Financial Assets, Debt and Liquidity Crises

The macroeconomic development of most major industrial economies is characterised by boom-bust cycles. Normally such boom-bust cycles are driven by specific sectors of the economy. In the financial meltdown of the years 2007–9 it was the credit sector and the real-estate sector that were the main driving forces. This book takes on the challenge of interpreting and modelling this meltdown. In doing so it revives the traditional Keynesian approach to the financial–real economy interaction and the business cycle, extending it in several important ways. In particular, it adopts the Keynesian view of a hierarchy of markets and introduces a detailed financial sector into the traditional Keynesian framework. The approach of the book goes beyond the currently dominant paradigm based on the representative agent, market clearing and rational economic agents. Instead it proposes an economy populated with heterogeneous, rationally bounded agents attempting to cope with disequilibria in various markets.

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Financial Assets, Debt and Liquidity Crises: A Keynesian Approach

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Notation

Steady state or trend values are indicated by a sub- or superscript 'o'. When no confusion arises, letters F, G, H may also define certain functional expressions in a specific context. A dot over a variable $x = x(t)$ denotes the time derivative, a caret its growth rate; $\dot{x} = dx/dt$, $\hat{x} = \dot{x}/x$. In the numerical simulations, flow variables are measured at annual rates.

As far as possible, the notation tries to follow the logic of using capital letters for level variables and lower case letters for variables in intensive form, or for constant (steady state) ratios. Greek letters are most often constant coefficients in behavioural equations (with, however, the notable exceptions being π, ω).

The following list of symbols corresponds to the notation used in Parts I and II and Chs. 8 and 11 of the book and it contains only domestic variables and parameters (Chs. 9 and 10 contain some notation that is specific to them). Foreign magnitudes are defined analogously and are indicated by an asterisk ($*$). To ease verbal descriptions we shall consider in the following the 'Australian dollar' (or the Norwegian Krona, in Ch. 2) as the domestic currency (A\$) and the 'US dollar' (\$) as a representation of the foreign currency (currencies).

A. Statically or dynamically endogenous variables

Y	Output of the domestic good
Y^d	Aggregate demand for the domestic good
Y^p	Potential output of the domestic good
Y^e	Expected sales for the domestic good
Y_w^{Dn}, Y_c^{Dn}	Nominal disposable income of workers and asset holders
$u = Y/Y^p$	Rate of capacity utilisation of firms
Y_f	Income of firms
L_1	Population aged 16–65
L_2	Population aged over 65
L_0	Population aged 0–15
L^d	Total employment of the employed
L_f^d	Total employment of the workforce of firms

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$L_g^d = L_g^w$	Total government employment (= public workforce)
L_f^w	Workforce of firms
L^w	Total active workforce
u_f^w ($\bar{u}_f^w$)	(Normal) Employment rate of those employed in the private sector
α_l	Participation rate of the potential workforce
$e = L^d/L$	Rate of employment ($\bar{e}$ the employment complement of the Non-Accelerating Inflation Rate of Unemployment or NAIRU)
$C_w(C_w^o)$	Real (equilibrium) goods consumption of workers
$C_c(C_c^o)$	Real (equilibrium) goods consumption of asset owners
$C = C_w + C_c$	Total goods consumption
C_h^s	Supply of dwelling services
C_h^d	Demand for dwelling services
I	Gross business fixed investment
I_h	Gross fixed housing investment
$\Lambda_f, \Lambda_w, \Lambda_g$	Debt of firms, workers, government
$I^a(I^{na})$	Gross (net) actual total investment
$\mathcal{I}$	Planned inventory investment
N	Actual inventories
N^d	Desired inventories
i	Nominal short-term rate of interest (price of bonds $p_b = 1$)
i_l	Nominal long-term rate of interest (price of bonds $p_b = 1/i^l$)
$\pi_b = \hat{p}_b^e$	Expected appreciation in the price of long-term domestic bonds
i^r	Required rate of interest
p_e	Price of equities
$\pi_e = \hat{p}_e^e$	Expected appreciation in the price of equities
$S^n = S_p^n + S_f^n + S_g^n$	Total nominal savings
$S_p^n = S_w^n + S_c^n$	Nominal savings of households
S_f^n	Nominal savings of firms (= $p_y Y_f$, the income of firms)
S_g^n	Government nominal savings
$T^n(T)$	Nominal (real) taxes
G	Real government expenditure
r^e	Expected short-run rate of profit of firms
r^a	Actual short-run rate of profit of firms
r^l	Expected long-run rate of profit of firms
r_h	Actual rate of return for housing services
r_h^l	Expected rate of return for housing services
K	Capital stock
K_h	Capital stock in the housing sector

