STOCKS, FLOWS, AND UNCERTAINTY:
CRITICAL PROBLEMS IN THE STOCK FLOW CONSISTENT APPROACH TO MONETARY ECONOMICS

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Thesis submitted for the degree of PhD in Economics

2013

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Declaration for PhD thesis

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ACKNOWLEDGEMENTS

There are a number of people I would like to thank here that helped bring this thesis to fruition. First is my supervisor, Costas Lapavitsas, from whose knowledge of detail and critical eye for the core arguments the thesis has been improved enormously.

Working with economists with whom disagreements are possible, but not terminal, has been a revelation, particularly in the Research on Money and Finance group at SOAS. Jo Michell, Nina Kaltenbrunner, Alexis Stenfors, Duncan Lindo and others from RMF have provided an ideal intellectual environment over a number of years to sharpen and challenge my thoughts.

My family, and especially my parents, have been patient and supportive throughout the more trying times involved in writing a thesis, and I thank them for this. And without the constant and unwavering support of Yva Alexandrova I doubt very much I would have been able to finish. I am dedicating this thesis to her, with love.

James Meadway

February 2015

ABSTRACT

This thesis presents a critique of the increasingly popular post-Keynesian stock-flow consistent (SFC) approach to macroeconomic modelling. With the Godley-Lavoie (2007) textbook taken as the paradigmatic treatment, it explores the claims of SFC to provide both a complete and coherent means to analyse and model any modern economy.

It finds that the presence of uncertainty in firms' decision-making renders the system inconsistent with either rational behaviour on the part of firms, or SFC's wider claims to rigorous consistency conditions being met. Once uncertainty of this kind is introduced, we find a line of transmission from the real economy back into the monetary system that conventional SFC models cannot cope with.

Building on this, the thesis presents the role of capital and initial financing as fundamental problems within the SFC framing, resulting also in monetary imbalances. We suggest that drawing on the classical political economy and its understanding of the hoarding of money with the circuit of accumulation can help resolve some of these difficulties. The thesis concludes with an exploration of the shadow banking system in light of the preceding discussion.

CONTENTS

CHAPTER ONE

INTRODUCTION

The crisis in macroeconomics since the Great Recession of 2008-9 has been fundamental. After a nearly decade, over which the tremors at the start of the millennium associated with the dot.com crash appeared to have faded to a distant memory, and the macroeconomics profession could reassure itself that the "New Consensus" (Arestis 2009) had resolved all major theoretical and policy difficulties, the crash came as an ugly shock. For all the increasing mathematical sophistication of the neoclassical mainstream, the dominant paradigm of "representative agents", rational-optimising behaviour, and market clearing settings (with the occasional "New Keynesian" deviation) looked to be seriously out of step with reality. Mainstream models, overwhelmingly, did not predict and did not expect the crash.

An intellectual and practical failure of this scale was bound to give a new lease of life those critics who, in the years of the New Consensus, had been marginalised or excluded from academic discourse. The traditions of the heterodoxy – increasingly forced to the edges of academia – appeared suddenly to offer potentially convincing challenges to the neoclassical mainstream, despite their comparative lack of institutional support.

In keeping with heretics throughout history, however, the ranks of the heterodox may not have entirely grasped this opportunity themselves. Years, stretching into decades, of something approaching intellectual isolation had both thinned their numbers absolutely, and reduced the remnants to a selection of apparently mutually-incompatible (and frequently mutually hostile) alternatives: post-Keynesians, Marxists, institutional economists, environmental economists, the Austrian School , neo-chartalists, evolutionary economists: the list can be extended for some distance, without gaining any greater clarity. As against the exceptional (if ultimately futile) coherence of the neoclassical orthodoxy, with its claims of rigour and high technical standards, the heterodoxy lacked a systemic intellectual means to organise itself.

It is within the last few years, however, that this lack of coherency may have started to breakdown. Ably promoted by its supporters, the stock-flow consistent (SFC) approach to modelling has moved, as Wynne Godley and Marc Lavoie suggest in their seminal *Monetary Economics*¸ from a fringe concern to a potential alternative to the New Keynesian paradigm.

The growing popularity of the techniques is evident: to pick some examples, Wynne Godley, pioneer of much of modern stock-flow modelling, was the subject of a New York Times profile just before the current paper was completed (Schlafer 2013); the Institute for New Economic Thinking, established with private funding to promote alternative approaches to the neoclassical mainstream, including SFC models; and the Levy Institute at Bard College has been central to promoting and disseminating stock-flow consistent and flow-of-funds methods.[1] The glimmerings of a mainstream academic recognition are beginning to stir, with Paul Krugman amongst the recent neoclassical commentators – if only to (largely) dismiss the approach as "old-fashioned" (Krugman 2013), apparently in the belief that a lack of microfoundations cause SFC models predict secular stagnation.

