of introducing financial aspects in the CGE models are also discussed at length.

To our knowledge, a Financial Social Accounting Matrix (FSAM) is prepared for the first time for India by integrating the data available from National Account Statistics (NAS), Input-Output Transactions Tables compiled by the Planning Commission for the year 1983-84, and, most importantly, the Flow of Funds (FOF) accounts published by the RBI and various other data sources. Since NAS provides data for most of the macro variables used in the model, we have taken the data available from NAS as control data and adjusted the data from other sources so as to be consistent with our control data. Consistency, the basic requirement of a SAM (or FSAM), necessitates such type of adjustment of micro and macro data available from the various sources using different methodology and procedures of estimation. The requirement of

consistency and estimation of data, when such consistency was lacking, took a great deal of our time. The construction of FSAM clearly highlighted the inconsistencies in the existing data base of the country available from publications of the Government of India, the RBI and various other agencies. It indicates that there is an urgent need for making concentrated and integrated efforts for building the data base related to various aspects of the economy in a consistent manner. To the extent macro-economic studies neglect the inconsistencies in the existing data base, their results are subject to scrutiny.

In the model economy, the saving and investment both are made endogenous variables rather than assuming that saving determines investment or taking a scenario of forced saving. In keeping with the mixed economic system of the Indian economy, explicit treatment of the public sector and the private sector is essential and, therefore, the model explicitly takes into account the behaviour of the two sectors. An important distinguishing characteristic of the study from other financial CGE models available for India [for example, Panda and Sarkar (1986), Bhide and Pohit (1993)] is the greater disaggregation of the financial sector. Keeping in mind the different objectives of various financial intermediaries and the differing nature of their liabilities, the financial intermediaries are disaggregated into the RBI, the banking sector and the OFIs. The greater disaggregation of financial intermediaries also required a corresponding disaggregation of financial assets. Because of this disaggregation of financial institutions and financial assets we are able to see the often neglected impact of non-bank source of finance on the credit availability to various economic agents.

In contrast to the existing macro-economic studies and financial CGE studies, which basically provide the estimates of sectoral incomes (for example, income accruing to agricultural and non-agricultural sectors) our study provides the estimates of the incomes of the different economic agents. This, combined with the greater disaggregation of the capital account and explicit introduction of financial assets, makes it possible to explicitly introduce the interest components of incomes of various economic agents and transfer of interest payment among economic agents. Even in the base year, interest component of

various agents was estimated to be non-negligible.¹ In a liberalized scenario, these interest payments are expected to affect the income distribution among economic agents significantly and, hence, expected to influence the outcomes of various policy and exogenous changes in a manner which cannot be explained by conventional reasoning based on partial equilibrium analysis or on CGE models, which have a very aggregated treatment of the financial sector. Hence, in our model, these interest payments are endogenized and explicitly shown as components of incomes of various economic agents considered in the study.

The model has been calibrated to replicate the FSAM for the base year 1983-84 and to obtain the values of share parameters from the base year FSAM.

The model has been subjected to policy and exogenous shocks. Policy simulations are carried out involving monetary and credit policy changes and measures of financial sector reforms and fiscal reforms in an illustrative way and the results interpreted.

Specification of the equations of the model is flexible to incorporate changes of regimes which have occurred in the past and are likely to occur in the Indian economy in the near future. The model can, in many respects, be modified, extended and elaborated to suit the needs of the policy makers. We have studied the impact of real public sector investment under various regimes and under differing values of various elasticity parameters involved in our model.

A larger disaggregation of financial intermediaries and financial assets and the incorporation of behavioural specification for various economic agents has made it possible for us to examine the impact of the various monetary and credit policy changes including the impact of deregulation of interest rates (partial liberalization scenario) on government securities and small savings and the inter-linkages of sources of bank credit and non-bank credit. This is not possible in

¹ For example, cost of borrowing to the private corporate sector from the financial sector formed approximately 34 percent of its current account expenditure and interest payment on private corporate securities formed another 9 percent of its current account expenditure. As far as household sector is concerned, interest earnings were approximately 3 percent of total earnings of the household sector. As far as the financial institutions are concerned most of their income is from interest receipts on various assets. In this study it is estimated to be approximately 80 percent of their income.

other CGE models for India, where either the financial sector is absolutely neglected or disaggregation of financial assets is limited to a few assets only. Even when some of the important categories of financial assets are given explicit treatment in these models, because of lack of behavioural specification in the form of demand and supply functions for these assets in these models, the application of the model to study policy changes is restricted to the given regime only. For example, Sarkar and Panda (1986) have introduced explicitly the bank credit to the government (broadly equivalent to investment in government securities in our model) and bank credit to the commercial sector. Bank credit to the government in their model is supply determined. In the absence of demand function for the government securities, which has been explicitly introduced in our model, it would not be possible in their model to study the impact of deregulation of the interest rate on these securities. Most of these models basically concentrate on the study of inter-linkages among money supply and availability of credit to the private sector and real sector activity under the assumption that there is a one to one relationship between money supply and the availability of credit to the private sector, neglecting the fact that the existence of non-bank credit to various economic agents may not allow such a relationship to emerge in the economy.

Thus, the main contribution of the study lies in incorporating the interplay of crucial aggregates like money, bank credit, non-bank credit and real economic activities. By doing so (as we have seen in chapter 5), the study has been able to provide explanations for some of the observed recent developments in the economy. As some of these developments (for example, existence of excess SLR assets with the banking sector inspite of the decline in the SLR requirement, lower supply of bank credit to the private sector even in the presence of excess liquidity with the banking sector, etc.) can not be explained by the conventional wisdom based on a partial equilibrium analysis, they are sometimes referred to as paradoxes in the financial sector of the economy.

6.2 Major Findings, Insights Gained and Policy Implications

6.2.1 Major Findings and Insights Gained

The following insights are gained from the main findings (results) from experiments carried out in this thesis:

1. The outcomes of various policy changes are strongly influenced by the portfolio effects. Changes in the relative returns or costs of the various financial assets or liabilities (and, consequently, the interest receipts and payments) do affect the levels of and the distribution of income among the various economic agents and their saving and do lead to substitution processes, which influence the direction and intensity of the impacts of shocks. These effects become dominant and have substantial influence in the liberalized scenario particularly when higher interest response elasticities are assumed in demand and supply functions for various assets.

