THE DYNAMICS OF KEYNESIAN MONETARY GROWTH

MACROFOUNDATIONS

Carl Chiarella
and Peter Flaschel

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This book is in the tradition of non-market clearing approaches to macrodynamic analysis. It builds a series of integrated disequilibrium growth models of increasing complexity, which display the economic interaction between households, firms and government across labor, goods, money, bonds, and equities markets. Chiarella and Flaschel demonstrate how macrodynamics can be developed in a hierarchical way from economically simple structures to more advanced ones. In addition they investigate complex macrodynamic feedback mechanisms.

The book is organized into seven chapters. Chapter 1 discusses traditional macrodynamic model building. Chapters 2–4 show how Keynesian disequilibrium growth can be obtained from Tobin and Keynes–Wicksell monetary growth models. Chapter 5 treats the cases of substitution in production, and chapter 6 provides the working model of the book. Chapter 7 discusses further extensions and gives an outlook on future work.

CARL CHIARELLA is Professor of Finance at the University of Technology, Sydney. He holds doctorates in applied mathematics and in economics from the University of New South Wales. His main research interests are economic dynamics and quantitative finance. His work appears in journals such as *JEDC*, *JEBO*, *Macroeconomic Dynamics*, *Economic Modelling*, *Applied Mathematical Finance* and the *Journal of Computational Finance*. He is the author of *Elements of a Nonlinear Theory of Economic Dynamics* and the co-author, with Peter Flaschel, of *Disequilibrium, Growth and Labor Market Dynamics*.

PETER FLASCHEL is Professor of Economics at the University of Bielefeld. He completed his doctoral thesis in mathematics at the University of Bonn and his habilitation thesis in economics at the Free University of Berlin. He publishes extensively on economic theory and macroeconomic dynamics in journals such as *Econometrica*, *JEBO*, *JEDC*, *Macroeconomic Dynamics*, *Economic Modelling* and *The Manchester School*. He is the author of *Macrodynamics*, *Dynamic Macroeconomics* and the co-author, with Carl Chiarella, of *Disequilibrium, Growth and Labor Market Dynamics*.

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CARL CHIARELLA

School of Finance and Economics
University of Technology, Sydney
Australia

PETER FLASCHEL

Department of Economics
University of Bielefeld
Germany

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Foreword

Richard H. Day

In his effort to reorient economic theory so that it might offer an explanation of severe and prolonged recessions and insights concerning the possibilities and limitations of fiscal and monetary policies for dealing with them, Keynes introduced two factually based assumptions: first, price and wage stickiness; second, independently determined savings and investment variables. In developing the implications of these two facts, Keynes exploited the concept of demand, not at the usual level of the market for a single good, but at the level of the entire economy for the aggregate of all goods. Thus, for example, instead of an Engle curve for a single good, which gives the demand for a good in terms of real income, he exploited the dependence of aggregate demand for all goods on income, that is, the consumption function. With the real money rate of interest as the only endogenously determined price – in this case the price (or opportunity cost) of using money as an idle balance – the money market is seen to play a potential role; potential, because its role depends on sensitivity to interest rates on the markets for goods and money.

Although his analytical derivations were static and focused on a new kind of persistent unemployment situation, Keynes had in mind a dynamic theory. He fully intended to illuminate the tendency of the market economy to fluctuate due to the interactions between the monetary and real goods sectors.

Keynes' ideas were obviously relevant. Within a decade they led to a new field of economics based on a reduction of the microeconomics of many goods and prices to a macroeconomics based on a measure of the aggregate of all goods and money. Extreme assumptions were necessary to reduce the theory to the graphical dimensions required by contemporary pedagogy. This yielded the standard by which the theory became widely known: Hicks' ingenious IS–LM framework.

The deficiencies of this static, simplified version were obvious. Instead of prices and wages that adjusted stickily, it assumed prices that did not

adjust at all; it included investment but not capital accumulation; it treated the money supply as exogenous instead of incorporating a dependence on credit conditions and government finance. These deficiencies motivated a large body of work aimed at reducing these deficiencies, work that continues to the present as readers of this volume will come to appreciate. But, in the meantime, a quite different body of work veered off this (then) mainstream approach. Instead of building on aggregate supply and demand of heterogeneous firms and households out of equilibrium, it built on the concept of a Robinson Crusoe or a representative agent in intertemporal equilibrium. Since only a single agent is modeled, there is no problem of coordination among markets, no need to consider savings and investment out of equilibrium, and no need to consider fluctuations caused by the interaction of money markets and goods. Instead, the source of fluctuation is sought in terms of unexplained, exogenous shocks which push equilibria around.

The intellectual advantage of this approach lies in its reliance on the equilibrium assumption which is embodied in the principle of optimality. It enables the derivation of "optimal trajectories" for consumption, labor, and capital. By means of an extended duality principle, the supporting competitive equilibrium price trajectories are implied. Along such equilibrium paths involuntary unemployment and excess capacity do not occur.

This is not the occasion to address in detail the relationship between these two approaches except to emphasize that the dynamic, aggregate supply/demand approach represents the economy as one that adjusts out of perfect coordination to disequilibrium signals, in contrast to the equilibrium approach which represents the economy as a perfectly coordinated process with no need for mechanisms of adaptation to deal with discrepancies among the constituent parts.

As the American academic establishment expanded during the last half-century into a new kind of mass market for education and science, it began to exhibit a herding phenomenon not unlike fashions in consumer goods. For a time, the macroeconomic fashion leaders were centered at a Harvard/MIT/Penn nexus in the persons of Hansen, Duessenberry, Samuelson, and Klein. Out-of-equilibrium thinking ruled macroeconomic theory and econometrics until the mid 1970s. When the leading macroeconomic equilibrium pundit moved from Carnegie Mellon to Chicago, a new fashion of equilibrium macroeconomics emerged with a new center of gravity. The new fashion leaders spread in due course to Harvard and Stanford and many points in between and beyond.

In the meantime, the serious work of extending the out-of-equilibrium aspect of macroeconomics so as to remove its deficiencies, so as to improve its ability to explain real world events and so as to improve its potential for

policy repercussion analysis has continued. In England and especially in Germany and Italy, as well as to a lesser extent in the USA, this stream of work has continued until a more general and more satisfactory theory has emerged. Its potential for illuminating macroeconomic phenomena has been enhanced and its potential for providing new understanding of fiscal and monetary policy improved.

This book by Chiarella and Flaschel is a contribution to this out-of-equilibrium stream of macroeconomic theory. Beginning with Tobin's monetary growth analysis, it successively introduces realistic, complicating relationships that eliminate, step by step, some of the major deficiencies in the earlier Keynesian models. It gives a meticulous analysis of each model's properties and an equally meticulous explanation of each model's relationship to the contributions of other scholars. Anyone who wants to understand the development of macroeconomic thinking as a whole and who wants to see the modern development of the out-of-equilibrium approach, will want to study this volume.