Nonetheless, it is fair to argue that stock-flow consistency has increasingly come to inform alternative approaches. One of its merits, as the next chapter explores briefly, is its seeming openness: as a method of organising an economic model, it can provide (its supporters argue) a structure that is both open enough to allow many different behavioural and structural relationships to be tested, empirically or analytically; and yet, simultaneously, it can provide a sufficiently robust theoretical armature to ensure the coherency and stability of models over time. In this way, not only could the (now-dominant) post-Keynesian variant of stock-flow modelling, with its concerns of endogenous money, credit creation, imperfect competition, and so on, be incorporated in SFC, so, too, could a neoclassical version. James Tobin and his collaborators, early on, explored the possibility of SFC as a means to resolve some of the lacunae inside the neoclassical, general equilibrium system. This line of research has, however, now very largely fizzled out, and we explore some of the reasons for this in the next chapter.

This leaves the post-Keynesian, and similar, overtly heterodox approaches as the dominant tendency within the development of SFC. It is the claim of *generality* that interests us most– of SFC as an organising principle for otherwise competing theoretical schools, akin to that of general equilibrium for heterodoxy. It is this claim, we suggest, that is distinctive for SFC in the post-Keynesian variant that has come to dominate. The success or otherwise of the theoretical claim stands or falls on this generality, imposing two sets of questions: first, is SFC internally coherent and consistent? Second, on the basis of this coherency (or lack), can it be used to describe the evolution of an economy over time?

[1] The two terms are virtually interchangeable as a description of the modelling methodology. We use stock-flow consistent (SFC) throughout to refer to this methodology; flow-of-funds is only used when referring to the empirical data.

We take these two questions as the over-riding concern. Our particular strategy to answer both is to assess the degree to which the framework represents a *general* rather than a *particular* frame for a monetary economy, and then to check for its own internal consistency. The general framework of SFC, at least in its post-Keynesian variant, is not only an exercise in the construction of a set of abstract matrices, with behavioural relationships as described by the modeller. It also, as Godley, Lavoie, and others correctly indicate, involves the necessity of some theoretical claims about the world.

At the centre of these claims is a certain conception of money and its role within the economy. In stark opposition to the neoclassical paradigm, SFC models an overtly *monetary* economy: one in which economically relevant transactions between agents are conducted in money terms, and with money. This, in turn, requires SFC models to take an unusually (relative to the neoclassicists) clear position on the creation and use of money in the economy. In close parallel, it forces any modeller to approach time not (as in the general equilibrium case) a mere index of events, but as a real structure in the economy that compels a particular logic on behaviour: the economy, in SFC, is a sequence of events taking place over time, and these events an internal coherency and logic. Taking these two elements, we explore the relationship between them, developing a particular understanding of the place of *uncertainty* which, as we will see, post-Keynesian accounts have placed great store by, but which SFC (we suggest) somewhat neglects.

To the question of uncertainty, we develop, in turn, a particular critique of SFC, based in large part on the work of political economists writing in a broadly Marxist theoretical mode. We isolate the (related) treatments of uncertainty and financing as central to the coherence and explanatory power of the SFC model, and develop on this basis an approach to uncertainty and financing that we think can begin to resolve some of the problems here. This involves, in parallel, a development of some of the Marxist approaches to credit and finance, where these had otherwise treated uncertainty as an afterthought. We draw on Marx and later writers because, with some refinements, it appears to offer the best means to integrate the issues of sequencing, coherency, and aggregation that post-Keynesian SFC models place centre-stage.

This is the research strategy in the whole paper. It involves, of necessity, the exclusion of much that is of interest: we do not consider, for example, the question of behavioural relations in any great depth; nor do we approach the issue of pricing, and we only touch, indirectly, on the behaviour of firms. There are no simulation models or other empirical

exercises, although we offer the development of the shadow banking system, in a concluding chapter, as an empirical anomaly that SFC alone (to say nothing of the neoclassical school) has some trouble accommodating itself to.

These exclusions, all of them containing great potential for future research, are necessary to maintain what we hope is the clear focus of the paper on the *structural* considerations of SFC – its coherency and completeness – ahead of the particular uses to which it might be put. We offer a further structural element – that of uncertainty as a social fact within an economy organised on competitive lines, and using money as a means of exchange and unit of account. This structural element is introduced with the claim that it is both singularly important for a convincing account of a monetary economy; and, at the same time, helps us resolve some of the inconsistencies that can appear in SFC models.

The existing literature and an alternative paradigm

The chapter immediately following this introduction is a critical review of the literature of stock-flow consistency. It reconstructs the separate strands that fed into the current modelling methodology, drawing on the "monetary theory of production" and circular flow theorists from Quesnay onwards; the creation of national income accounting; and the introduction by Copeland of flow-of-funds methods to national income accounts.

It presents SFC as both the progressive development of these separate parts of economic theory, but further suggests SFC emerged in particular as an attempt to resolve what had, by the no later than the mid-1970s, become evident problems within the mainstream of macroeconomic thought, itself heavily influenced by a variant of Keynes. It shows both how SFC was used in a neoclassical setting by the Yale school, and how the method was taken in a very different direction by economists closely associated with Cambridge, England, Wynne Godley outstanding amongst them.

