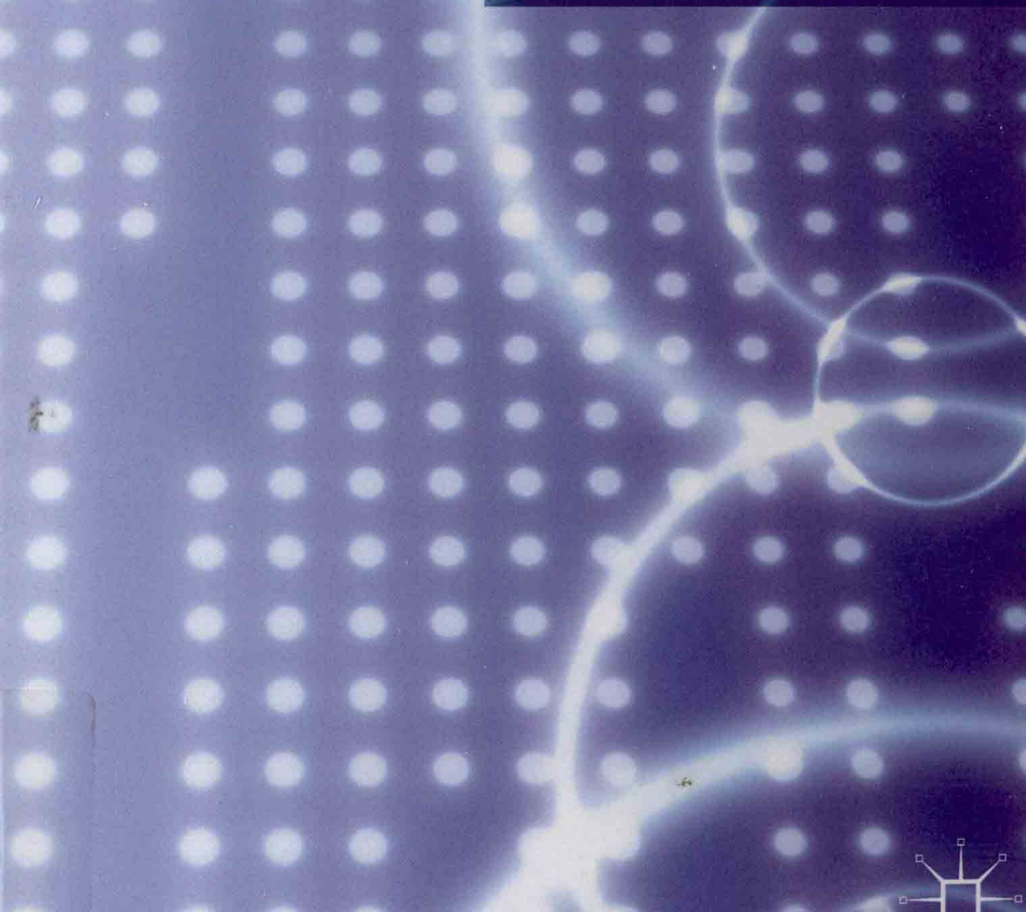
Asset Markets, Portfolio Choice and Macroeconomic Activity

A Keynesian Perspective

Toichiro Asada, Peter Flaschel, Tarik Mouakil and Christian Proaño



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A Keynesian Perspective

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First published 2011 by
PALGRAVE MACMILLAN

Palgrave Macmillan in the UK is an imprint of Macmillan Publishers Limited, registered in England, company number 785998, of Houndmills, Basingstoke, Hampshire RG21 6XS.

Palgrave Macmillan in the US is a division of St Martin's Press LLC, 175 Fifth Avenue, New York, NY 10010.

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ISBN 978–0–230–29017–4

This book is printed on paper suitable for recycling and made from fully managed and sustained forest sources. Logging, pulping and manufacturing processes are expected to conform to the environmental regulations of the country of origin.

A catalogue record for this book is available from the British Library.