As the agents differ in their behaviour, the redistribution of income on account of changes in interest rates would affect the economy differently in different situations. Income distribution in favour of the household sector would positively affect the consumption expenditure. On the other hand, distribution of income in favour of financial institutions would affect the availability of credit to the economic agents which would primarily affect the economy via investment.

2. The redistribution of income among economic agents as a consequence of change in interest income also results in an asymmetric impact on the various market determined interest rates.

Interest income forms differing proportions of the incomes of various economic agents. For the financial institutions it is the primary source of income. As far as the household sector is concerned it is only a small proportion its total income. We have seen that in the partially liberalized regime, in which interest rates on government securities and small savings are deregulated, the impact of a decline in the public sector borrowing requirement on the returns on government securities and on small savings was asymmetric. Decline in the public sector borrowing requirement, initially, resulted in a lowering of the return on small savings and government securities, initially, and adversely affected incomes

of the household sector and the financial institutions. Interest income on government securities formed a substantial proportion of the incomes of the financial institutions (7 percent). In the presence of non-significant change in the income on other accounts, the income of the financial institutions declines which adversely affects the demand for government securities by this sector. The fall in the demand for government securities by the financial institutions turned out to be larger than the fall in the borrowing requirement of the public sector. Thus, a higher proportion of the borrowing requirement is met from the small savings by the public sector. Therefore, the interest rate on small savings starts rising. Since earnings on small savings formed only a small percent (0.36 %) of total income of the household sector, the initial decline in the supply of small savings due to the decline in income was not large enough to outweigh the positive substitution effect due to the higher yield on this asset. Therefore, contrary to expectations, we get a lower interest rate on government securities but a higher interest rate on small saving when there is a decline in the public sector borrowing requirement.

3. As interest payments form a significant proportion of the current account expenditure of some of the economic agents, the changes in the interest payments on borrowed funds would themselves affect the deficit and, hence, the borrowing requirement of these agents. This issue of increasing burden of cost of borrowing resulting in even higher borrowing is often discussed in the literature with reference to the public sector borrowing requirement. But our analysis, based on the CGE framework, has pointed out that the same issue is equally relevant in case of the private corporate sector also.

For example, we have seen that the interest payments formed 43 per cent of the current account expenditure of the private corporate sector. When changes in income and expenditure on other accounts are not significant, the amount of interest payment determines the amount of internal availability of funds with the private corporate sector. Increase in saving on account of reduction in interest payments increases the internal availability of funds with the private corporate sector. On the other hand, a decline in saving, on account of higher burden of interest payments, results in higher dependence on borrowed funds for this

sector. We have seen that decline in the CRR reduced the cost of funds to the private corporate sector. It resulted in higher investment, higher GDP and higher incomes of various economic agents. The saving of the private corporate sector increases in this scenario substantially on account of reduction in interest payment on its borrowing. The increase in saving turned out to be higher than the increase in investment and therefore, finally, the borrowing of the private corporate sector from various sources declined.

4. Given the inelastic nature of the borrowing requirement of the public sector and the easy availability of non-bank credit to the public sector, a reduction in the SLR would not be sufficient to increase the availability of credit to the private corporate sector.

The OFIs, *even when the differing nature of their liabilities is not taken into account*, play an important role in the allocation of the non-bank credit to various economic agents. Conventional analysis, mainly concentrating on bank-credit, often neglects the influence of the OFIs in allocating credit among various economic agents. However, findings of our study point out that in the presence of rigidities and downward inflexibility in certain crucial variables (such as the more or less autonomous nature of the public sector borrowing requirement) importance of such finance becomes crucial in determining the outcomes of various policy measures. We have seen from the results of our simulation exercise related to a reduction in the SLR that even in the event of lowering of the SLR requirement, the supply of credit to the private corporate sector from the banking sector does not increase. In the event of reduction in the SLR , to meet its more or less exogenously given borrowing requirement, the public sector has to tap the non-bank sources of credit. Therefore, when the SLR is reduced, the demand for credit by the public sector from the OFIs increases, which reduces the supply of credit from the OFIs to the private corporate sector as well as to the banking sector. Thus, the cost of non-bank credit (and, hence, the average cost) to the private corporate sector increases which turns out to be detrimental to the investment by this sector. The decline in investment reduces the borrowing requirements of this sector. Therefore, the excess reserves of the banking sector increase. Even when the interest rate on government securities are

market determined, a reduction in the SLR would only increase the cost of funds to the public sector. The increase in the return on government securities would make it profitable for the financial institutions to hold government securities. Thus, SLR reduction would only result in higher holding of government securities by the banking sector and would not reduce the overall cost of credit to the private corporate sector.

5. Another important insight, which has been gained from our analysis, is that it is possible to have an expansionary situation in the economy but still excess liquidity with the banking sector.

We have seen that a reduction in the CRR increases the availability of fund with the banking sector. Consequently, the supply of credit to the private corporate sector increases and the cost of credit to this sector declines. This has a favourable impact on the investment. As a consequence, real GDP and incomes of various economic agents increase. The saving of the private corporate sector increases not only on account of an increase in its income but also because of the reduction in the interest payment on borrowed funds. The increase in saving outweighs the increase in investment by the private corporate sector. Hence, finally, demand for borrowed funds by the private corporate sector from financial institutions declines. Excess reserves (and, hence, liquidity) of the banking sector increase as a consequence of this.

6.2.2 Policy Implications

Though, before drawing firm policy conclusions, we need to extend this study in various directions (discussed in the next section), the insights gained from the results of primary investigations carried out in this thesis have brought out some important policy implications. Briefly, they are as follows:

1. A reduction in indirect tax rates can be favoured as it produces favourable impact on the economy as well as reduces the borrowing requirement

of the public sector by increasing the direct tax revenue and reducing the nominal value of consumption and investment expenditure. However, in this expansionary situation, the internal sources of the private corporate sector turn out to be insufficient to finance this investment expenditure. Therefore, dependence of the private corporate sector on borrowed funds increases which raises the cost of credit to the private corporate sector. In the event of higher return on the advances, excess reserves of the banking sector decline. Economy thus faces liquidity crunch.