SFC, in this reading, as it has developed especially over the last decade, is an attempt to both continue and resolve some of the tensions and issues within post-Keynesian economic thought. It is not, we will argue, completely successful, since core issues of the empirical and theoretical relevance of SFC models remain unresolved. Nonetheless, a survey of the recent literature suggests a viable alternative methodology can be constructed. We close by suggesting that the work of Godley and Marc Lavoie in drawing together and systematising the separate elements within SFC, constructing what amounts to an anti-

neoclassical alternative paradigm, are now central to the coherency of the SFC paradigm as such.

Chapter three introduces the stock flow consistent model through a discussion of the problems that emerge in the alternative modelling paradigm of general equilibrium theory. We aim to show that, first, general equilibrium ignores gross financial flows in favour of net, and thus obscures potentially important economic behaviour; second, this treatment of net assets results in an internal inconsistency, thanks to the presence of inside money; third that the use of inside money leads to an empirically poor and generally inconsistent treatment of the banking and financial systems.

We propose SFC as a means to resolve these problems, and briefly introduce some of the key concepts – the use of balance sheets, the centrality of the two consistency conditions, and the treatment of money as endogenous and finance as more than intermediary.

Time and inconsistencies in SFC

The next chapter, number four, forms a central part of the whole argument. It proposes, in outline, that the treatment of uncertainty as it affects real production is not satisfactory within the canonical Godley-Lavoie model, producing either internal inconsistencies, or a failure of coherence, which in turn have particular economic impacts.

It starts, via a discussion of Steve Keen's arguments for continuous-time methods, with the argument that the properly economic approach to time within a stock-flow consistent setting must be through the use of discrete time periods. This opens a discussion of the approach to income as the form of flow that arises on the basis of a stock. We note that income can be considered in an "accounting" sense, as the *backwards-looking* net flow, or in an "economic" sense, following Hicks (1946), in which it is the value that can be taken from any given economic unit without affecting the *expected* value of the of the unit's assets. This is clearly forward-looking; the distinction matters, since these two amounts can differ, and the differences have behavioural implications.

We move on to a discussion of the treatment of inventories within the textbook Godley-Lavoie (2007) model. Inventories act as both the result of failed expectations in firms' production targets, and as a hedge against the possible future failure of those production targets. In other words, they combine both a backward- and forward-looking element. We

claim that this is a confusion of concepts that in turn confuses the presentation in the SFC matrix: the treatment inconsistently claims inventories are valued at cost of production, when all other elements are valued at market price.

No rational firm, however, would treat its inventories in this manner; resolving the issue by valuing inventories at expected future income, however, causes the matrix to become inconsistent. Currently, the SFC presentation can either be consistent with itself, but inconsistent with rational firm behaviour, or inconsistent with itself, but consistent with firm behaviour. This inconsistency, the product of the effect of uncertainty on firms' production decisions, in turn produces a financial effect, in altering the valuation of firms' assets, and that, in turn, causes the SFC matrix to fail to close and the money market fail to come into balance.

We show that the system can be closed only in the neoclassical case of factors being paid their marginal products. This resolves the imbalance in the matrix and brings the money market back into equilibrium. However, without a specification of agent optimisation or some other method to bring factor payments in line with their marginal products, we view this outcome as inherently unlikely. Far more likely is that factors are paid less than their marginal product, resulting in an excess supply of money relative to demand. Critically, it is the *uncertainty* that firms face that motivates the inconsistency. Resolving the treatment of this uncertainty is central to our critique.

The stock of capital

Chapter five looks at the concept of capital. We examine the issue of capital as a stock that produces an income at a very high level of generality, before moving on to the particular issues for valuation and pricing this causes. We find that attempt to move directly from physical outputs to market prices, "smoothly" in the words of Godley and Lavoie, in fact disguises a problem of inconsistency highlighted by Piero Sraffa (1960). The issue of factor payments, particularly if they are paid their marginal products, leads to a discussion of the Cambridge controversy, and we attempt to show that the issues this raised are of a concern to any economic theory that attempts to include an account of production over time, and of the presence of accumulated capital.

This leads directly to a discussion of the treatment of capital within SFC models. We show that the treatment of capital gains is, in general, not consistent. We argue that the need for

initial financing of investment creates the need for *additional* financing. We show that capital is not reducible to a form of inventory, and that (due to the issue of valuation of both) these two elements cannot be simply summated on a balance sheet, as is done in practice: only one or the other can be consistently entered without some external pricing mechanism being introduced. We suggest that SFC in fact ends up with a retrograde concept of capital as an "accumulation of commodities", akin to that proposed in Ricardo, but without the necessary external theory of valuation – the labour theory of value, or general equilibrium theory could equally work here.

Initial financing and the sequence of events

Chapter six returns to the question of initial financing, opening with a discussion of entrepreneurs' motives to want to invest and – critically – to fail to invest, and to hoard financing. This opens up a discussion of Keynes' "financial motive" for holding additional money balances to meet the initial demand for finance. We argue that this cannot be simply reduced to a further element in the demand for money, but has to be treated as a necessary part of production in capitalist economy.