A catalog record for this book is available from the Library of Congress.

10 9 8 7 6 5 4 3 2 1
20 19 18 17 16 15 14 13 12 11

Printed and bound in Great Britain by
CPI Antony Rowe, Chippenham and Eastbourne

Preface

This book builds on what we have sketched as 'road ahead' in the final chapter of Asada, Chiarella, Flaschel and Franke (2010). It reflects and puts into perspective from a post-Keynesian angle the Keynes–Metzler–Goodwin (KMG) disequilibrium growth dynamics and also the various AS–AD approaches that surround this model of demand-driven distributive cycles. It does this in particular with respect to those studies which explicitly deal with stock-flow consistency and the stock-flow interactions they imply, i.e., the need for specifying all macro budget equations and the asset accumulation equations they give rise to.

We start from small models of the dynamics of aggregate demand and supply. Against this background we then reflect the KMG modelling framework in its methodological premises and its position concerning the modelling of Keynesian macrodynamics, which significantly distinguishes this approach from what is now called the new Keynesian D(ynamic) S(tochastic) G(eneral) E(equilibrium) paradigm. This paradigm insists on market clearing with respect to all real markets, makes use, in general, of a single representative household, in addition, makes use of perfect interest rate parity conditions in place of imperfect asset substitution and, above all, employs so-called rational expectations solutions in order to get by assumption a stable deterministic core dynamics around which the implications of stochastic shocks (ad shockeries) can then be considered. The resulting 'rocking horse methodology' is in striking contrast to what we will pursue in this book, where we focus on feedback-channel guided dynamic analyses of endogenously generated, demand-driven distributive cycles in the context of heterogeneous expectations formation and with a particular focus on a Tobin portfolio module in addition to the original primarily real KMG modelling framework.

The resulting model of KMG–Tobin type will be discussed and analysed in core chapters of the book, after its detailed motivation has been provided in the first two chapters. This portfolio approach to KMG growth is formulated in closed economies in terms of stocks of financial assets demanded and supplied. It needs reformulation for open economies, since capital accounts are to be represented in terms of flows. To achieve this we build on the Mundell–Fleming–Tobin (MFT) portfolio approach of Chiarella, Flaschel, Franke and Semmler (2009) which simplifies the real side of the KMGT macroeconomy considerably, in order to focus on the analysis of stock-flow interactions for small open economies as well as for interacting two-country macrodynamics.

The portfolio adjustment processes we introduce on the financial markets of these models of open economy macrodynamics are extended in the final chapter of the book to the treatment of more than one risky asset and the implied term structure of interest rates which was so far absent in the considered KMGT and MFT models where only equities and fix-price bonds were considered. We therefore sketch in this chapter again 'a road ahead' for future research which significantly enriches the structure of the financial side of the economy.

We hope that this book is capable of showing that there is a common core in the Keynesian literature (without any prefix), which in our case took its point of departure from Chiarella and Flaschel's (2000) critical overhaul of the achievements of the old neoclassical synthesis and which in other cases may be closer related to work of Kalecki in particular. We stress that their common view surely is that the new (Keynesian) neoclassical synthesis is devoid of issues that were of importance for both Keynes and Kalecki.

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General Introduction

Methodological premises

The traditional view of business cycles is usually presented through Wicksell's famous 'rocking horse' metaphor. If a rocking horse is hit with a stick, the horse will move and its movement will be different from that of the stick. In other words, erratic *exogenous* 'shocks' are the cause of economic cycles (providing the necessary energy to keep the horse moving) and the fundamental law which determines the form of these cycles is given by the *equilibrium conditions* of the economic system.