w^b	Nominal wages including payroll tax
w	Nominal wages before taxes
$\omega = w/p$	Real wages
w^u	Unemployment benefit per unemployed
w^r	Pension rate
w^e, l^e	Wage and labour intensity in efficiency units
p_v	Price level of domestic goods including value-added tax
p_y	Price level of domestic goods net of value-added tax
p_x	Price level of export goods in domestic currency
p_m	Price level of import goods in domestic currency including taxation
p_h	Rent per unit of dwelling
p	Price level (in the one good case)
$\pi^c = \hat{p}_v^e$	Expected rate of inflation or inflation climate
s	Exchange rate (units of domestic currency per unit of foreign currency: A\$/\$)
$\epsilon_s = \hat{s}^e$	Expected rate of change of the exchange rate
$\sigma = sp^*/p$	Real exchange rate
L	Labour supply
l^e	Labour supply in efficiency units per unit of capital
B	Stock of domestic short-term bonds (index d: stock demand)
B_w	Short-term debt held by workers
B_c	Short-term debt held by asset owners
B^l	Stock of domestic long-term bonds, of which B_1^l are held by domestic asset holders (index d: demand) and B_1^{l*} by foreigners (index d: demand)
B_2^l	Foreign bonds held by domestic asset holders (index d: demand)
E	Equities (index d: demand)
W^n, W	Nominal and real domestic wealth
n	Natural growth rate of the labour force (adjustment towards $\tilde{n}$)
$z = Y/L^d$	Labour productivity
$\hat{z}$	Rate of Harrod neutral technical change
X	Exports
J^d	Imports
$NX^n = p_x X - sp_m^* J^d$	Net exports in terms of the domestic currency
NFX^n	Net nominal factor export payments (in A\$)
NCX^n	Net nominal capital exports (in A\$)
τ_w	Tax rate on wages, pensions and unemployment benefits
τ_m	Tax rates on imported commodities

t^n	Total taxes per value unit of capital
g_k^d, g_k	Desired and actual rate of growth of the capital stock K
g_h^d, g_h	Desired and actual rate of growth of the housing capital stock K_h
$\lambda_f, \lambda_w, \lambda_g$	Actual debt to capital ratios of times, workers and government respectively

B. Parameters of the model

The parameters of the non-linear extensions of the model are described when such functions are introduced in the text.

δ_k	Depreciation rate of the capital stock of firms
δ_h	Depreciation rate in the housing sector
α_i^j	All α-expressions (behavioural or other parameters)
β_x	All β-expressions (adjustment speeds)
γ	Steady growth rate in the rest of the world
$\bar{e}$	NAIRU employment rate (NAIRE)
$\bar{u}$	Normal rate of capacity utilisation of firms
$\bar{u}_h$	Normal rate of capacity utilisation in housing
κ_w, κ_p	Weights of short- and long-run inflation ($\kappa_w \kappa_p \neq 1$)
κ	$= (1 - \kappa_w \kappa_p)^{-1}$
y^p	Output-capital ratio
x_y	Export-output ratio
l_y	Labour-output ratio
j_y	Import-output ratio
p_m^*	World market price of import commodities
p_x^*	World market price of export commodities
$\bar{d}$	Desired public or firm debt/output ratio
ξ	Risk and liquidity premium of long-term over short-term debt
ξ_e	Risk premium of long-term foreign debt over long-term domestic debt
τ_c	Tax rates on profit, rent and interest
τ_v	Value-added tax rate
τ_p	Payroll tax
c_y	Propensity to consume goods (out of wages)
c_h	Propensity to consume housing services (out of wages)

C. Further notation

$\dot{x}$	Time derivative of a variable x
$\hat{x}$	Growth rate of x

r_o, *etc.*	Steady state values
$y = Y/K$, *etc.*	Real variables in intensive form
$m = M/(p_v K)$, *etc.*	Nominal variables in intensive form
GBR	Government Budget Restraint