This opens up, in turn, to a discussion of the "circuitist" school, with its focus on the need for initial financing to commence a sequence of production. The "paradox of profits" is discussed, along with some proposed resolutions. We suggest, however, that the introduction of uncertainty – and therefore of a requirement to hoard – can provide the means to resolve the paradox, since additional money balances are brought into circulation flexibly from the stocks of hoarded money, as needed.

Credit, money, and uncertainty

Chapter seven is lengthy, and builds on this notion of hoarding to discuss the creation, on this basis, of a market for credit. We introduce, via Marx and Marxian writers, the notion of the hoard as a barrier to uncertainty of a structural kind within the circuit, and that therefore this can become the basis for a credit system. The presence of these money hoards creates leaks from the circuit, and therefore any representation of the economy via balance sheets alone is unlikely to be a complete representation of economic processes, despite the SFC claims. It is money hoards that provide the initial basis for the credit system

as such, and the credit system which then can transform hoarded money into money-capital capable of circulation: the two (money and money-capital) are distinct elements within the system as a whole. We note that, although Keynes held a theory of hoarding, the notion of uncertainty was (by the *General Theory*) left undernourished on the monetary side, Keynes preferring to present his case by reference to the standard quantity theory. SFC models have in general ended up with a similar failure to distinguish money in different forms, precisely because the whole representation has to take place on a single set of balance-sheet and transaction matrices.

We suggest that this implies the quantity theory of money, with money determining prices, may not hold and that therefore we should be looking, as in Marx, to an anti-quantity theory of money, with prices determined by production conditions driving changes in the supply of money. We explore some of the implications of this: the need for a determining "law of reflux" and the requirement for money to act as a *real* rather than *symbolic* store of value. The anti-quantity theory, in turn, helps illuminate some of the contradictions we have developed within the SFC system, most notably the appearance (as a result of systemic uncertainty) of a "monetary excess". It is this excess, we suggest, that helps regulate the system as a whole, given uncertainty in particular, and note the role of world money in providing this function.

Chapter eight is a more empirical chapter that looks at what we argue is one of the major contemporary forms of money hoarding, outside of the conventional credit circuit, in the creation of off-balance sheet, non-depository banking institutions – the "shadow banking system". As previously suggested, the presence of uncertainty creates an imbalance in the money market, except in conditions of general equilibrium that are inherently unlikely. This imbalance has emerged as the exceptional demand for liquidity, given the needs of investment, alongside enormous concentrations of non-invested wealth. Together this has created the shadow banking system.

We draw on and attempt to provide some more empirical details for the discussions that have been introduced on uncertainty and the role of banks and credit money. We suggest that the complex tangle of processes developed inside the off-balance sheet, non-depository banking system can be understood as a system itself, but that we need to place this complexity within a macroeconomic framing capable of organising it: SFC, with its single-money form of representation and its (necessary) exclusion of leaks within its circuits of monetary flows may not be well-placed to do this. We conclude the chapter with an

assessment of one recent attempt, in a broadly SFC frame, to account for the processes of the shadow banking system and their relationship to the financial crisis.

The paper concludes with some suggestions for further research.

CHAPTER TWO

CRITICAL LITERATURE REVIEW

Introduction

This chapter provides a survey of some recent work in stock-flow consistency (SFC). It attempts, however, to place this within a broader framework of economic thought, seeking to show how SFC developed from specific parts of economic thought and in response to specific challenges. We do not want to treat it, then, as the unmediated expression of how the economy "really is" – as, on occasion, its enthusiasts have done – but as the particular development of a particular set of theories.

The aim is to both introduce the important literature, and indicate some of the main lines of criticism. We start with Keynes' circular flow of income, as the original development from which all subsequent SFC work follows, and note that this places SFC within a particular set of economic thought outside the mainstream. National accounting was developed, and then given economic content through early research on SFC, leading up to the arguments around the Cambridge school in the 1970s. We suggest that a neoclassical SFC is possible, as the work of Tobin and others showed, but that this has been largely abandoned due to the perceived ability of SFC to begin to resolve some longstanding issues within the post-Keynesian literature.

There is a critique of this line of thinking that draws out the major problems within SFC. The chapter concludes with an overview of these issues in the light of recent literature.

I. CIRCULAR FLOWS

Keynes' circular flow of income

Stock-flow consistency is incomprehensible without Keynes, and his 1936 *General Theory* in particular. Although not unique in doing so, this popularised the case for treating the concerns of economic policymaking for the whole economy as separate to those of individual markets: of the existence of a macroeconomy, whose rules could be quite different to those prevailing at a micro level. The development of this line of thinking

became known as Keynesianism, and SFC is in general best (although not *necessarily*) conceived of as an extension of a particular kind of Keynesian thought.