The current book relies on a completely different conception of economic cycles. Our premises are, first, that business cycles are in essence *endogenously* generated and, second, that the form of business cycles stems from the interaction between *stocks* of assets and monetary *flows*. The first premise means that, in our view, business cycles cannot be explained only by hits on Wicksell's rocking horse. We do not deny the importance of exogenous shocks, such as economic, political, social or natural events, in explaining economic fluctuations but we do trust that a great part of these fluctuations can be explained by mechanisms which are endogenous to economic systems. In other words, unlike new classical macroeconomics, our approach does not explain business cycles by introducing stochastic exogenous disturbances in linear dynamical structures. In our work cycles arise instead from the 'natural' *nonlinearities* exhibited by high-dimensional dynamic models which seek to describe the complex structure of economic systems.[1]

Of course to study the properties of such models requires the use of rather elaborate mathematical tools such as the Routh–Hurwitz theorem and local Hopf bifurcation theory.[2] However, we trust that the reader will find the insights given by our dynamic models to be worth these complexities and to be far more convincing than those of their new classical counterparts. In particular those of our readers who feel uncomfortable with the paradigm of equilibrium economics will be pleased to find a representation of the economy in which well-known macroeconomic adjustment processes can generate complex self-sustaining business fluctuations.

One can describe our conception of economic cycles through a 'predator–prey' metaphor[3] based not on a rocking horse, but on a closed natural system with foxes (predators) and rabbits (prey). Fluctuations in both species' populations (though of course subject to exogenous shocks) are generated endogenously by the combination of reproduction and predation mechanisms. Moreover, an increase in the number of foxes will reduce the number of rabbits which in turn will have a negative impact on the future number of predators. The last statement corresponds to our second premise. It means that to represent properly the dynamic behaviour of a given economic system requires one to take account of the fundamental principle that current economic flows modify the levels of existing stocks of real and financial assets, which in turn have an impact on agents' economic behaviour and future economic flows. Therefore, in line with the textbooks of dynamic macroeconomics written in the 1970s by Thomas Sargent (1979) and Stephen Turnovsky (1977), the present book will give particular attention to stock-flow interactions:

> The main emphasis of our analysis is on what we shall refer to as the **intrinsic** dynamics of the system. By this we mean the dynamic behaviour stemming from certain logical relationships which constrain the system; specifically the relationships between stocks and flows. (Turnovsky, 1977, p.3)

Inspired by the portfolio model of Tobin (1969), both Sargent's and Turnovsky's textbooks show that, for the dynamics of a macroeconomic model to be consistent, the behavioural equations defining the interaction between stocks and flows have to be compatible with the budget constraints facing the decision makers in the economy.

In a consistent macro-model, the behaviour of every economic sector (both in regards to its assets and its assessment of realized results) must respect two kinds of budget constraints: 'one is a **stock** constraint, the other is a **flow** constraint' (Turnovsky, 1977, p.43). The flow constraint arises from the concept of *net savings* which are defined as the difference between a sector's flows of income and its expenditures. This constraint asserts that the net amount of assets accumulated (liabilities issued) by one sector must equal its net savings (expenditures). In the same way, the stock constraint arises from the concept of *net wealth* which consists of the sum of a sector's assets minus the sum of its liabilities. This constraint states that, when a sector is managing its balance sheet by reallocating its financial assets (liabilities), the sum of all the net claims (commitments) it wishes to hold (undertake) must equal its net wealth (debt). In our models, as in the models of Sargent and Turnovsky, the flow constraint applies to all the sectors of the considered economy while the stock constraint concerns only households, who are the only agents to manage their balance sheet through portfolio choices.

In an n-sectors economy, the expenditures (income flows) of an economic sector are simultaneously income flows (expenditures) of another sector. Therefore, a model which takes into account the budget constraints of $(n-1)$ sectors is necessarily consistent with the flow budget constraint of the nth sector. This principle, which may be referred to as Walras' law, also applies to stock constraints since financial assets (liabilities) of a sector are simultaneously liabilities (assets) of another. In the models of the present book households are the only agents to be really concerned by a stock budget constraint and therefore Walras' law for stocks simply means, as shown by Sargent (1979, p.67), that if $(n-1)$ financial markets are in equilibrium then the nth market is also in equilibrium.