D. Commonly used abbreviations

AD	Aggregate Demand
ADF	Augmented Dickey-Fuller
AS	Aggregate Supply
BOJ	Bank of Japan
CAO	Central Application Office
CB	Central Bank
CDO	Collateralised Debt Obligation
CES	Constant Elasticity of Substitution
DSGE	Dynamic Stochastic General Equilibrium
ECB	European Central Bank
FED	Federal Reserve Board
GBR	Government Budget Restraint
GDP	Gross Domestic Product
GMM	Generalised Method of Moments
GNP	Gross National Product
IMF	International Monetary Fund
KMG	Keynes–Metzler–Goodwin
MBS	Mortgage Backed Security
METI	Ministry of Economy, Trade and Industry
MFT	Mundell–Fleming–Tobin
NAIRE	Non-Accelerating Inflation Rate of Employment
NAIRU	Non-Accelerating Inflation Rate of Unemployment
MOF	Ministry Of Finance
NDP	Net Domestic Product
NDP-F	Net Domestic Product at Factor costs
NNP	Net National Product
ODE	Ordinary Differential Equation
OECD	Organisation for Economic Co-operation and Development
OLG	OverLapping Generations
PC	Phillips Curve
PPP	Purchasing Power Parity
RBC	Real Business Cycle
RMBS	Residential Mortgage Backed Security
WB	World Bank

Preface

When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done.
   (John Maynard Keynes, *The General Theory of Employment, Interest and Money*, 1936, p.159)

Deflation is also harder to fight than inflation. Over the past two decades central bankers have gained plenty of experience in how to conquer excessive price increases. Japan's ongoing inability to prevent prices falling suggests the opposite task is rather less well understood. Although it is true that heavily indebted governments might be tempted to erode their debts through higher inflation, there are few signs that political support for low inflation is waning.
   (*The Economist*, 'The deflation dilemma', 3 June 2010)

The current macroeconomic development of the USA as well as of most major industrial economies is characterised by boom-bust cycles. Such boom-bust cycles start with overconfidence, expectations of high returns and overleveraging. Often an asset price boom goes hand in hand with a credit boom and rising prices. When a downturn is triggered, often initiated by a sudden bankruptcy or similar event, frequently entailing long-term protracted periods of low growth and low employment, prices may fall and periods of debt deflation are experienced. Normally such boom-bust cycles are driven by specific sectors in the economy. In the most recent boom-bust cycle, the credit sector and the real estate sector were the main driving forces.

To study such phenomena, this book takes a macroeconomic perspective. It uses a dynamic framework that builds on the theoretical tradition of non-clearing markets. The modelling philosophy behind most of the chapters of this book is of a Keynesian nature, representing an attempt to revive this theoretical approach on the working of the interaction of the financial market and macroeconomy from a fundamental perspective that also takes account of very recent developments. In its empirical application it refers to the various financial crisis episodes that the new century has already experienced.

The macroeconomic research approach that we employ differs in significant ways from the mainstream literature that uses the Dynamic Stochastic General Equilibrium (DSGE) approach as the basic modelling device. The key difference is that our approach represents an out-of-equilibrium approach which assumes that macrofoundations have to precede microfoundations. Most importantly, we dispense with the well-informed agents that are a key assumption of the rational expectations school. The main features

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of the DSGE approach are – by contrast – the assumptions of intertemporally optimising agents, rational expectations, competitive markets and price mediated market clearing through sufficiently flexible prices and wages. Credit markets and financial markets have no particular role in this framework since all shocks are real shocks, coming from the real side of the economy. The New Keynesian approach to macroeconomics has, in the last decade or so, to a large extent, also adopted the DSGE framework, building on the intertemporally optimising agents and market clearing paradigm, but favouring more the concept of monopolistic competition, sticky wages and prices and nominal as well as real rigidities. An excellent description of this line of research is Eggertsson and Woodford (2003).

The focus of our approach in this book is to revive the Keynesian business cycle perspective on macrodynamics by giving a central role to the financial sector, as it was already formulated by Keynes (1936). It is well known that the intertemporal approach of smoothly optimising agents and fast adjustments in order to establish temporal or intertemporal marginal conditions in the product, labour and capital markets has not been very successful in matching certain stylised facts on those markets. A further deficiency of the intertemporal decision models is that macroeconomic feedback effects, in particular the ones that come from the financial sector – as well as their stabilising or destabilising impact on the macroeconomy – are rarely considered. Yet such feedback mechanisms, which are indeed relevant for the interaction of all three markets, have been central to the theoretical and empirical explorations by Keynesian authors since the 1930s. The emphasis of the topics here lies in the study of the relative strength and interaction of these feedback mechanisms as well as the transmission channels with respect to all three markets, those for labour, goods and financial assets. We are, in particular, interested in their impact on the stability of the economy once their working is considered in the context of a fully developed dynamical system approach.