The barebones Keynesian case can be stated quite easily. The simplest plausible model for the economy includes two sectors, households and firms. This is a direct descendent of Keynes' "circular flow of income", introduced in the *General Theory*, in which a supply of incomes from firms to households, in payment for labour supplied, returns back to firms as a flow of earnings from sales revenues. In this sense, it is clear that every expenditure by one sector *must* be an earning by the other, giving a final expenditure national income for the whole economy as $Y=C+I$, where C is consumption spending by households and I is investment spending by firms – here including their expenditure on wages. Looking at the flow of income from the point of view of earnings gives us the same total. If households earn wages wN and firms, holding capital, earn the return rK, we have for factor incomes $Y=wN+rK$. Ex post, both the income-derived and the spending-derived national incomes will equate. Where savings by households occur, this will be equal to $Y-C=S$. It can immediately be seen that, ex post, savings must equal investment, $S=I$. This is the critical balancing point of the entire Keynesian system: it ensures that the whole system can be closed.

Things become more complicated with the introduction of a functioning money asset. If *money* is earned for the supply of labour by households, and then spent on goods supplied by firms, households always have the option to *fail* to spend: they can withdraw money from circulation, and hold money balances as a savings. They may have incentive to do this for reasons Keynes, famously, identified in the general theory: in addition to the *transactions* motive for holding money, necessary because money is the only valid means of payment; if money can also act as a *store of value*, there appears in addition the *precautionary* motive to hold positive money balances, since money can act here as a form of hedging against an uncertain future. In particular, unknown future demands for payments can arise, and so households have an incentive to hold money in the present. If a functioning asset market also exists, there can emerge a *speculative* demand for holding money, in anticipation of making future gains with interest rate rises, or avoiding future losses in the event of their falls.

Stock-flow consistent modelling builds on that barebones framework to attempt to show not just the *flows* arising from transactions, but also the balance of the *stocks* of assets and liabilities held within the economy. These stocks, in turn, engender flows of income

between sectors and agents; it is the duty of the modeller to attempt to capture these movements and these relationships as best as possible.

The requirement of consistency in this relationship can be stated formally. Following Siegel (1979), Patterson and Stephenson (1988) provide a formal definition of stock-flow consistency as where a pair of variables, *x(t)* and *y(t)*, indexed by time, have the following relationship:

$$\int_{-\infty}^{t} y(t) = x(t) + c$$

Or, equivalently *y(t)=x(t)/dt*. This is a continuous-time conception of the stock-flow relationship, in which (as can be seen from the integration), the cumulative value of the flows *y(t)* to time *t* are the same as the value of the stock *x(t)*, plus some arbitrary constant that can here be thought of as past, unmodelled history. This relationship is "consistent" because the value of any given stock at any point in time is equal to the value of past flows into the stock (plus history); alternatively, the rate of any given flow at any point in time is the rate of change of the stock. As chapter three covers in more detail, the question of continuous versus discrete time period modelling becomes an issue once the requirement of consistency between stocks and flows is introduced, since (as Foley (1975) demonstrates) in flow-flow systems, of the kind modelled in general equilibrium, the choice of periodisation is irrelevant.[2]

The requirement of consistency has two direct economic implications, built in to the whole system. As Wynne Godley, arguably the dominant theorist in SFC economics, neatly phrased it, the system in the aggregate will be one with "with no 'black holes' – every flow comes from somewhere and goes somewhere" (Godley 1996:7). The two economic consequences of this are, first, in common with the mainstream of economics, that budget constraints are binding on sectors: it is not possible for any sector in the aggregate to make use of more flows than it has access to within a period. Requirements for consumption spending, for example, above current incomes necessitate the creation of loans – a flow arising in the banking sector, moving to households, and attached to an increasing stock of loans and deposit holdings. This familiar requirement will probably not be controversial.

More unusual is the second constraint, that of the double entry accounting principle: every stock held as an asset has a liability as its counterpart elsewhere in the system, and (of

[2] Foley also shows that a flow-flow system, showing only the relationship between end period flows, is equivalent to a stock-stock system, showing only the relationship between start-of-period stocks, if general equilibrium obtains.

course) vice versa. This is not a constraint generally considered by the neoclassical mainstream, which deals (as we shall argue in the next chapter) exclusively with *net* flows of wealth, and therefore can ignore the *gross* position of assets and liabilities. It is a position not, however, without its own problems. Together, these two requirements impose a constraint on the entire modelled system that we refer to throughout as the zero-sum condition: each row, and each column, within the balance sheet should sum to zero, with (sometimes) the single exception of net wealth. This requirement is absolutely critical to the successful functioning of stock-flow models; nonetheless, it is not, itself, uncontroversial.