The authors dramatically demonstrate the power of the dynamic point of view, and the potential for explaining apparent anomalies by endogenous economic forces. For example, the scatter of data suggesting a relationship between the rate of price changes and unemployment has usually been explained in terms of shifting Phillips curves. However, when the scattered dots are connected in a time sequence, irregular Phillips *spirals* are revealed. To theorists of dynamics, such spirals suggest an underlying endogenous mechanism, not stationary points at the intersection of exogenously shifting curves. By chapter 4 of the present volume, somewhat similar spirals are shown to emerge from endogenous, out-of-equilibrium, real/monetary interactions, a finding of great potential importance.

The authors modestly present their findings as work in progress, and so it is, but it is, nonetheless, a work of consummate scholarship. I have been fortunate in having been able to follow the gradual accumulation of the authors' and their collaborators' studies to their present state. It is an appropriate stage to present it in this integrated form. Every serious student of macroeconomic theory will want to know what they have done, for in this work they will find a comprehensive analytical exegesis of the steps by which the theory has reached its present state at the frontier, and an excellent jumping off point for further research. It seems to me likely that it is only a matter of time before empirical studies, based on models of the kind analyzed here, will achieve a new breakthrough in understanding real economic data and a new basis for predicting policy analysis.

Preface

"Macroeconomics has never reached a consensus and probably never will. The subject is too diverse and the approaches too varied for that to become likely." (S. Turnovsky, *Methods of Macroeconomics Dynamics*)

This book provides the reader with a systematic study of macrodynamic models of monetary growth in the Tobin, the Keynes–Wicksell and the Keynesian (if it exists) tradition. Our point of departure is, therefore, the core of descriptive macrodynamic models of monetary growth of primarily traditional origin; recent contributions of neo- or post-Keynesian type as well as other schools of thought are given scant consideration in this book. Instead, we considerably extend and refine the aforementioned model types so that they give rise to a hierarchical sequence of fully integrated macrodynamic models, each providing an improvement on the shortcomings of one or more structural equations of its predecessor. In this way we arrive at the formulation of an integrated model of the Keynes–Metzler type, with both sluggish price and quantity adjustment and under- or overemployment of both labor and capital, which may be considered as the working Keynesian prototype model of IS–LM growth.

Yet, this model type also has its shortcomings, so the hierarchical structure proposed here does not end with it, but rather will be continued in future research by way of more refined treatments of asset markets, of expectations, of the role of income distribution, of international trade in goods and financial assets, of stochastic influences, and so on. In this regard we view this book as providing "macro foundations," or a systematic way to proceed from elementary studies of models of cycles and growth with a full range of markets (labor, goods, money, bonds, equities) to ever more refined and detailed ones. Partial "micro foundations" for the structures exist in the literature and, of course, must be improved as well, but this has to be done based on the knowledge of what indeed has to be micro

founded, and thus put on a firmer basis.

This book is the product of a continuing collaboration between the authors which began in 1992 when the first author was on study leave at the University of Mannheim in Germany. At a number of meetings during that period we realized that we shared a strong, common desire to set up a framework within which the non-market-clearing approach to dynamic macroeconomics could be built in a systematic, consistent, and transparent manner, starting from mainstream contributions to disequilibrium growth developed in the sixties, seventies, and eighties. We have sought to construct a framework in which such mainstream contributions to the non-market-clearing paradigm could be reformulated on a common basis and extended systematically, leading successively to more and more coherent integrated models of disequilibrium growth with progressively richer interactions between markets and sectors. In this way, we sought a framework to which further refinements, in terms of more markets, more agents, more advanced behavior of agents, could be added or inserted in a natural way, far beyond even the general working model of traditional Keynesian monetary growth that is the focus of this book. Indeed, in other work we have already started the task of these further extensions in several directions, and these are alluded to in the final chapter. Of course, we must leave to the reader to judge whether we have succeeded in our aims of providing what we would call macro foundations of traditional macrodynamics on the basis of which more recent contributions to the non-market-clearing approach to economic dynamics may be reconsidered, evaluated and used as macro perspectives for the project we have begun with this book.

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The work has progressed thanks to almost annual visits since 1993 of Peter Flaschel to the School of Finance and Economics at the University of Technology, Sydney and almost equally frequent visits by Carl Chiarella to the Faculty of Economics at the University of Bielefeld. We are both deeply indebted to our respective institutions for the very strong financial support we have received which made these various visits possible, as well as other infrastructure support which allowed this project to be brought to completion.

A number of professional colleagues deserve special thanks. In particular Willi Semmler, who has offered constant encouragement and support throughout this project and the other related projects of the authors which are discussed in the final chapter. Richard Day, Reiner Franke, Gangolf Groh, Christian Groth, Cars Hommes, Klaus Jaeger, Reinhard John, Ingrid Kubin, Thomas Lux, Hans-Walter Lorenz, Reinhard Neck, Matthias Raith, Hans-Jürgen Ramser, Rajiv Sethi, and Peter Skott offered valuable comments as discussants at presentations of aspects of the material of this book at various international conferences and on other occasions. Of course, none of the aforementioned is responsible for the remaining errors in this work, neither with respect to form nor with respect to substance.

We owe a particular debt of gratitude to Alexander Khomin, formerly of the School of Finance and Economics at the University of Technology, Sydney, and now at the Commonwealth Trading Bank, Australia. He designed and built the C + + computer package which we used to perform many of the simulations of the model reported both here and in our other published work.

We are indebted to the anonymous referees who read the original version of the manuscript and offered many suggestions for its improvement. We would also like to thank Ashwin Rattan of Cambridge Univer-

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Notation

The notation employed throughout this book is subdivided into statically or dynamically endogenous variables and parameters, a subdivision which is here presented from the perspective of chapter 7:[1]

A Statically or dynamically endogenous variables[2]

Y^p	Potential output
Y	Output ($\neq Y^p$ = potential output in general)
Y_c^D, $Y_{c,e}^D$	Disposable income (index c: of capitalists, index e: perceived)
Y^d	Aggregate demand $C + I + \delta K + G$
Y^e	Expected aggregate demand
L^w, L^d	Employed workforce, employment of the employed workforce ($L^d = L^w$ with the exception of chapter 7)
C	Consumption
I	Investment
I^p	Planned investment $I + \mathscr{I}$ ($I^a = I + \dot{N}$ actual investment)
r	Nominal rate of interest (price of bonds $p_B = 1$)
p_e	Price of equities
S_p	Private savings
S_f	Firms' savings
S_g	Government savings
$S = S_p + S_f + S_g$	Total savings
T	Real taxes (T_w, T_c of workers and capitalists)
G	Government expenditure

[1] The NAIRU-employment rate – denoted by $\bar{V}$ in the following is the Non-Accelerating-Inflation-Rate-of-Utilization (here of the labor force), i.e., the employment-complement of the NAIRU of the literature. Starting with chapter 4 we shall make use in addition of a NAIRU concept $\bar{U}$ with respect to the rate of capacity utilization U of the capital stock K.