2. On the other hand, on the same accounts, the reduction in real investment by the public sector cannot be favoured.

Even though the model neglects the supply side effect of the investment, the decline in the investment adversely affects the economy from the demand side in all the scenarios considered by us (in the restricted regime and in the partially liberalized regime with low as well high values of various interest rate elasticities involved in the model equations). A contractionary situation sets in the economy. Contrary to expectations, the reduction in the real investment expenditure does not lower the public sector borrowing requirement in the restricted regime. In this regime, due to increase in the nominal value of its expenditure, public sector saving turns out to be lower than the nominal value of investment.

Even in the liberalized regime, the impact on the public sector borrowing requirement is subject to the value of various interest rate elasticities involved in the model. Slightly higher interest rate elasticities than that were assumed in the base solution significantly increase the borrowing requirement of the public sector on account of increased interest payment on the liabilities of the public sector.

3. Contrary to expectations, a reduction in the SLR does not result in the lowering of the average cost of credit to the private corporate sector.

As the borrowing requirement of the public sector is more or less autonomous, in the event of a decline in the SLR, the public sector has to

increase its borrowing from the OFIs. Therefore, credit to the private corporate sector from OFIs declines which increases the cost of such credit to the private corporate sector. The average cost of credit to the private corporate sector increases as a result. This adversely affects the investment in the economy and sets in a contractionary situation in the economy.

To make the SLR an effective tool of monetary and credit policy, the government needs to reduce its borrowing not only from the banking sector but also from the OFIs. The overall reduction in the borrowing requirement of the public sector should not be achieved by a reduction in its investment expenditure because (as we have seen above) that sets in a contractionary situation in the economy. The efforts should be made by the public sector to increase its income. The increase in income can be achieved, to a certain extent, by reduction in indirect tax rates.

4. On the other hand, a reduction in the CRR does succeed in reducing the cost of credit to the private corporate sector. Therefore, a reduction in the CRR can be favoured by the monetary authority if the aim is to reduce the cost of credit to the private corporate sector.

However, we have seen above that the reduction in the CRR also results in excess liquidity with the banking sector. Given the cost of fund as fixed, the reduction in the interest rate on advances also adversely affects the profitability of the financial institutions. To increase the profitability of the banking sector, the monetary authority can combine the CRR reduction with the measures which also reduce the cost of funds to the banking sector. A reduction in the RBI lending rate to the banking sector (Bank Rate and/or refinance rate) is one such measure which is expected to reduce the cost of funds to the banking sector. We have also seen above that the reduction in indirect tax rates produces a favourable impact on the economy and the economy faces shortage of liquidity. Thus, a reduction in the CRR combined with a reduction in indirect tax rates is expected to mop up the excess liquidity with the banking sector.

5. A reduction in the interest rate on bank deposits can also be preferred if

the aim is to increase the productive capacity of the economy. However, the reduction in the bank deposit rate reduces the interest rate component of the income of the household sector. Consumption expenditure of the household sector declines which sets in a contractionary situation in the economy. Therefore, this measure in itself cannot be preferred to other measures (such as the reduction in the CRR and the reduction in the indirect tax rates) which not only increase the investment but also set in an expansionary situation in the economy. However, this measure can always be used with other desirable measures to get a balanced growth of the economy.

6. One policy implication, which emerges from all the simulation exercises carried by us, is that the regulating authorities need to address both the demand side and the supply side of the economy. Concentration on only one side would result in undesirable impact (such as excess liquidity with the banking sector in the presence of an expansionary situation) in certain sectors of the economy. To get a balanced growth of the economy, a proper mix of policy measures such as a reduction in the CRR (which increases the availability of funds with the banking sector and reduces the cost of credit to the private corporate sector), a reduction in the RBI lending rate to the financial sector (which reduces the cost of funds to the banking sector) and a reduction in the indirect tax rates (which not only introduces a strong expansionary force in the economy but also mops up the excess liquidity with the banking sector) is recommended.

6.3 Suggestions for Further Research

However, the model formulated in the present form suffers from a number of limitations which may be noted here and which need to be kept in mind while carrying out further research in this area using a CGE framework.²

²

Though these limitations were realized during the formulation and estimation stage, we were restricted in our attempts to overcome these limitations and extend the model in the desired direction due to time constraint. A lot of time has been spent in tackling the infeasibility which

As most of the policy changes affect the economy over a period of time, we need to have a dynamic model of the economy. We have specified a dynamic model in chapter 4, but have not been able to see its working due to time constraint and the number of infeasibilities encountered while trying to achieve the base run of the model. The interim period (dynamic) model, as described in chapter 4 would be used to obtain a base run of the model over a period of five years. Policies can then be evaluated across time to track the responses on the economy.

The model construction has not taken into account the productivity impact of the investment. This negligence of the supply side, does not alter the results of the exercises carried out in this study as the experiments are short term comparative static. In the short term, the sectoral capital stocks are assumed to be fixed and investment during the period only affects the economy from the demand side by generating demand for intermediate and primary inputs. However, investment adds to the productive capacity of the economy and, thus, the supply side becomes important in the long run. Therefore, the present study needs to be modified in such a way that it takes into account the productivity impact of the investment.

Other features of the economy can also be incorporated into the model such as the stock market or the division of the economy into more than just agricultural and non-agricultural sectors.

Liberalization policies are followed not only in the domestic sectors but also in the external sector. A number of measures are taken in order to encourage foreign direct and portfolio investment. Efforts are being made to move towards full convertibility of the exchange rate not only on the current account but also on the capital account. In the process, the economy is getting strongly linked with the world economy through not only the commodity and the factor markets but also the financial markets. The present model needs to be extended so as to incorporate these aspects of the reforms in the economy and the implications of

arose during the calibration procedure and replicating the model for the base year using the computer software, GAMS, developed for this purpose by the World Bank.

the stronger integration of the Indian economy with the world economy.