The "underground" history of circular flows

In emphasising the necessity for an economy to exist as a *circular* flow of transactions between entities, rather than a fundamentally static equilibrium, stock-flow consistent (SFC) approaches to macroeconomic questions are usually part of what Graziani (1982) has called the "underground" tradition of economic thought that stretches from the SFC and flow-of-funds work of Godley, Lavoie, Dos Santos and others, through Keynes himself , taking in Joseph Schumpeter and Rosa Luxemburg (Luxemburg, Tarbuck et al. 1973; Bellofiore and Passarella 2009), and then back to Karl Marx's "reproduction schemes" in volume two of *Capital* (Marx 1894). These were themselves strongly influenced by Francois Quesnay's presentation of a recognisably circular flow of income in his *Tableau Economique* (Quesnay 1969), the first time such a representation was attempted. Central to all of these conceptions of the economy is the importance of money as the means by which the separate units within the economy are brought together. This buried tradition, then, stands in stark contrast to that of the dominant neoclassical school within economics, with its stress on static equilibrium analysis, its stress on real (rather than nominal) factors within the analysis, and its general belief in the neutrality of money itself.

Such "social accounting matrices" (the coinage is Richard Stone's) of wealth fed directly into the development of national income accounting in the 1920s and 1930s. Simon Kuznet's pioneering work for the US national accounts, with the first complete set published in 1934, was preceded by the work of Ernst Wagemann and the Institute for Business-Cycle Research in Germany. Wagemann had developed a notion of the circular flow of income as early as 1923, and the Institute was by the end of the decade able to

make detailed statistical cases in support of an increasingly interventionist state (Tooze 1999; Tooze 2001). As Geoff Tily notes, however, these early efforts at *complete* sets of national accounts, incorporating all relevant parts of economic life themselves had a long intellectual prehistory in the incomplete and partial attempts to measure "national wealth". William Petty's sketches in the 1660s, and Gregory King's work, completed in 1696, are outstanding in this case, King building both an income and a consumption measure of national income for the UK, France, and Holland (Stone 1984: 118). That work had been slowly built upon during the 19th century by Alfred Flux, Arthur Bowley and Josiah Stamp, amongst others, (Tily 2009: 331) but it was not until statistical and survey techniques had developed sufficiently to allow consistent recording of data that the first true national accounts could be published. Developments in statistical accounting here marched in parallel with the development of macroeconomics as distinctive discipline within the wider field of economics, a development inseparable from the publication of Keynes' *General Theory* (1936) and the subsequent systematization of its insights.

Benjamin Mitra-Kahn traces this intellectual lineage in his account of the development of the "economy" as an object of social and political concern (Mitra-Kahn 2011). His argument that the tools, in some sense, *created* the economy bears some resemblance to the performativity theories of Michel Callon (Callon 1998; Callon, Millo et al. 2007) and Donald MacKenzie (MacKenzie 2006; MacKenzie, Muniesa et al. 2007). This is not a resemblance explicitly identified by Mitra-Kahn, and of course the stress on knowledge itself as the product of a given history, and of power relations, should bring to mind the Nietzscheanism of Michel Foucault : the notion of set of theoretical practices as definitive of its own object of study immediately recalls Foucault's *dispositif* (Foucault 1980). We do not, here, need to accept the entirety of his historical thesis; but the notion that accounts are *created*, and that accounting has a history, can act as a useful corrective to the – recurrent, if generally unstated – belief that national accounts are simple expressions of economic truth. Much of the work that this chapter surveys contains this unexamined assumption: that the accounting matrices, if based on the national accounts now published in standardised form globally, are in fact identical to the state of the economy, containing all relevant economic information. This may be the case; but we cannot *guarantee* that it is the case, if any degree of reflexivity in the construction of the accounts is allowed for. Much of the thesis that follows will end up exploring some of the implications of this problem.

In any case, the techniques of national accounting were given an immense boost by the Second World War. Its overwhelming demands for a total mobilisation of economic resources, combined with the necessity to refine planning techniques, created an immense incentive to improve the collection and production of accounts. Richard Stone's 1948 memorandum introduced double-entry accounting to national income, allowing a properly financial record of assets and liabilities to be presented. By 1952, the UN's System of National Accounts offered an internationally-recognised standard for the production and publication of nation income statistics. The "social accounting perspective" was by this time a well-established methodology for the presentation of economic statistics.

II. NATIONAL ACCOUNTING AND "NEW CAMBRIDGE"

From national accounts to stock-flow consistency

However, to move from this treatment of the accounts as economic datum, and towards a treatment of the accounts as a determining factor in economic theory, required the introduction of dynamics: the production, not just of static balances, but of some indication of *flows of funds* throughout the system. The key breakthrough here was provided by Copeland (1949), who extended the social accounting matrix to explicitly include movements of money and funding throughout out the system. This, in turn, transformed the static double-entry accounting principle, familiar from standard company accounts, into the dynamic *quadruple-entry* accounting: since one unit's inflow of funds is *also* another's outflow, the standard double-entry account is itself doubled: assets produce an inflow and outflow; liabilities produce a parallel inflow and outflow. This feature, of quadruple-entry accounting, is now at the heart of any SFC system, directly reflecting the consistency and coherency claimed for the methodology.