We do not deny that forward-looking behaviour and (the attempt at) intertemporal optimisation by economic agents might be relevant for the dynamics of the economy, but in our view the exclusive focus on these issues in the present academic literature leaves completely to one side too many interesting, important and relevant issues. In particular, in the interaction of all three markets there may be non-linear feedback mechanisms at work which do not necessarily give rise to market clearing, nor necessarily to convergence towards a (unique) steady state growth path. Also, as recent research has shown, there is heterogeneity of agents and beliefs present in modern economies, as well as a large variety of informational, structural and financial frictions in the real world. We believe that this leaves many questions open so that the true understanding of the economy might better be pursued by a variety of frameworks. Often it is said with respect to the DSGE models that one needs to use an intertemporal optimising and rational expectations framework, otherwise one would leave 'too much money on the sidewalk'. But one might also add, that by doing so, there is a danger that one might also leave too many problems in macroeconomics on the sidewalk.

Central points in our book on Keynesian macrodynamic theory, and its application to the study of the financial market and boom-bust cycles, are the mechanisms generating non-cleared markets and the phenomenon of disequilibrium recurrently present in certain markets such as the labour or goods markets. In contrast to the tradition that stresses the clearing of all markets at each instant of time,[1] in our modelling approach, as it will be stressed at several occasions throughout this book, disequilibrium situations are the main driving forces of wage and price inflation dynamics. Moreover, disequilibrium in financial markets is often generated by overleveraging in the real sector, the household sector as well as the financial sector of the economy. Some of the markets may act as either stabilising or destabilising forces through a variety of different macroeconomic channels such as the real wage feedback channel, product market, financial market as well as debt devaluation channels, showing that there are indeed different (and also valid) possibilities to specify and analyse the dynamics of the macroeconomy in a different way from that of the DSGE framework.

Due to the fact that in our modelling approach the stability of the analysed dynamical system is not imposed *ab initio* by the assumption of rational expectations (which requires that the economy always 'jumps' to some stable path and therefore always converges to the steady state after any type of shock), its stability properties (and its analysis) are based on the relative strength of the interacting macroeconomic and financial feedback channels. Such stability analysis, despite its importance for the understanding of the dynamics of an economy, does not seem to be relevant for the literature based on the rational expectations market clearing tradition and divergent paths (apart from anomalies) do not appear to be an issue there. However, the ongoing occurrence of 'bubbles' and 'herding' in financial markets worldwide, as well as the large macroeconomic imbalances present nowadays in the global economy through overleveraging indicate that such divergent paths can indeed take place in significant and sometimes long-lasting ways.

In our framework we finally dispense with another prominent assumption of mainstream economics, namely the assumption of a single representative household. In a capitalist economy there are – almost by definition – always at least two representative households to be considered, workers and asset holders. Of course, there exist more household types in actual economies and also hybrid configurations of them, but certainly not a single type as far as utility formation and budget constraints are concerned, as the current subprime and credit crises make obvious. Macroeconomic theory with only 'Robinson Cruse', and not also 'Man Friday', not only ignores the conflict over income distribution and labour and employment issues, but also neglects the impact of financial and real boom-bust cycles on the labour market and job creation and destruction. The labour market will thus play an important part in our modelling strategy.

A number of professional colleagues, too numerous to name here, have contributed to the present project through stimulating discussions on various aspects of the subject

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[1] This is really an heroic assumption in a continuous-time modelling framework.

matter of this book as well as on related research projects. We are also grateful for comments and criticisms we have received from numerous participants at presentations of aspects of the material of this book at numerous international conferences and research seminars. Of course, we alone are responsible for the remaining errors in this work. We are indebted to two anonymous referees who read the original version of the manuscript and offered many, even detailed, suggestions for its improvement. We also wish to thank Stephanie Ji-Won Ough of the University of Technology, Sydney 'UTS' for her excellent editorial work. Finally we would like to thank Chris Harrison of Cambridge University Press for all he has done to make the publication process go as smoothly as it has.