Most of the elasticity and substitution parameters were borrowed from the existing literature without statistically validating them. The model results are sensitive, of course to a different extent, to the selected values of parameters. Therefore, in future we would like to do the elaborate sensitivity analysis to see how the model responds to changes in values of some of the important parameters. To get an idea about the stability of various parameters one needs to construct and calibrate a series of FSAMs.

In future, our efforts would also be directed at estimating the various elasticity and substitution parameters econometrically. We tried to estimate some of the elasticity parameters involved in the financial sector econometrically. However, we could not make use of these estimated values because of wrong signs of some of the estimated coefficients. In future, we would have enough data for the liberalized regime and portfolios of various economic agents might start responding to the various interest rates. Then we might be able to get the estimates for various elasticity and substitution parameters involved in the model with proper signs. Even the larger elasticity values assumed by us might begin to appear as more realistic.

The present study also points out the urgent need towards putting integrated efforts to construct a consistent data base for the economy. To draw firm conclusions for the changed, liberalized scenario FSAMs have to be constructed for the recent years. For this we not only need the input-output tables but also the financial balance sheet at a highly disaggregated level for the recent years. The proposed preparation of Input-Output Transactions Tables for 1989-1990 by CSO would fulfill this purpose to a certain extent. Even the Financial Balance Sheet available from Mohanty (1994) could be made use of by disaggregating it further by institutions and assets.

As pointed out in the earlier chapters, the model presented in this thesis is used for the purpose of policy experimentation. Simulation and sensitivity exercises carried out in this study are simple and performed mainly to gain insights into the workings of the model. In spite of its limitations, some important

insights have been gained from our analysis, which can also be used to provide an explanation for some of the so-called paradoxes of the economy. The insights gained from this financial CGE analysis encourages us to extend this research further.

REFERENCES

- Abel, A.B. (1990), "Consumption and Investment" in Friedman, B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Vol. II, Elsevier Science Publisher, B.V.:725-778.
- Adelman, I. and Robinson, S. (1978), *Income Distribution Policies in Developing Countries : A Case Study of Korea*, Stanford, Stanford University Press.
- Alchian, A.A. (1977), "Why Money ?", *Journal of Money, Credit and Banking*, 9: 133-140.
- Armington, P. (1969), "A Theory of Demand for Products Distinguished by Place of Production", *IMF Staff Papers*, Vol.16, March: 159-78.
- Arrow, K.J. (1964), "The Role of Securities in the Optimal Allocation of Risk-Bearing", *Review of Economic Studies*, 31: 91-96.
- Auerbach, A. and Kotlikoff, L. (1987), *Dynamic Fiscal Policy*, Cambridge, M.A.: Cambridge University Press.
- Barnett, W. (1982), "The Optimum Level of Monetary Aggregation", *Journal of Money, Credit and Banking*, 14 (4), Part II: 687-710.
- Baumol, W.J. (1952), "The Transactions Demand for Cash: An Inventory Theoretic Approach", *Quarterly Journal of Economics*, 66: 545-556.
- Benassy, J. P. (1982), *The Economics of Market Disequilibrium*, New York: Academic.
- Benassy, J. P. (1990), "Non-Walrasian Equilibrium, Money and Macroeconomics" in Friedman, B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Vol. I, Elsevier Science Publisher: 103-170.
- Bergman, L. (1990), "The Development of Computable General Equilibrium Modeling", in Bergman, L., Jorgenson, D. and Zalai, E. (ed.), *General Equilibrium Modeling and Economic Policy Analysis*, Basil Blackwell Inc, 3 Cambridge Centre, Cambridge, Massachusetts 02142, USA: 3-32.

- Bhattacharya, B.B. and Lodh, M. (1990), "Inflation in India : Analytical Survey", *Artha Vijnana*, March, V.32, N1: 25-68.
- Bhide, S. and Pohit, S. (1993), "Forecasting And Policy Analysis Through A CGE Model For India", *Margin*, April-June.
- Blanchard, O.J. (1990), "Why Does Money Affect Output ? A Survey", in Friedman, B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Vol.II, Elsevier Science Publishers, B.V.: 779-835.
- Blanchard, O.J. and Stanley, F. (1992), "Lectures on Macroeconomics", The MIT Press, Cambridge, Massachusetts.
- Bourguignon, F., Branson, W.H. and de Melo, J. (1989), *Macro - economic Adjustment and Income Distribution : A Macro - Micro Simulation Model*, Technical Papers, No. 1, OECD Development Centre, OECD, Paris, April.
- Bourguignon, F., Branson, W.H. and de Melo, J. (1992), "Adjustment and Income Distribution : A Micro - Macro Model for Counterfactual Analysis", *Journal of Development Economics*, 38 : 17-39.
- Bovenberg, A.L. and Goulder, L.H. (1989), *Promoting International Capital Mobility : An International General Equilibrium Analysis*, NBER, Working Paper No. 3139.
- Bovenberg, A.L. and Goulder, L.H. (1991), "Introducing Intertemporal and Open Economy Features in Applied General Equilibrium Models" in DON, H., de Klundert, Th Van and Sinderen, J. Van (ed.), *Applied General Equilibrium Modelling*, Dordrecht : Kluwer Academic Publishers.
- Branson, W. (1979), "Macroeconomic theory and Policy", New York, Harper and Row.
- Brock, W.A. (1990), "Overlapping Generations Models with Money and Transactions Costs" in Friedman B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Vol.I; Elsevier Science Publisher, B.V.: 263-295.
- Brunner, K. (1989), "Money Supply", in Eatwell, J, Milgate M. and Newman, P. (ed.), *The New Palgrave : Money*, The Macmillan Press Limited.