This breakthrough, however, did not have an immediate impact on economic theory as such. Copeland's "certainly had an influence on economics", but this was "mainly as source of financial data" (Caverzasi and Godin 2013: 5). The possibility of using this insight to disrupt economic theory, and to begin – more practically – to relate real and financial flows in a systematic fashion, breaking with the supposition of neutrality, was not convincingly taken up at the time – or for decades afterwards (Cohen 1972).

The development of modern stock-flow approaches can be traced back to the disintegration of the "Keynesian" consensus in macroeconomics from the 1970s onwards.

From the development of the Hicksian synthesis (Hicks 1937) onwards, through the formalisation of the basic principles in the work of Samuelson (1948) in particular, a wide agreement had developed in post-war economics as to the core elements of understanding the economy. These were, first, national income determination in the national income identity; second, the presence of the multiplier effect and therefore of a rationale for sustained government intervention; third, the empirical existence of the Philips Curve trade-off between inflation and unemployment that would allow different policy mixes to be rationally considered.

For almost thirty years, governments in the West could win elections, as Britain's Harold Macmillan did in 1955, on variants of the slogan, "you've never had it so good". This Golden Age (Hobsbawm 1994) of economic growth had its direct theoretical expression in the development of "Keynesian macroeconomics", creating what Meghnad Desai has accurately described as (Desai 2002: 216) an "Age of Keynes". It was only as both the post-war boom fizzled out, from the late 1960s onwards, and as the "Keynesian" techniques of demand-management appeared to break down, that a serious intellectual challenge was made to the hegemony of Keynesianism. This emerged, principally, in the reassertion of the virtues of free markets, and technically sophisticated arguments for their primacy, particularly in developing the notions of rational expectations (Muth 1961) and the need for "microfoundations" to provide consistency in macroeconomic models (Lucas 1976). A "counter-revolution" (Johnson 1971) in economic thought appeared to be taking place, overturning the consensus, and replacing it with variants of the earlier "classical" school – Keynes' own description for the pre-war consensus view on the macroeconomy. Concerns that had been shunted to the margins of economic theory were given new interpretations and brought back into the core of the mainstream theory (Friedman 1968).

However, the consensus in the mainstream had also clouded over other, different voices. A particular tradition of broadly Keynesian thought had developed, associated principally with the economics department at Cambridge, England, that stressed the continuity of Keynes' own thought between the *Treatise on Money* and the *General Theory*, emphasising particularly the radicalism of the latter. The mainstream would be dismissed as "hydraulic" or even "bastard" Keynesianism (Robinson 1975), stripping the insights of Keynes and reducing them to a bland set of theoretical propositions. An approach that explicitly opposes itself to the conventional model is that of the post-Keynesian school. This line of

thinking, growing particularly from the work of Hicks (1980), Kaldor (1977) and others in the later 1970s, has based itself on a re-interpretation of Keynes' own writings.

Against the neoclassical interpretation, as developed notably by the younger Hicks (Hicks 1937), pre-war, and Samuelson (1948) after WW2, post-Keynesianism has built on what they identify as Keynes' key concerns, throughout his life and work, with risk, uncertainty, and expectations. Conventional presentations of the "neoclassical synthesis" of Keynes' work, typically through the use of the IS-LM standard macro model, develop a deterministic view of the macroeconomic world. The principal macroeconomic relationships can be described by a few linear (or linearisable) equations relating in consistent fashion the propensities to save, invest, consume and hold money. Within the loosely-defined group of post-Keynesians, it was the work of Wynne Godley, especially, that did the most to lay the foundations – and then subsequently develop – a specifically post-Keynesian interpretation of macroeconomics that placed the stock-flow identity at its centre.

Distinctively, these developments initially took the form of what became known as the "New Cambridge" approach to macroeconomics (Dos Santos and Macedo e Silva 2010). Separately from direct claims about stock-flow consistency, authors associated with Cambridge and the Department of Applied Economics developed the "three balances" approach to macroeconomic issues. Sharing a family resemblance to Kalecki's (1971) well-known reconfiguration of national income, noting that profits are the sum of capitalist investment, capitalist consumption expenditures and the government deficit, minus workers' saving, the three balances approach related (in an open economy setting) private, public, and the current account via the national income identity.

We can extend the basic national income identity to include government and the rest of the world:

$$Y \equiv C + I + G + (X - M)$$

Note, importantly, that this is an *identity*: it will of necessity hold for any set of values for each variable. With *C* as private sector consumption by households, *I* as private sector investment by firms, *G* as government spending and *(X-M)* as the balance of trade. This implies a division of the economy into three parts: private (households and firms), public (government) and the rest of the world, seen here through the current account. Each of these sectors makes payments to the others, either as direct transfers (say in the form of taxes and subsidies), or as payments for services (say for labour). With *T* as the *net* taxes

paid to government (that is, net of transfer payments *from* government), T_{pe} as the net payments from the private sector to abroad, and T_{ge} as the net payments of government to abroad, we have:

$$Y - T - T_{pe} \equiv C + I + G + T_{ge} - T + (X - M) - T_{pe} - T_{ge}$$

This can be rearranged to show the key New Cambridge relationship:

$$Y - T - T_{pe} - C - I = \left(G + T_{ge} - T\right) + (X - M - T_{pe} - T_{ge})$$