[2] Some of these variables will be given parameters in the earlier chapters of this book.

ρ	Rate of profit (expected rate of profit ρ^e)
$V = L^w/L$	Rate of employment ($\bar{V}$ *the NAIRU employment rate*)
$V^w = L^d/L^w$	Utilization rate of the employed
$U = Y/Y^p$	Rate of capacity utilization ($\bar{U}$ the NAIRU rate of capacity utilization)
K	Capital stock
w	Nominal wages
p	Price level
p^*	p-star price level of the FED/German Bundesbank
$\bar{v}$	Velocity of money circulation
π	Expected rate of inflation (medium run average)
M	Money supply (index d: demand, growth rate μ_0)
L	Normal labor supply
B	Bonds (index d: demand)
E	Equities (index d: demand)
W	Real wealth
N	Stock of inventories
N^d	Desired stock of inventories
$\mathscr{I}$	Desired rate of inventory change
γ	Trend growth rate of the capital stock
$n = n_1$	Natural growth rate
n_2	Rate of Harrod neutral technical change
$v = N/K$	Inventory–capital ratio
ω	Real wage ($u = \omega/x$ the wage share)
$u = \omega/x$	Wage share (x is labor productivity, see below)
$y = Y/K$	Output–capital ratio

B Parameters (all parameters represent positive scalars)

y^p	Potential output–capital ratio
x	Output–labor ratio (labor productivity)
δ	Depreciation plus inventory rate
i, i_1, i_2	Investment parameters
h_1, h_2	Money demand parameters
μ_0	Steady growth rate of money supply
$\beta_w, \beta_{w_1}, \beta_{w_2}$	Wage adjustment speed parameters
β_p	Price adjustment speed parameter
$\beta_{\pi_1}, \beta_{\pi_2}$	Inflationary expectations adjustment speed parameters
β_v	Rate of employment adjustment parameter
$\beta_{\bar{v}}$	NAIRU adjustment parameter
β_γ	Trend growth adjustment parameter
β_y	Demand adjustment parameter

β_n^d	Desired inventory output ratio
β_n	Inventory or natural growth rate adjustment parameter
β_y^e	Demand expectations adjustment parameter
β_k	Accumulation regime parameter
κ_w, κ_p	Weights of short- and medium-run inflation ($\kappa = (1 - \kappa_w \kappa_p)^{-1}$)
α	Weight with respect to backward and forward looking expectations
τ, τ_c, τ_w	Tax rate (of capitalists and workers) = const. (or $t^n = (T - rB/p)/K = \text{const.}$, $t_c^n = (T_c - rB/p)/K = \text{const.}$)
s_c	Savings ratio (out of profits and interest)
s_w	Savings ratio (out of wages, $= 0$ in this book)
μ_2	Fiscal policy parameter

C Mathematical notation

$\dot{x}$	Time derivative of a variable x
$\hat{x}$	Growth rate of x
l', l_w	Total and partial derivatives
$y_w = y'(l)l_w$	Composite derivatives
r_0, etc.	Steady state values ($\bar{r}$ a parameter which may differ from r_0)
$l = L/K$, etc.	Real variables in intensive form
$m = M/(pK)$, etc.	Nominal variables in intensive form

General introduction

In this book we shall be concerned with the foundations of integrated macromodels of monetary growth dynamics in disequilibrium as they have been laid out (to some extent) in the sixties and the seventies. These foundations are reconsidered and reformulated as well as extended into a uniform and systematic body of macrodynamic models of closed economies with five markets and three agents. The stress here lies on disequilibrium models as we believe that there is an urgent need for progress in this neglected, but nevertheless very relevant, area of macrodynamics. We do not believe that the numerous equilibrium models of monetary growth that have been developed over the last two decades[1] will realize their potential for policy analysis if they are not supplemented and confronted with disequilibrium analyses that try to portray, with more and more descriptive exactness and analytical rigor, the macroeconomy and the policy scenarios to be investigated.

On the one hand completeness of such models is necessary when one wants to provide a systematic and comparative study of them (and their pros and cons) which can then be used as a framework and as a foundation for the further systematic development of this area of macroeconomics. Such a systematic development is almost nonexistent in the literature on disequilibrium monetary growth dynamics. Partial models may of course be of great interest if, as is generally the case, more specialized questions are considered. Yet, it should in principle always be possible to trace back what type of model has been specialized in such a study and what the general model may look like.

On the other hand completeness of monetary growth models with respect to agents and sectoral behavioral descriptions including budget restrictions and with respect to markets and their type of adjustment process is nowadays a compelling prerequisite for a broader acceptance of

[1] See the survey by Orphanides and Solow (1990) for example.

so-called macro ad-hoc (or descriptive) macromodels, to be distinguished from micro ad-hoc macromodels (where ad-hoc refers to the empirical relevance of the micro assumptions that are made). The advantage of such approaches to macro theory indeed lies in the fact that these models can more easily be made complete, and thereby tested with respect to the degree of consistency that is achieved by them, than the many micro ad-hoc models that are now the fashion. These latter models are generally partial in nature because of the restrictions that are caused by the technical complexity of the dynamic intertemporal optimization framework that they employ. Furthermore, the dynamics of such models is by technical necessity generally limited to a study of linearized systems around steady states. Such approaches automatically exclude the type of complex behavior which the models in this book can display.

Complete or integrated macrodynamic models therefore may provide a macro foundation for micro perspectives and be further developed in the light of the achievements obtained from such micro perspectives. Complete disequilibrium macrodynamic models of monetary growth therefore mainly serve the purpose of providing right from the outset a full picture of the economy in states of disequilibrium by means of more or less traditional tools or modules. These modules may subsequently be updated step by step as better descriptions of their micro foundations become available.