- Brunner, K. and Meltzer, A.H. (1990), "Money Supply", in Friedman, B.M. and F.H. (ed.), *Handbook of Monetary Economics*, Vol.I, Elsevier Science Publisher, B.V.: 356-490.
- Cambridge Department of Applied Economics (1962), *A Programme for Growth*, Vols. I to XI, Chapman and Hall, London.
- Central Statistical Organization (CSO) (1987), *National Accounts Statistics*, GOI.
- C.S.O. (1988), *Sources and Methods: National Accounts Statistics*.
- C.S.O. (1989a), "Estimates of Rural and Urban Income 1980-81", *Monthly Abstract of Statistics* - July.
- C.S.O. (1989b), *National Accounts Statistics, Sources and Methods*.
- C.S.O. (1990), *Input - Output Transactions Tables: 1983-84*, CSO-GOI.
- C.S.O. (1991), *National Accounts Statistics*.
- Chitre, V. and Naik, U. (1989), *Integration of Money and Real Analysis in an Empirically Estimable Applied General Equilibrium Framework*, Presented in the International Conference on Methods of Planning in Mixed Economics, IGIDR, Bombay, January, 5-7.
- Clark, Colin (1937), *National Income and Outlay*, Macmillan, London.
- Clements, K.W. (1980), "A General Equilibrium Econometric Model of the Open Economy", *International Economic review*, Vol.21: 469-488.
- Clower, R.W. (1967), "A Reconsideration of the Microfoundations of Monetary Theory", *Western Economic Journal*, 6 : 1-8.
- Copeland, M.A. (1935), "National Wealth and Income - An Interpretation", *Journal of the American Statistical Association*, Vol.XXX, No.190 : 377-386.
- Copeland, M.A. (1937), "Concepts of National Income", *Studies in Income and Wealth*, Vol.I, National Bureau of Economic Research, New York : 3-63.
- Debreu, G. (1959), "Theory of Value", New York : Wiley.
- Decaluwe, B. and Martens, A. (1987), *Developing Countries and General*

- Equilibrium Models : A Review of the Empirical Literature*, IDRC Report No., IDRC-MR 155e, International Development Research Centre, Ottawa, Canada.
- Demery, D. and Demery, L.(1992), *Adjustment and Equity in Malaysia*, OECD, Paris.
- Dervis, K., de Melo, J. and Robinson, S. (1982), *General Equilibrium Models for Development Policy*, Cambridge University Press.
- Desai, M. (1989), "Endogenous and Exogenous Money"; In Eatwell, J., Milgate, M. and Newman, P. (ed.), *The New Palgrave : Money*, The Macmillan Press Limited.
- Devarajan, S., Lewis, J.D. and Robinson, S. (1986), *A Bibliography of Computable General Equilibrium (CGE) Models Applied to Developing Countries*, Working Paper No.400, Department of Agricultural and Resource Economics, University of California at Berkeley.
- Dewatripont, M. and Michel, G. (1987), "On Closure Rules, Homogeneity and Dynamics in Applied General Equilibrium Models", *Journal of Development Economics*, Vol.26.
- Dornbusch, R. and Giovannini, A. (1990), "Monetary Policy in the Open Economy" in Friedman, B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Elsevier Science Publishers, B.V. : 1231-1303.
- Duffie, D. (1990), "Money in General Equilibrium Theory", in Friedman, B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Vol. I, Elsevier Science Publishers, B.V.: 80-101.
- Easterly, W.(1990), "Portfolio Effects in a CGE Model : Devaluation in a Dollarized Economy" in Taylor, L.(ed.), *Socially Relevant Policy Analysis: Structuralist Computable General Equilibrium Models for the Developing World*, MIT Press, Cambridge, Mass.
- Eckhaus, R.S., Mc Carthy, F.D.and Mohie - eldin Amr (1981), "A Social Accounting Matrix for Egypt", *Journal of Development Economics*, Vol.9 : 183-203

- Feltenstein, A. (1984), "Money and Bonds in a Disaggregated Open Economy", in Scarf H. and Shoven, J.B. (ed.), *Applied General Equilibrium Analysis*, Cambridge, Cambridge University Press.
- Feltenstein, A. (1986), "An Intertemporal General Equilibrium Analysis of Financial Crowding Out : A Policy Model and an Application to Australia", *Journal of Public Economics*, 31 : 79-104.
- Fisher, I. (1930), *The Theory of Interest*, New York : Macmillan.
- Foley, D. (1989), "Money in Economic Activity", in Eatwell, J, Milgate M. and Newman, P. (ed.), *The New Palgrave : Money*, The macmillan Press Limited.
- Friedman, M. (1956), "The quantity Theory of Money : A Restatement", in Friedman, M. (ed.), *Studies in the Quantity Theory of Money*, Chicago : University of Chicago Press.
- Fullerton, D.; Shoven, J. and Whalley, J. (1983), "Replacing the U.S. Income Tax with a Progressive Consumption Tax", *Journal of Public Economics*, 20: 3-23.
- Gale, D. (1982), *Money : In Equilibrium*, Cambridge University Press.
- Gale, D. and Hellwig, M. (1984), *A General-Equilibrium Model of the Transactions Demand for Money*, CARESS Working Paper 85-07, University of Pennsylvania.
- Ginsburgh, V. and Wealbroeck, J. (1981), *Activity Analysis and General Equilibrium Modeling*, Amsterdam, North-Holland.
- Ginsburgh, V. and Wealbroeck, J. (1984), "Planning Models and General Equilibrium Activity Analysis", in Scarf, H.E. and Shoven, J.B. (ed.), *Applied General Equilibrium Analysis*, Cambridge, Cambridge University Press.
- Goldfeld, S.M. (1989), "Demand for Money: Empirical Studies", in Eatwell, J, Milgate, M. and Newman, P. (ed.), *The New Palgrave : Money*, The Macmillan Press Limited.
- Goldfeld, S.M. and Daniel, E.S. (1990), "The Demand for Money", in Friedman, B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Elsevier Science Publisher, B.V.: 298-355.