The Keynes–Metzler–Goodwin framework

Accounting consistency is far from being the only feature that our dynamic models have inherited from the textbooks of Sargent and Turnovsky. Indeed the models presented in the present book are extensions of the Keynesian growth model of Chiarella and Flaschel (2000a, b), which was itself an extension of the growth models of the neoclassical synthesis as discussed in the textbooks of Sargent and

Turnovsky. Neoclassical growth models can be described as 'aggregate supply-aggregate demand (AS–AD) growth models'; they are based on IS–LM equilibrium, and the so-called AD curve that derives from it, as well as the AS schedule representing the situation where prices equal marginal wage costs. This AS–AD framework is then made dynamic through a Solow-type growth of the stock of capital and an expectations-augmented Phillips curve for wages.

Chiarella and Flaschel's main contribution to this body of literature was to introduce disequilibrium elements into the AS–AD framework in order to overcome its logical inconsistency. In an influential paper, Robert Barro (1994) showed that coupling together IS–LM equilibrium with the assumption that prices always equal marginal wage costs amounts to trying to combine two conflicting theories of production and pricing. On one hand, one assumes that firms produce to meet demand by making quantity adjustments while keeping the price fixed. On the other hand firms produce to maximize their profits and are price takers. Thus, for a given level of price, the AS–AD framework determines two different levels of output:[4]

> The AS-AD model is logically flawed as usually presented because its assumption that the price level clears the good market is inconsistent with the Keynesian underpinnings for the aggregate-demand curve. (Barro, 1994, p.5)

Barro showed that one way to make the AS–AD framework consistent is to assume that the AD curve applies only when the price level has adjusted to ensure market clearing; which is to say that price expectations are *rational* and enable the level of effective demand to become consistent with the profit-maximizing level of the output.[5] However, in this case, the AS–AD framework is no longer Keynesian and becomes equivalent to the rational expectations-based new classical models of Lucas (1972) and Sargent and Wallace (1973, 1975). In the same way, Flaschel *et al.* (1997) showed that when rational expectations are introduced into the AS–AD growth model of Sargent (1979, ch.5), it becomes a new classical model (with a vertical Phillips curve) where monetary shocks have nominal but no real effects.

In his paper, Barro advocates market-clearing closures but acknowledges that another way to achieve a consistent model is to build on the IS–LM framework by using gradually adjusting wages *and* prices. It is precisely in this way that Chiarella and Flaschel modified Sargent's model in order to achieve a consistent Keynesian growth model which was later labelled 'Keynes–Metzler–Goodwin' (KMG).[6] In the KMG model all real markets are demand-led and remain in disequilibrium. In particular there is nothing which leads towards an equality between supply and demand of labour; that is, to full employment. As for the product market, supply cannot adjust instantaneously to demand and firms are forced to hold inventories which are modelled along the lines of Lloyd A. Metzler's (1941) work. In the absence of market-clearing mechanisms, the model exhibits sluggish wages and prices the dynamics of which are defined through a pair of modified Phillips curves inspired by the models of Rose (1967, 1990). These two Phillips curves exhibit 'cost-push' components (represented through the weighted average of the actual inflation rate and the 'inflation climate')[7] and 'demand pressure' components (represented through the utilization rate of the two factors of production, labour and capital). Moreover, regarding consumption demand, the model differentiates between workers (who consume their total wages) and capitalists (who save a fraction of their rentier income) and therefore generates an interaction between income distribution and growth which is similar to the one achieved in Richard Goodwin's (1967) model. Another innovation of the model is the use of a Kaleckian investment function according to which the rate of accumulation of capital depends on the level of its utilization rate and the spread between the rate of return of capital and its opportunity cost (the real interest rate).