As we shall see in this book, there exists now a hierarchically structured class of such models which build upon each other in a step-by-step improvement of the modules they contain. Yet, even though at the end of this book we will be higher up in the hierarchy of our models, there will remain some module formulations that are obviously problematic and which therefore call for significant further improvement. There is thus the need to extend much further the project begun here. Yet, it should have become obvious to the reader by this stage that such a task can be accomplished by continuing to proceed in the manner we have developed in this book. This will indeed give rise to a structured body of theories of monetary growth in disequilibrium, up to the most recent developments of disequilibrium macrodynamics, where insights of earlier achievements are preserved and where a pathway of systematic progress to more convincing and realistic model types becomes visible. This is the main advantage of a method which provides a class of monetary disequilibrium growth macromodels that all attempt to be complete and thereby clearly show the path to their further improvement and the next required step to be taken in their further development.

The resulting prototypes of such models in this book are descriptive in the sense that they generally use traditional macro tools to describe the behavior of the various sectors of their economies. These tools may never-

theless simplify the considered behavior significantly with respect to its descriptive content in order to allow us to proceed from simple building blocks to more elaborate ones in a systematic fashion, thereby filling their descriptive or ad-hoc macro assumptions with more realism step by step. Descriptive components of such macromodels can therefore at first be fairly abstract and stylized in their "descriptive" content, due in particular to the tradition that has been established in the formulation of such components of macromodels. The basic justification for the use of such (sometimes radically simplified) building blocks is that also in this area of macroeconomics one has to start from known model structures and to go from the simple (and abstract) to the more complex (and concrete) by means of a stepwise improvement in the formulation and the analysis of intentionally complete models of monetary growth.

We shall make no attempt here to base the descriptive components of our models on micro assumptions surrounding the concept of representative agents as is now the fashion in macroeconomics,[2] since our central aim is a complete presentation and analysis of the interaction of the three sectors of our economies. This interaction will be made more refined as the book proceeds, leaving a systematic improvement of the behavior of sectors to later studies of these models (where also refinements by means of modern microfounded approaches may be taken into consideration).

The intention of this book on descriptive macrodynamic models thus is to start from the traditional roots of a more or less orthodox formulation of such monetary growth dynamics (in particular Tobin and Keynes–Wicksell models of monetary growth) in order to obtain from them and their detailed presentation and discussion (from the beginning of chapter 4 of the book) a description of a general prototype model which may properly be regarded as a Keynesian one. Such a model, which allows (as should be the case in a Keynesian model) for the investigation of unemployed labor as well as underutilized capital, has rarely been considered in the literature, and certainly not in the fully specified dynamic framework which we shall employ throughout this book.

Instead, a so-called neoclassical production function, and the marginal productivity postulate for the employment of labor, have generally been included in the existing analyses of monetary growth in such a way that only labor is considered as experiencing unemployment (due to nominal wage rigidities).[3] In chapter 5 we shall also allow for neoclassical smooth

[2] Note, however, that most of the (traditional) behavioral relationships we employ have received some micro foundations in the course of their use in macroeconomics.

[3] The exception to this is provided by models of the so-called neo-Keynesian or non-Walrasian type which, however, are seldom as complete as our development and presentation of the working model of Keynesian monetary growth.

factor substitution and then demonstrate that this does not prevent the analysis of underutilized capital in a Keynesian setup. In general, however, we will stick to the simpler assumption of fixed proportions in production, since this makes the Keynesian analysis of underutilized resources much more transparent.

After providing some numerical investigations of the considered models of Tobin, Keynes–Wicksell and Keynes(ian) type with or without smooth factor substitution we shall finally consider two further important extensions of the Keynesian prototype introduced here: a Metzlerian extension of this prototype when IS-disequilibrium is allowed for and a "Marxian" extension of it which avoids the use of "natural" economic magnitudes as much as possible. The final chapter will also point to a variety of omissions in the modeling framework presented here which must be addressed in order to properly make the analysis a Keynesian one, particularly since the behavior of wealth owners is still much too passively modeled in the approaches to monetary growth dynamics presented in this book. Also, investment behavior is still presented far too simply to portray accurately the trade cycle vision of Keynes' *General Theory*. All of these extensions, however, must be left for future research.

We shall consider throughout this book only macroeconomic models which fit into the standard and basic framework of a closed three-sector economy (households, firms, and government), where there exist five distinct markets (for labor, goods, money, bonds [savings deposits], and equities [perfect substitutes of bonds]).[4] Money market transactions are, of course, a mirror image of transactions on the remaining four markets and are to be related to these activities by means of budget restrictions for the three sectors assumed. In table I.1 we use the index d to denote "quantities demanded" and no index in the case of "quantities supplied." Furthermore, since we will use continuous-time models throughout this book we have to distinguish between flow and stock demand and supply since we here follow the macroeconomic tradition which distinguishes between stock and flow constraints in such a setup; see Turnovsky (1977a) and Sargent (1987) for details. This said, the symbols in table I.1 should be clear as to

[4] We restrict ourselves to this standard, basic framework due to our intention to stay, at least initially, very close to orthodox foundations of neoclassical and Keynesian dynamics. The following modeling framework is therefore chosen, initially, as identical to the one that is employed in such a conventional textbook of macroeconomics as that of Sargent (1987); see also Turnovsky (1977a) for a related framework. In this book we shall revise only some of the assumptions (but nevertheless very important ones) that underlie the Sargent approach to complete, or integrated, macroeconomic models. In some respects the contents of this book may thus be characterized as providing simply improved and dynamic counterparts of the three model prototypes that are at the core of Sargent's (1987, part I) mainly static analysis of them.

Table I.1. *Basic structure of closed economies*

	Labor market	Goods market	Money market	Bonds market	Equities market
Households	L	C	$M^d, \dot{M}^d$	$B^d, \dot{B}^d$	$E^d, \dot{E}^d$
Firms:	L^d	$Y, I + \delta K$	—	—	$E, \dot{E}$
Government	—	G	$M, \dot{M}$	$B, \dot{B}$	—

their economic meaning (a detailed list of the notation employed is provided at the front of this book).[5]

Table I.1 shows the basic structure of the closed economies that are considered throughout this book and it is of the same type as the one in Sargent (1987, chs. 1–5) as will become apparent from its further description in chapter 1.

We will model the behavior of our three economic agents in the usual fashion by staying close to behavioral assumptions which are firmly rooted in the tradition of descriptive macroeconomics. This guarantees that the models considered in chapters 2–7 will not depart too much from the established formulations of (textbook) macrodynamic models, though they will be generalized considerably with respect to their degree of integration. As in Turnovsky (1977a), our main aim is to develop and analyze such integrated (or complete) models of monetary growth (of closed economies) in a systematic way. In this respect it is of particular importance that the budget restrictions (BR) of all three sectors, households, firms, government (to be denoted by HBR, FBR, and GBR, respectively), are always fully specified. The behavior of the agents that is assumed to take place within these budget restrictions may, due to the traditional roots of our modeling framework, still not be too convincing. Yet, improved assumptions or derivations for the assumed behavioral relationship can easily be inserted into the complete models employed in this book, thereby changing the description of one or more sectors of the model, but not the overall formulation of the interaction of these sectors. Our conjecture is that such improvements may change details in the models' behavior but not the general finding of this book that the considered models of monetary growth do exhibit a high potential for generating undamped and, if appropriate nonlinearities are assumed, also viable patterns of cyclical growth.