- Grandmont, J.M. (1977), *Temporary General Equilibrium Theory*, *Econometrica*, Vol.45.
- Grandmont, J. M. (1983), *Money and Value : A Reconsiderations of Classical and New Classical Monetary Theories*, Cambridge University Press : 535-572.
- Grossman, H.I. (1989), "Monetary Dis-equilibrium and Market Clearing", in Eatwell, J., Milgate, M. and Newman, P. (ed.), *The New Plagrove : Money*, The Macmillan Press Ltd.
- Gruenbaum, Ludwig (1941), National Income and Outlay in Palestine, Economic Research Institute of the Jewish Agency of Palestine, Jerusalem.
- Gunning, J.W. and Keyzer, A.M. (1995), "Applied General Equilibrium Models for Policy Analysis", in Srinivasan, T.N. and Behrman, J. (ed.), *the Handbook of Development Economics*, Vol III : 2026 - 2107.
- Gurely, J.G. and Shaw, E.S. (1955), "Financial Aspects of Economic Development", *American Economic Review*, September.
- Gurely, J.G. and Shaw, E.S. (1960), *Money in a Theory of Finance*, Washington, DC : Brookings Institute.
- Handa, Jagdish and Nigam, Ashok (1990), *Devaluation Policy and The Indian Economy*, S. Chand and Company Ltd., New Delhi.
- Hahn, F. H. (1965), "On Some Problems of Proving the Existence of Equilibrium in a Monetary Economy", in Hahn, F.H. and Brechling, F.P.R. (ed.), *The Theory of Interest Rates*, London : Macmillan : 126-135.
- Hahn, F.H. (1971), "Equilibrium with Transactions Costs", *Econometrica*, Vol. 39 : 417-439.
- Hahn, F.H. (1973), "On Transactions Costs, Inessential Sequential Economies and Money", *Review of Economic Studies*, Vol.40 : 449-461.
- Hahn, F.H. (1975), "Money and General Equilibrium", *Indian Economic Journal*, 23, Special Number in Monetary Economics, October-December.
- Hansen, B.(1970), "A Survey of General Equilibrium Systems", *Economics Handbook Series*, Mc Graw Hill Book Company.

- Harberger, A. C. (1962), "The Incidence of the Corporate Income Tax", *Journal of Political Economy*, 70(3) : 215-240.
- Hicks, J.R. (1942), *The Social Framework*, Calrendon Press.
- Hudson, E.A. and Jorgenson, D.W. (1975), "U.S. Energy Policy and Economic Growth 1975-2000", *Bell Journal of Economics and Management Science*, 5(2), Autumn: 461-514.
- de Janvry, A., Sadoulet, E. and Fargeix, A. (ed.) (1991), *Adjustment and Equity in Ecuador*, OFCD, Paris.
- Jemio, L.C. and Jansen, K. (1993), *External Finance, Growth and Adjustment : A Computable General Equilibrium Model for Thailand*, Working Paper - Sub - Series on Money, Finance and Development - No.46 March, Institute of Social Studies, The Netherlands.
- Johansen, L. (1960), *A Multisectoral Study of Economic Growth*; Amsterdam, North-Holland.
- Jorgenson, D.W. (1963), "Capital Theory and Investment Behaviour", *American Economic Review, Papers and Proceedings*, 53.
- Keynes, J.M. (1936), *The General Theory of Employment, Interest and Money*, London Mcmillan.
- Kirman, A. P. (1992), " Whom or What Does the Representative Individual Represent?", *Journal of Economic Perspectives*, 6 : 117-136.
- Kumar, Jagdish, Sarkar, A.K. and Narain, Pratap (1977), "National Balance Sheet for India - an Exercise", *The Journal of Income and Wealth*, Vol.1, No.2, April.
- Lambert, S. and Suwa, A. (1992), "Application of a Numerical Model 1980-86", in Schneider, H. (ed.) *Adjustment and Equity in Cote D'Ivoire*.
- Levhari, D. and Patinkin, D. (1968), "The Role of Money in a Simple Growth Model", *The American Economic Review*, Vol. 58, No.4, September.
- Levy, S. (1987), "A Short Run General Equilibrium Model For A Small Open Economy", *Journal of Development Economics*, Vol.25 : 63-88.

- Lewis, J.D. (1992), "Financial Repression and Liberalization in a General Equilibrium Model With Financial Markets", *Journal of Policy Modeling*, Vol. 14, No.2 : 135-166.
- Lindsey, D.E. and Wallich, H.C. (1989), "Monetary Policy", in Eatwell, J., Milgate, M. and Newman, P. (ed.), *The New Palgrave : Money*, the Macniellan Press Limited.
- Lucas, R.E. (1972), "Expectations and the Neutrality of Money", *Journal of Economic Theory*, 4.
- Mansur, A. and Whalley, J. (1984), "Numerical Specification of Applied General Equilibrium Models : Estimation, Calibration and Data", in Scarf, H.E. and Shoven, J.B. (ed.), *Applied General Equilibrium Analysis*, Cambridge University press.
- Martel, R.J. (1996), "Heterogeneity, Aggregation and a Meaningful Macroeconomics" in David Colander (ed.), *Beyond Microfoundation : Post Walrasian Macroeconomics* : 127-143.
- Mc Callum, B.T. and Goodfriend, M.S. (1989), "Demand for Money : Theoretical Studies", in Eatwell, J., Milgate, M. and Newman, P. (ed.), *The New Palgrave : Money*, The Macmilan Press Limited.
- de Melo, J. (1988), "Computable General Equilibrium Models for Trade Policy Analysis in Developing Countries : A Survey", *Journal of Policy Modeling*, 10 : 469-503.
- Mercenier, J. (1987), "Tariff change, Foreign Capital and Immiserization : A General Equilibrium Evaluation of the Latin American Case", *Journal of Development economics*, Vol.26 : 437-438.
- Miller, M.H. and Orr, D. (1966), "A Model of the Demand for Money by Firms", *Quarterly Journal of Economics*, 80, August : 413-435.
- Mohanty, D. And George, A. (1989), "Rural - urban Income Series : Some Estimates", *Reserve Bank of India - Occasional Papers*, Vol.10, No.4, December.