Instead of having introduced rational expectations in the AS–AD framework, Chiarella and Flaschel used the assumption of *adaptive* expectations according to which medium-term expectations (not short-term ones) are based on the observation of past data. Though this assumption has a bad reputation in some quarters, we believe that the representation of expectations found in the KMG model is more convincing than the new classical one for the following two reasons. First, there is widespread evidence from economics and behavioural sciences that adaptive expectations are used by real economic agents. Even supporters of rational expectations like Mankiw (2001, p.C59) recognize that 'the assumption of adaptive expectations is, in essence, what the data are crying out for'. Second, the KMG model adopts a pragmatic view which combines adaptive expectations with myopic perfect foresight on the real markets and with so-called *regressive* expectations in the financial part of the model. The latter are based on a general idea from the asset markets (that is, a *fundamentalist* view), according to which the variable is expected to return to its normal level after some time.

For the rest, the KMG model remains very close to AS–AD growth models developed in the 1970s and, in particular, it is written in *continuous* time. In his textbook, Turnovsky (1977, p.44) distinguishes four arguments in favour of analysing a growth model in continuous time instead of discrete time:

> First, there is the important reason ... of analytical tractability; differential equations are easier to study than difference equations. Secondly, discrete-time analysis suffers from the serious disadvantage of assuming that all decisions of a particular type are perfectly synchronized. Thirdly, a related difficulty with discrete time analysis is that in most economic contexts there is no obvious interval to serve as the natural unit. Fourthly, while discrete-time analysis is conceptually simpler, it does suffer from the danger that its underlying assumption of a fixed period length may unwittingly yield misleading conclusions. To test whether or not this is the case, it is desirable to allow the period length to vary and ultimately let it shrink to its limit.

The first advantage of working in continuous time is obvious in the case of the KMG model which, even in its intensive form, remains a system of differential equations of high dimension (6D). By applying the Routh–Hurwitz theorem to a sequence of subsystems of increasing dimensions, Chiarella *et al.* (2005) proved that variations in given parameters of the KMG model bring (in-)stability through a Hopf bifurcation. Working in continuous time facilitated the mathematical analysis of this model by saving them the difficulties attached to the use of lags. Studying a similar 6D non-linear system of *difference* equations would have been far harder, if not impossible. The use of continuous time not only simplifies the mathematical analysis of dynamic models, but is also the better choice to approach macroeconomic issues. In the case of discrete-time macroeconomic models it is very hard to give a theoretical interpretation of the use of a uniform period length which generates a synchronization of economic decision making across all sectors and activities. Moreover most empirical macroeconomic models in discrete time ignore the discrepancy between the frequencies of actual *data generating* and the corresponding *data-collection* processes of the great majority of macroeconomic variables. While the actual data-generating process at the macroeconomic level is by and large of a quasi-continuous-time nature (with a less than daily frequency), the corresponding frequency of data collection available nowadays, at least in the real market of the economy, is on a quarterly or even yearly basis. Ignoring this discrepancy can be misleading when the resulting dynamic properties of the calibrated theoretical model depend not on its intrinsic characteristics, but mainly on the length of the iteration intervals. This issue is particularly clear in discrete-time dynamic models of dimension one or two which exhibit chaotic properties (with annualized data), whereas in their analogous continuous time representations the occurrence of such chaotic properties is simply impossible from the mathematical point of view.

Two 'Old Keynesian' models

The aim of the present book is to propose 'old Keynesian' dynamic macroeconomic models which help to understand how the interaction between monetary flows and financial (as well as real) stocks can generate self-sustaining business cycles. The 'old' prefix refers to the theoretical framework developed by James Tobin. According to the Nobel-prize winner, the five features that differentiate his old Keynesianism from the neoclassical synthesis are the following:

(i) Precision regarding time
(ii) Tracking of stocks
(iii) Several assets and rates of return
(iv) Modeling of financial and monetary policy operations
(v) Walras' law and adding-up constraints. (Tobin, 1982, pp. 172–3)

The first feature, precision regarding time, corresponds to the idea that the short-run determination of macroeconomic variables is one among several steps of a dynamic sequence, not a repetitive equilibrium in which the economy settles. Therefore macroeconomic models