[5] Planned aggregate demand Y^d is, as usual, given by $C + I + \delta K + G$. Note also that table I.1 suggests (again as is customary) that money holdings of firms are considered as unimportant and thus ignored and that there is no bond supply on the side of firms, but only equity financing if necessary.

We start with the most orthodox model of monetary growth that is available in descriptive macroeconomics: the Tobin (1965) extension of the neoclassical growth model which introduces money as a further asset into this otherwise purely real framework. This model will be introduced in chapter 2 in a form that is convenient both with respect to our general assumption of fixed proportions in production as well as from the point of view of the historical development of capitalistic economies. Our particular reformulation of this basic Tobin model will be extended in various directions in chapter 2 leading eventually to a very general formulation of it that serves as a basis for our subsequent introduction of a general model of Keynes–Wicksell type (chapter 3) and later of proper Keynesian type (chapter 4).

The general Tobin model is, however, problematic in its assumption of money-market disequilibrium and the price-adjustment equation that is built upon it. Furthermore its view of the behavior of the firm sector is extremely limited, since it allows only for production decisions in this substructure of the economy. All these weaknesses are overcome (in chapter 3) by our next prototype, the Keynes–Wicksell approach to monetary growth dynamics. Here investment decisions of firms and their financing by means of equities are considered explicitly and made consistent with the other sectors of the economy. Price adjustment is also put on a firmer basis in this model type and gives rise to the famous growth cycle mechanism of Goodwin and Rose as part of this extended framework of analysis and its dynamical implications. The inclusion of these Classical growth cycle mechanisms, by way of an improved wage–price module of the model, in a relatively pure form, is the main contribution that we will obtain from this variation of the Tobin monetary growth model.

Having improved the presentation of asset markets (in particular by assuming money market equilibrium throughout), the goods market remains a problem, since the added description of the investment behavior of firms generally now gives rise to a disequilibrium situation which is not present in the Tobin approach due to its dependence on Say's Law on the market for goods. The further development of the model (in chapter 4) to a basically Keynesian one therefore now adds IS-equilibrium. Following from this latter assumption (and the assumed wage/price adjustment behavior) the degree of utilization of the capital stock becomes the variable which will always adjust appropriately in order to make possible the assumed goods market equilibrium. In contrast to the fashionable full equilibrium version of the Tobin models we thereby arrive at the basic Keynesian prototype structure that will underlie all following generalizations of models of monetary growth exhibiting IS–LM-equilibrium and disequilibrium on the labor market and within firms. These disequilibria

are then used as the basis for wage and price adjustments and the investment decision of firms.

This latter Keynesian prototype will be extended in various directions in chapters 4–7 to allow for factor substitution, technological change, wage taxation, p-star expectations, delayed quantity adjustments, endogenous natural rates and insider–outsider effects in the labor market. By the end of these extensions the Keynesian prototype will have become what we label a working Keynesian model. It will also be demonstrated to the reader that this working model still represents only a starting point (though already a fairly elaborate and consistent one) to a thorough consideration of many further extensions. Indeed section 7.7 provides a survey of such, necessary, extensions.

The way in which the basic "proper" Keynesian prototype, and then the working Keynesian model of monetary growth, is established here will in addition show that this model type overcomes important weaknesses of the predecessor models of Tobin and Keynes–Wicksell type by a systematic variation of them. Nevertheless, each of these two predecessor models is also of importance in its own right, due to the specific topics that have been considered important within these earlier prototypes. The Tobin model, for example, distinguishes between actual and perceived disposable income of households and allows consideration of a number of interesting effects that flow from this distinction, including the fact that it will represent a nonlinear model (again due to this distinction) even if all of its structural equations are linear. The consequences of distinguishing between actual and perceived disposable income will only be considered in chapter 2, while later chapters will again identify perceived with actual disposable income, leaving this specificity of the Tobin approach for the later investigations of our other models.

In our presentation of the various model types we shall mostly employ linear economic behavioral relationships. Thus nonlinearities that appear in the dynamic laws will be naturally occurring in that they are brought about by product terms such as the wage bill, state variable quotients such as the rate of employment, and some formulations being in terms of rates of growth. This serves the purpose of investigating the dynamical systems that are implied at first only in a "naturally" or "intrinsic" nonlinear setup in order to see how much "dynamical complexity" is already involved on this most basic level of the study of integrated economic systems. Occasionally we introduce, however, specific nonlinear behavioral relationships, in particular in investment functions and Phillips curves, in order to maintain economic viability of the dynamics being analyzed. However, we leave for future research a systematic study of the introduction into our general modeling framework of these and other nonlinear economic behav-

ioral relationships which have been proposed in the literature on macroeconomic fluctuations.

Throughout this book we model expectations as a weighted sum of "backward looking" and "forward looking" components. We endow our agents with neither the information of the model structure in which they play out their economic roles, nor the computational ability that they would need to form expectations in a way that is currently referred to as "rational" in a large body of literature. Our reasons for adopting this approach are detailed in section 1.6. In essence these reasons revolve around a critique of the so-called jump-variable technique which the adoption of a "rational" expectations approach would necessitate as well as a growing body of empirical evidence which suggests that our approach to expectations modeling may be more appropriate. However here we stress that the future research agenda to which we have already referred will need to incorporate the effects of heterogeneity of expectations and of learning on the part of the various economic agents of our models.

This concludes the description of the basic line of reasoning that we will employ in the development of our model structure. Since there is a clear progression from model to model in this book we will generally explain the model equations only when they appear for the first time. Before we now proceed to such a systematic step-by-step development of prototype models of monetary growth we will briefly consider in chapter 1 certain roots of these approaches in the literature.

The material presented in chapters 1 to 7 of this book is neither of direct textbook type nor written in the way of a handbook on monetary growth. There is now a variety of advanced textbooks on macroeconomics available, ranging from traditional Keynesian analysis of extended IS–LM type to analysis that claim to go "beyond IS–LM," see in particular Blanchard and Fischer (1989), Carlin and Soskice (1990), Karakitsos (1992), Leslie (1993), Turnovsky (1995), and Romer (1996). On the one hand, we add to these presentations a new hierarchically structured set of theories and models of monetary growth that can be used for classroom teaching. On the other hand, we seek to draw to the attention of writers of advanced textbooks and researchers in the field of macrodynamics the fact that traditional analyses of models of monetary growth cannot be viewed as a set of isolated models. Rather they must be considered as a lively body of systematic studies which, when fully integrated, are still poorly understood and where further investigation will provide a firm foundation and a better understanding of existing and future developments in this area.