- Mohanty, Deepak (1994), "Stock of Financial Assets in India-An Estimate, 1961-1990", *Journal of Income and Wealth*.
- Morrison, C. (1991), *Adjustment and Equity in Morocco*, Paris, OECD, Development Centre.
- National Council of Applied Economic Research (NCAER) (1964), *Attitudes towards and Motivations for Saving*, New Delhi.
- NCAER (1976), *Household Income and its Disposition*, Vol. I & II (mimeo).
- National Sample Survey Organization (1985), *Report on the Third Quinquennial Survey on Consumer Expenditure*, 38th Round, January-December., 1983, No. 319.
- Niehans, J. (1971), "Money and Barter in General Equilibrium with Transaction Costs", *American Economic Review*, 61(5).
- Nsengiyumva, F. and Decaluwe, B. (1992), *Impact of Economic Policies in a Credit Rationed Economy : Interaction With a Real and Financial CGE Model Applied to Rwanda*, Department of Economics, Laval University, Canada.
- Orphanides, A. and Solow, R. (1990), "Money, Inflation and Growth", in Friedman, B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Vol. I; Elsevier Science Publisher, B.V. : 223-262.
- Ostroy, J.M. and Starr, R.M. (1990), "The Transactions Role of Money", in Friedman, B.M. and Hahn, F.H. (ed.), *Handbook of Monetary Economics*, Vol. I; Elsevier Science Publishers. 3-62.
- Panda, M.K. and Sarkar, H. (1984), *Monetary Feedbacks in a Macro - Model for India : Expansionary Fiscal Policy*, NCAER, New Delhi, Mimeo.
- Panda, M.K. and Sarkar, H. (1986), "Quantity-Price-Money Interaction in a CGE Model with Applications to Fiscal Policy", *Margin*.
- Pandit, B.L. (1991), *The Growth and Structure of Savings in India*, Oxford University Press.

- Patinkin, D. (1965), *Money, Interest and Prices - An Integration of Monetary and Value Theory*, Harper Row; Publishers, New York.
- Patinkin, D. (1989), "Neutrality of Money", in Eatwell, J., Milgate M. and Newman, P. (ed.), *The New Palgrave : Money*, The Macmillan Press Ltd.
- Pereira, A.M. and Shoven, J.B. (1988), "Survey of Dynamic Computational General Equilibrium Models for Tax Policy Evaluation", *Journal of Policy Modeling*, 10 (3) : 401-436
- Piggott, J. and Whalley, J. (ed.) (1985), *New Developments in Applied General Equilibrium Analysis*, Cambridge, Cambridge University Press.
- Pigou, (1949), *The Veil of Money*, London, Macmillan.
- Pyatt, G. and Roe, A. (1977), *Social Accounting for Development Planning with Special Reference to Sri Lanka*, International Labour Organization, Cambridge University press, Cambridge.
- Radner, R. (1968) "Competitive Equilibria Under Uncertainty", *Econometrica*, 36 : 31-58.
- Radner, R. (1990), " Uncertainty and General Equilibrium", in Eatwell, J., Milgate, M. and Newman P. (ed.), *The New Palgrave : General Equilibrium*, The Macmillan Press Limited.
- Registrar General of India (19), *Population Census (1981)*.
- Reserve Bank of India (RBI) (1987), *All India Debt and Investment Survey-Assets and Liabilities of Households as on the 30th June 1981*.
- RBI Bulletin (1980), *Flow of Funds in the Indian Economy, 1970-71 to 1976-77*, March
- RBI Bulletin (1982), *Finances of Government Companies, 1978-79*, March.
- RBI Bulletin (1985), *India's International Investment Position - 1977-78 to 1979-80*, April.
- RBI Bulletin (1986), *Ownership of Government (Rupee) Debt : March 31, 1982 and Preliminary Trends in 1983- 84*, January.
- RBI Bulletin (1988), *Flow of Funds Accounts of the Indian Economy*, December.

- RBI Bulletin (1991), *Flow of Funds Accounts of the Indian Economy : 1980-81 to 1985-86*, January.
- Robinson, S. (1989), "Multisectoral Models", *Handbook of Development Economics*, Vol.2, Amsterdam : North-Holland : 885-947.
- Robinson, S. and Rolland-Holst, D. (1988), "Macroeconomic Structure and Computable General Equilibrium Models", *Journal of Policy Modeling*, 10(3) : 353-375.
- Robinson, S. and Tyson, L. (1984), "Modeling Structural Adjustment : Micro and Macro Elements in a General Equilibrium Framework", in Scarf, H. and Shoven, J. (ed.), *Applied General Equilibrium Analysis*, Cambridge University Press.
- Rosensweig, J. and Taylor, L. (1990), "Devaluation, Capital Flows, and Crowding Out : A CGE Model with Portfolio Choice for Thailand", in Taylor, L. (ed.), *Socially Relevant Policy Analysis : Structuralist Computable General Equilibrium Models for the Developing World*, MIT Press Cambridge, Mass. (Also see Mimeo, the Department of Economics, MIT, Cambridge, MA (1984)) : 303-332.
- Samuelson, P.A. (1958), "An Exact Consumption-Loan Model With or Without the Social Contrivance of Money", *Journal of Political Economy*, 66.
- Sarkar, A.K. and Murthy, G.S. (1977), "Estimates of Household Saving in India by Rural and Urban Areas", *The Journal of Income and Wealth*, Vol.I, No.2, April.
- Sarkar, H. and Subba Rao, S.V.(1981a), "A Short Run Forecasting Model for India for 1980-81", *Margin*, Vol.13, No.4, July.
- Sarkar, H. and Subba Rao, S.V.(1981b), "A Social Accounting Matrix of India for 1980-81", *Margin*, Vol.13, No.4, July.
- Sarkar, H. and Subba Rao, S.V. (1981c), "A Short Run Forecasting Model for India: Structure and Uses", *Indian Economic Review*, Vol.16. Nos. 1 and 2.
- Scarf, H.E. (1967), "On the Computation of Equilibrium Prices", in Feliner, W.J.(ed.), *Ten Economic Studies in the Tradition of Irving Fisher*, New York, Wiley.
- Scarf, H.E. (With Hansen, T.) (1973), *The Computation of Economic Equilibria*, New Haven, Yale University Press.