This book is also not a handbook on aspects of monetary economics or more precisely a survey on the theory of monetary growth, as provided, for example, by Orphanides and Solow (1990). Instead we show that there still

exists a large evolutionary potential in traditional macrodynamics that leads us to integrated macrodynamical models with Keynesian short-run features and Keynesian and monetarist features in the medium run as well as in the long run. These integrated models not only allow us to evaluate the contributions of the two schools of economic thought from this integrated perspective, but also serve to put into perspective more recent contributions to the theory of fluctuations and growth in monetary economies. In this way our book provides a benchmark against which alternative approaches can be judged and be developed further, including the working model of this book, towards a common core of macrodynamics that "we all can believe in."

1 Traditional monetary growth dynamics

1.1 Introduction

We reconsider in this chapter the leftover ruins of traditional monetary growth dynamics[1] which, with respect to the general dynamics they can give rise to, have so far been poorly analyzed and understood in the literature.[2]

We attempt to show to the reader, in section 1.2 in overview, and in detail in chapters 2–5, that these leftover ruins can be arranged and represented in a systematic way so that they form a hierarchical structured class of monetary growth models where each subsequent model type eliminates some of the weaknesses of the preceding model type. We then indicate in section 1.2 two ways in which this methodological approach to macrodynamics can be significantly extended beyond the existing scope of traditional models of monetary growth. Firstly, this way of proceeding in fact leads to the establishment of a proper (still traditional), but much neglected Keynesian model of monetary growth where both labor and capital exhibit fluctuating degrees of utilization independently of the assumptions that are made on "technology." Secondly, our approach leads to a further improvement of this IS–LM growth type of dynamics by allowing for sluggish price, as well as quantity, adjustments (two Phillips-curve mechanisms and a Metzlerian treatment of disappointed sales expectations) and by establishing thereby what we will call the working Keynesian model of this book. Section 1.2 therefore provides a survey of what we call the macro foundations of (disequilibrium) macroeconomics, namely the indication that there is a systematic way of proceeding from less sound and

[1] See Turnovsky (1995, part I) with respect to another reconsideration of integrated macrodynamics of traditional type.

[2] See for example Sargent's (1987, ch. 5) analysis of "Keynesian Dynamics" of AS–AD type and its reconsideration in Flaschel (1993, ch. 6–7) and Franke (1992a), or Stein's (1982) investigation of dynamic models of Keynes–Wicksell type and its reconsideration in Flaschel, Franke, and Semmler (1997, ch. 10).

elaborate to more sound and elaborate presentations of integrated macrodynamic models of monetary growth. In this way we demonstrate both in this survey chapter and in more detail in chapters 2–7 a systematic procedure on the macro level by which integrated or complete macrodynamical models can be made more and more elaborate and coherent in their presentation of the fundamental feedback structures that characterize interdependence on the macro level.

Our approach proceeds independently of any justified claim for better micro foundations of macroeconomics. Indeed, improved micro foundations that emerge from research in this area should be capable of integration into appropriate modules of the macro structure that we build in this book. There is no space here, however, to go into this topic in detail. A recent approach which considers the problem of the micro foundations of macroeconomics from a critical perspective and which provides alternative and interesting micro foundations of macroeconomics (not based only on budget and technological constraints) is Hahn and Solow (1995). There it is found in particular that stickiness of wages and prices may be good for economic stability. Our treatment of Keynesian monetary growth in chapters 4–6 arrives at a similar conclusion, but from a quite different perspective.

The various steps in the building of a class of hierarchical structured models of monetary growth are made on the basis of assumptions on the structure of markets and sectors of the economy as they are used in Sargent (1987, chs. 1–5) which are indeed very convenient for the first stage of the project started in this book. We extend Sargent's (1987, part I) mainly static analysis of AS–AD macroeconomics (cum growth in his ch. 5) on the one hand into a full dynamic analysis of growing monetary economies and on the other hand into the direction of proper Keynesian models of monetary growth (where also firms are no longer on their supply schedule). In this way we lay foundations for a Keynesian approach to monetary growth which has rarely been studied in the literature so far.[3] When the final stage is reached in this book, however, the need for further extensions in the structure of Keynesian monetary growth dynamics will become apparent. Possibilities for such extensions are briefly discussed at the end of chapter 7. These provide a research agenda of systematic developments along the methodological lines established in this book.[4]

In sections 3–5 of this chapter we consider for introductory purposes basic models of Tobin, Keynes–Wicksell and AS–AD type. Very general versions of these approaches are introduced and investigated in subsequent

[3] See for example Orphanides and Solow (1990), where models of this type are not even mentioned.

[4] See Chiarella and Flaschel (1998f) and Chiarella et al. (1998, 1999).

chapters. Since Sargent's treatment of the AS–AD growth model focuses on the role various expectations schemes play in the dynamics generated by this model type, we in addition provide an alternative view on the modeling of expectations in section 1.6 which will be used in subsequent chapters on various levels of generality. Section 7 provides a few characterizations concerning the proper Keynesian models of monetary growth that we shall introduce and analyze in chapters 4–7.

1.2 Macro foundations of macroeconomics

The purpose of this section is to indicate to the reader that there is a hierarchical structured body of disequilibrium models of monetary growth where each subsequent stage in the development of such models improves the descriptive relevance of the preceding stage in a systematic and significant way. Independently of the need for sound micro foundations of the assumed (fairly conventional) behavioral relationships, the evolution of disequilibrium macrodynamics (which is not easily micro founded) does thereby indeed exhibit systematic progress to more and more convincing formulations of the fundamental modules of the dynamics of monetary growth in disequilibrium, and thus to the description and analysis of real growth dynamics. To show this in detail and to indicate how the framework of disequilibrium macrodynamics that we develop can be extended beyond its current scope are two of the main purposes of this book.

Subsection 1.2.1 provides a brief summary of the evolution and achievements of dynamic disequilibrium models of monetary growth in the past. Subsection 1.2.2 reviews the contributions that this book will make to the current state of the theory of monetary growth with under- or overemployed factors of production. A brief outlook on what needs to be and can be done on the basis of the results achieved in this book will conclude the subsection.

1.2.1 A brief genesis of disequilibrium models of monetary growth

We discuss in this subsection forerunners to the Keynesian model of monetary growth to be introduced in chapter 4 and developed further in subsequent chapters toward our working model of disequilibrium monetary growth dynamics.

The starting point

- Neoclassical models of monetary growth of Tobin type
- Extension of the Solow model of real growth:
  – towards an inclusion of financial assets

– where money market (dis-)equilibrium drives inflation
– in interaction with inflationary expectations

Neoclassical models of monetary growth were introduced into the macroeconomic literature through the work of Tobin (1955, 1965) which extended the Solow model of real growth by introducing monetary factors. Generalized versions of this model type were developed subsequently by Johnson (1966), Sidrauski (1967a), Hadjimichalakis (1971a,b), Nagatani (1970), Hadjimichalakis and Okuguchi (1979), and Hayakawa (1979). Burmeister and Dobell (1970), Sijben (1977), Sargent (1987), and Orphanides and Solow (1990) give further presentations and a survey of this literature. These extensions were generally characterized by the consideration of money as an asset in addition to real capital and the use of money market disequilibrium as the foundation of the theory of inflation and inflationary expectations, coupled with Say's Law on the markets for goods (thereby excluding any goods-market problems).[5] Tobin type models have led to an enormous amount of literature on equilibrium growth models with optimizing behavior of economic agents, which, due to its general equilibrium nature, is not a suitable topic for a book such as this, the focus of which is on disequilibrium monetary growth theory.

Typical issues addressed by the above-cited authors were the analysis of the steady state effects of the growth rate of the money supply (and of so-called Tobin effects) and the local stability analysis of the steady state where in particular the destabilizing role of inflationary expectations was investigated when the adjustment of adaptively formed inflationary expectations became sufficiently fast. A detailed presentation of such stability issues is provided in Hayakawa (1984), while Benhabib and Miyao (1981) investigate the possibility of the cycles generated by Hopf bifurcations for intermediate adjustment speeds of inflationary expectations. It is shown thereby that the Cagan (1967) inflationary dynamics and the disequilibrium approaches that were built on it by Goldman (1972) and others not only give rise locally to saddlepath situations (that are now the basis of the jump-variable technique of rational expectations models), but that there will emerge limit cycles for particular ranges in the adjustment speed of expectations from the nonlinear structure of these neoclassical models of monetary growth.

In chapter 2 we will start from the most basic (general equilibrium) version of the Tobin monetary growth model and shall subsequently

[5] Labor market phenomena were generally treated as in Solow (1956) by assuming full employment and the macroeconomic marginal productivity theory of income distribution. But labor market disequilibrium is easily introduced into this framework as in Goodwin (1967), here combined with neoclassical smooth factor substitution as discussed in detail in chapter 5.

establish step by step a general disequilibrium version of this model type (with money and bonds as financial assets and, of course, Say's Law remaining the [trivial] representation of goods market equilibrium). As in the evolution of the literature on models of monetary growth, we thus begin this book with the stability problems of monetary models of neoclassical growth where we, however, attempt to stress the cyclical properties of the dynamics of these models which, when necessary, may be bounded and thus imply viable cyclical oscillations through appropriate nonlinearities in the assumed behavioral relationships of neoclassical monetary growth. The main ingredients of our development of a Tobin general disequilibrium monetary growth model are listed at the head of this subsection.

The Keynes–Wicksell alternative

- Independent investment behavior based on Tobin's q
- Removal of Say's Law due to savings $\neq$ investment
- Augmented Wicksellian demand-pressure price-inflation
- Money wage Phillips curve
- Full capacity growth

The next model type that we develop is based on the Keynes–Wicksell approach to monetary growth. The most important work in this area of monetary growth theory has been provided in the late sixties and early seventies by Stein (1966, 1968, 1969, 1970, 1971) and by Rose (1966, 1967, 1969). Further contributions are Fischer (1972), Fujino (1974), Sijben (1977), Nagatani (1978), Brems (1980), Iwai (1981), and Asada (1991). In particular Stein (1982) has related this type of approach to the discussion between Keynesians, monetarists, and New Classicals, while Skott (1989a,b) provides a general theory of conflict about income distribution and of effective demand with similarities to the Keynes–Wicksell theory of monetary growth. Rose (1990) pursues the same aim from a somewhat different perspective and relates his general approach to many partial models of macroeconomic dynamics. The work of these latter two authors shows that there are still emerging important developments of this Keynes-oriented area of monetary growth theory, which in particular attempts to provide a Marshallian perspective of Keynes' theory of effective demand.

The importance of the Keynes–Wicksell approach toward an explanation of the working of a (growing) monetary economy stems from two observations. Firstly, in the recognition that savings and investment decisions are to be differentiated from each other in an essential way (thereby denying the validity of Say's Law both in its trivial and in a more elaborate form), and that the theory of price inflation must be related to the goods market and its disequilibrium and not, as in the generalized Tobin models,

to money market disequilibrium. Goods market imbalance was measured in these approaches through the deviation of investment decisions from savings decisions. The theory of inflation was based on this imbalance and augmented by expected inflation in Fischer (1972) in a monetarist fashion in order to allow for steady state equilibrium. The money market, by contrast, was now described through the usual Keynesian LM-equilibrium condition as the theory of the nominal rate of interest (the deviation of which from the nominal gross rate of profit was then used to determine the level of investment).

Secondly, that this alternative to the neoclassical view on monetary growth dynamics stressed the cyclical implications of labor market disequilibrium, the conflict over income distribution and capital accumulation. The work of Rose (1967) in particular established the Goodwinian (1967) growth cycle mechanism in an independent way and from a different perspective by relating it to a locally unstable Wicksellian theory of price inflation that gave rise to persistent fluctuations by way of appropriate assumptions on wage flexibility in a setup with smooth factor substitution. Rose (1990) provides important extensions of this type of monetary growth theory, extensions which have significantly influenced the formulation of the wage–price dynamics of our general Keynes–Wicksell model in chapter 3.

Our view on the Keynes–Wicksell contribution to the analysis of monetary growth is that it represents a decisive step forward in the macroeconomic description of such growth processes. Neoclassical and Keynes–Wicksell models of monetary growth are not situated in the hierarchy of monetary growth models on the same level of abstraction, but follow each other in this order, since the latter model type takes account of the independence of investment decisions from savings conditions and tries to incorporate this fact from a Wicksellian perspective in the simplest way possible. This extension in the approach to monetary growth also leads to an inclusion of a new financial asset besides money and bonds (equities) that is explicitly introduced, and related to Tobin's q, in our general reformulation of the Keynes–Wicksell approach in chapter 3. The main ingredients in our development of the Keynes–Wicksell alternative are listed on p. 14.