- Scarf, H.E. and Shoven, J.B. (ed.) (1983), *Applied General Equilibrium Analysis*, Cambridge : Cambridge University Press.
- Schneider, H. (1992), *Adjustment and Equity in Cote D'Ivoire*, Paris, OECD.
- Sen, A.K. (1963), "Neo-classical and Neo-Keynesian Theories of Distribution", *Economic Record*, 39 : 53-66.
- Sen, Pronab (1987), *Stabilization and Adjustment Policies and Programmes*, Wider - Country Study (13) - India, March.
- Shackle, G.L.S. (1966), *The Nature of Economic Thought : Selected Papers, (1955-1964)*, Cambridge University Press.
- Shoven, J.B. and Whalley, J. (1973), "General Equilibrium With Taxes : A Computation Procedure and an Existence Proof", *Review of Economic Studies*, 60, October.
- Shoven, J.B. and Whalley, J. (1984), "Applied General Equilibrium Models of Taxation and International Trade : An Introduction and Survey", *Journal of Economic Literature*, Vol.XXII, September : 1007-1051.
- Shrivastava, N.N. (1978), "A Note on the Second Working Group Report on Money Supply in India : Concepts, Compilation and Analysis", in *Recent Developments in Monetary Theory and Policy : Papers and Proceedings of the Seminar held at Bombay in Jan.*, RBI Economic Department, Bombay.
- Slemrod, J. (1983), "A General Equilibrium Model of Taxation with Endogenous Financial Behaviour", in Feldstein, M. (ed.), *Behavioural Simulation Methods in Tax Policy Analysis*, NBER, University of Chicago Press.
- Steiger, O. (1989), "Monetary Equilibrium", in Eatwell, J., Milgate, M. and Newman, P. (ed.), *The New Palgrave : Money*, The Macmillan Press Ltd.
- Stone, R. (1970), *Mathematical Models of the Economy and Other Essays*, Chapman and Hall, London.
- Stein, J.L. (1982), *Monetarist, Keynesian and New-Classical Economics*, Basil Blackwell Publisher Limited.

- Stone, R. and A. Brown, (1962), *A Programme for Growth*, Vol. 1-6, Cambridge University, Department of Applied Economics.
- Stone, R. and Croft - Murray, G.(1959), *Social Accounting and Economic Models*, Bowes and Bowes, London.
- Subba Rao, K.G.K. and Nag, A.K. (1990), "On Disaggregation of Household Saving into Rural and Urban Components", *Reserve Bank of India Occasional Papers*, Vol.11, No.2.
- Taylor, L. (1983), *Structuralist Macroeconomics : Applicable Models for the Third World*, Basic Books, Inc. Publisher, New York.
- Taylor, L. (1990), "Structuralist Computable General Equilibrium Models", in Taylor, L. (ed.), *Socially Relevant Policy Analysis : Structuralist Computable General Equilibrium Models for the Developing World*, MIT Press, Cambridge, Mass.
- Taylor, L. and Lysy, F.J. (1979), "Vanishing Income Redistributions : Keynesian Clues about Model Surprises in the Short Run", *Journal of Development Economics*, 6 : 11-29.
- Thorbecke, E. in Collaboration with Kim, B, Roland- Holst, D. and Berrian, D. (1992), "A Computable General Equilibrium Model Integrating Real and Financial Transactions in Indonesia", E. (ed.), *Adjustment and Equity in Inonesia*, Cpt.4.
- Tinbergen, J. (1937), *An Econometric Approach to Business Cycle Problems*, Hermann et.al., Paris.
- Tinbergen, J. (1939 a), *A Method and its Application to Investment Activity; League of Nations*, Geneva.
- Tinbergen, J. (1939 b), *Business Cycles in the United States of America, 1919-32*, League of Nations, Geneva.
- Tobin, J. (1956), "The Interest - Elasticity of Transactions Demand for Cash", *Review of Economics and Statistics*, 38 : 241-247.

- Tobin, J. (1958), "Liquidity Preference as Behaviour Toward Risk", *Review of Economic Studies*, 52 : 65-86
- Tobin, J. (1965), "Money and Economic Growth", *Econometrica*, Vol.33, No.4, October.
- Tobin, J. (1969), "A General Equilibrium Approach to Monetary Theory", *Journal of Money, Credit and Banking*, 1, February : 15-24.
- Tobin, J. (1982), "Money and Finance in the Macroeconomic Process", *Journal of Money, Credit and Banking*, Vol.14, No.2 : 171-204.
- Tobin, J. (1989), "Financial Intermediaries", in Eatwell, J., Milgate, M. and Newman, P. (ed.), *The New Palgrave : Money*, The Macmillan Press Limited.
- Tsiang, S.C. (1988), "The Flow Formulation of a Monetary Model for an Open Economy and the Determination of the Exchange Rate, in Kohen, M. and Tsiang, S.C. (eds.), *Finance Constraints Expectations and Macroeconomics*, Clarindon Press, Oxford.
- U.K. Treasury (1941), *An Analysis of the Sources of War Finance and an Estimate of the National Income and Expenditure in 1938 and 1940*, HMSO, London.
- United Nations (1947), "Measurement of National Income and the Construction of Social Accounts", *Studies and Reports on Statistical Methods*, No.7, United Nations, Geneva.
- United Nations, Statistical Office (1968), *A System of National Accounts Studies in Methods*, Series F., No.2.
- Venkatachalam, T.R. and Sarma, Y.S.R. (1977), "Structure and Trends in the National Balance Sheet of India", *Journal of Income and Wealth*, April : 95-143.
- Vongpradhip, D. (1987), *A CGE Model with Real and Financial Sector Linkages*, Presented at the Macroeconomic Research Conference, Thailand Development Research Institute, Bangkok, October.
- Wallace, N. (1980), "The Overlapping Generations Model of Fiat Money", in Kareken, J. and Wallace, N. (ed.), *Models of Monetary Economics*, Federal Reserve Bank of Minneapolis.

Yeldan, A. E. (1997), "Financail Liberalization and Fiscal Repression in Turkey: Policy Analysis in a CGE Model With Financial Markets", *Journal of Policy Modeling*, 19(1) : 79-117.