The Keynes–Wicksell type of analysis exhibits a number of problems. Firstly, the labor market is treated basically from a (neo)classical perspective in the same fashion as in the Goodwin model of the classical growth cycle, except with neoclassical factor substitution. Secondly, goods market imbalances drive prices and not quantities as in the Keynesian dynamic multiplier approach. Thirdly, capital is always operated at its full capacity as described by the usual profit-maximizing marginal productivity condition for real wages. Therefore, the (neo)classical view on capital accumula-

tion is still, at least partially, present in this type of analysis. A logically compelling next step in the Keynesian analysis of monetary growth, therefore, should be to establish a proper type of Keynesian goods market and money market analysis in the tradition of the IS–LM approach to the description of the functioning of these two markets. This is indeed the step that was taken in the literature on Keynesian dynamics in the context of monetary growth in the late seventies.

The Keynesian AS–AD growth model

- Keynesian IS–equilibrium (in addition to LM–equilibrium)
- Infinitely flexible prices based on marginal wage costs
- Expectations – augmented money wage Phillips curve
- Profit-maximizing output decisions of firms

The textbook treatment of Keynesian monetary growth dynamics (see Turnovsky 1977a and Sargent 1987 for typical examples) dispensed with the Wicksellian approach to the determination of the price level, or rather its rate of change, by simply adding wage dynamics and inflationary expectations dynamics in a monetarist fashion and Solovian capital stock growth to the usual AS–AD approach of the Keynesian short-run macroeconomic equilibrium.[6] To date this AS–AD growth model has been considered as the representation of traditional Keynesian growth dynamics (see for example Turnovsky 1995, part I). Yet the fact remains that the full dynamics of such integrated AS–AD growth models have rarely been analyzed to a satisfactory degree, which means that the dynamic behavior of these seemingly conventional models is poorly understood.[7] This represents an important gap in the theory of monetary growth, since we therefore do not have a generally accepted pool of knowledge at our disposal against which the achievements of more recent theories of monetary growth can be usefully compared. The main elements of the Keynesian AS–AD growth model are summarized above.

There are, however, inconsistencies present in the AS–AD theory of effective demand, inflationary dynamics, and real capital accumulation. Basing the theory of the price level on its determination through marginal wage costs, as Keynes (1936) did, amounts to assuming that producers are, on the one hand, constrained by the effective demand for goods, but are, on the other hand, capable of passing on this constraint to the labor supply of households, by allowing in one way or another for profit-maximizing prices so that they can stay on their supply schedule. In our view this

[6] IS–LM equilibrium coupled with the assumption that prices are always equal to marginal wage costs, the money wage level being given at each point in time.

[7] See in particular Flaschel, Franke, and Semmler (1997) for some investigations of the dynamics of these AS–AD growth models.

basically means that firms are price takers and quantity takers at one and the same time, which would give rise to a contradiction if prices are not assumed to adjust in such a way that the level of effective demand becomes consistent with the profit maximizing level of the output of firms. Our conclusion is that the Keynesian theory of goods-market constrained firms needs a theory of the price level other than that of the neoclassical approach to the theory of the firm. Such an alternative theory might be that of monopolistic competition or even more advanced theories representing more advanced stages in the evolution of capitalistic market economies. Furthermore, a Keynesian theory of the AS–AD type (even if it were consistent) would still be a theory of full-capacity growth and would thus represent only a partial description of what we observe in reality.

Barro (1994b, p. 4) has recently come to the same conclusion from a different but related perspective, stating in particular:

> We have available, at this time, two types of internally consistent models that allow for cyclical interactions between monetary and real variables. The conventional IS–LM model achieves this interaction by assuming that the price level and the nominal wage rate are typically too high and adjust only gradually toward their market-clearing values. The market-clearing models with incomplete information get this interaction by assuming that people have imperfect knowledge about the general price level.

This quotation lends further weight to our viewpoint that models of IS–LM growth with gradually adjusting wages *and* prices are the correct alternative to the general equilibrium approach to monetary growth. This perspective is in fact not a new one, but has indeed been essential for the so-called neo-Keynesian or non-Walrasian disequilibrium analysis of the short-, the medium-, and sometimes also the long-run evolution of temporary fixed price equilibria. This approach can therefore be used to improve considerably the presentation of macrodynamic disequilibrium growth of AS–AD type, though most of the efforts in this area have gone into the modeling of fixed price temporary equilibria from a microeconomic point of view (which are not reviewed in the following characterization of this approach).

Neo-Keynesian monetary growth analysis

- Three regimes of the IS–LM model: the Keynesian regime, the Classical regime, and repressed inflation
- No full capacity growth in the first and the last regime
- Varying capital utilization rates and price dynamics
- Varying labor utilization rates and wage dynamics
- Sluggish wage- as well as price-level adjustments

- Extended investment functions based on profitability measures and the rate of capacity utilization

From the macroeconomic point of view, the work of Benassy and Malinvaud is here of special interest for the purposes of this book, see in particular Benassy (1986b) and Malinvaud (1980), and from the viewpoint of monetary growth theory also the collection of essays in Hénin and Michel (1982). Benassy (1986b) provides in particular a detailed presentation of the three regimes that may be of particular relevance in the analysis of macroeconomic temporary equilibrium positions and dynamic models of inflation, the business cycle and the role of expectations based on this three-regime analysis. Malinvaud (1980) considers investment behavior based on profitability *and* capacity utilization besides a consumption function that is typical for the fixed price approach to temporary equilibrium. He incorporates these behavioral relationships into a three-regime medium-run model of Keynesian depressions, under the additional assumption that the profitability effect of real wage changes is less significant than the consumption effect of such changes.

We will borrow from this literature two important ideas. The first one, which also appears in the quite different macrodynamic approach of Rose (1990), is that there should be two Phillips-type curves in a Keynesian macrodynamic model, one for the wage level and one for the price level. Both of these are expectations augmented (from a cost-push perspective), and both exhibit demand pressure components that (in the first instance) are to be represented through the utilization rates of the two factors of production, labor and capital. The second idea is that the investment behavior of Keynes–Wicksell and dynamic AS–AD models, which was based on Tobin's q solely, should in addition be augmented by capacity considerations in order to take account not only of profitability differentials, but also of the now varying utilization rate of the capital stock.

These are the main elements (summarized in the list above) of the neo-Keynesian analysis of (the evolution of) fixed price equilibria that we will use in our formulation of a proper Keynesian model of monetary growth with IS-equilibrium or IS-disequilibrium. In this way we overcome important limitations of the growth models of Keynes–Wicksell and the AS–AD growth type by allowing also for fluctuating utilization rates of capital as in neo-Keynesian analyses of the medium or the long run. However, we do not make use of the regime-switching methodology of neo-Keynesian analyses, since we believe that there are significant buffers in the process of capital accumulation that generally prevent the occurrence of hard kinks caused by either labor demand, in the Classical regime, or labor supply, in the regime of repressed inflation.