In other words, the net financial balance of the private sector (on the left-hand side) is equal to the (negative of the) government deficit plus the current account. This simple rearrangement immediately implies both the strong case for government deficit expenditure as a driver of private sector growth, and the need to avoid persistent current account deficits: both policies closely associated with the New Cambridge school, and Wynne Godley in particular. The appearance of persistent current account deficits in the UK, worsening and then becoming apparently permanent from the mid-1980s, was a particular source of concern for the school. It should be noted that this is already an economy based on cashflows, in Hyman Minsky's sense, with economic activity determined by and around movements of *money income* rather than real balances. In Minsky's words, these cash flows "are the result of (1) the income-producing system, which includes wages, taxes and non-financial corporate gross profits after taxes, (2) the financial structure, which is composed of interest, dividends, rents, and repayments on loans, and (3) the dealing or trading in capital assets and financial instruments." (Minsky 1975: 118). Relatedly, we can see from this balance that Michal Kalecki's well-known definition of aggregate profits will hold, as Godley and Lavoie indicate (2007: 37): that profits "must, by definition, be equal to the sum of gross investment, plus the fiscal deficit, plus the trade surplus, plus capitalists' consumption, minus workers' savings." (Kalecki 1971: 82-3).

Stock-flow consistency, in versions derived via Cambridge rather than Yale, has these sets of identities at its heart. The three balances provide the rationale, in economic theory, for the presentation of the whole economy as the set of relationships developed between the three sectors: private, public, and external. They provide the rationale for describing the economy as consisting of these sectors since, if we follow the Keynesian logic of income flows, every expenditure by one sector is necessarily a source of income for another. Post-Keynesian stock-flow consistency, then, extends this underlying (and strongly Keynesian)

structure with the addition of Copeland's "moneyflows" – an explicit treatment of the sources and volumes of the flows of financing that relate the separate elements of the macroeconomy. Once these flows are included, the SFC model is complete: it should specify both the holdings of stocks (in the form of financial assets and liabilities, registered on the balance sheet) and the volumes and sources of the flows, in the form of transfers of funds. It is this completeness of the representation that marks the post-Keynesian SFC theory: rather than relying on the assumption of individual optimisation driving the economy back towards an equilibrium, the presumption of completeness means that, at *any* point in time, the economy is "solved": there are no imbalances across the balance sheets and the matrices, and the whole economy has no unexplained "leaks" from the system. Godley and Cripps' 1983 textbook, *Macroeconomics*, was seminal in beginning to demonstrate how a complete SFC model could be constructed in a broadly Keynesian setting, building on prior work.

Model closure and behavioural functions

One great merit of the SFC system, and certainly one claimed by its supporters, is its high level of generality. If, given the basic structure of the accounts and the flow relationships, the zero-sum conditions are observed, any set of behavioural relationships amongst the sectors can be used to close the system. The presence of (1) binding budget constraints and (2) double-entry accounting determines the whole system must be closed; and that, this being the case, it is overdetermined: in an SFC system of *n* equations, those up to *(n-1)* must be specified but *n*-th equation will be closed by the system itself. This implies, therefore, a high degree of generality to the system, if those two conditions hold.

The selection of behavioural functions, then, can look somewhat arbitrary – there are no necessary constraints on the functional form beyond the need to observe the two binding constraints present for the whole system. Backus, Tobin and others closer to the neoclassical school than the post-Keynesians have tended to stress portfolio choice, agents like households basing current choices about asset holdings on "long-run target asset and wealth positions, based on current and expected interest rates, incomes and other relevant variables. Actual positions are then adjusted towards these targets. Transitory factors, like windfall gains and losses, will also influence these adjustments." (Backus, Brainard et al. 1980: 273). The strong implication, at least, is that some variant of rational expectations could form an appropriate portfolio-selection rule – that agents have strongly forward-

looking behaviour. Godley, Lavoie, and others closer to a broadly post-Keynesian school have instead tended to emphasise rule-of-thumb decisionmaking, and adaptive expectations, in common with far earlier (and allegedly less theoretically robust) Keynesian model-making. There are alleged empirical benefits to this selection (Godley and Lavoie 2007), and on the grounds of tractability the model becomes easier to solve, although it should be noted that the expectations formations provided in Godley and Lavoie's textbook are strongly backward-looking.

III. FRAMING DIFFERENT THEORIES

Neoclassical stock-flow consistency

We will return the post-Keynesian shortly. But this was not the only somewhat subterranean tradition latterly buried by the swing to microfounded models and rational expectations. Nor was it, necessarily the only available interpretation of the twin theories of Keynesian economics, and social accounting. Other options were open. A line of research that had identifiable roots in Keynes' work on national income, but that rejected (explicitly or implicitly) much of the post-Keynesian interpretation of the *General Theory* system was also taking shape from the mid-1960s onwards.

The consensus view, by the late 1960s, laid great store on developing a set of relationships within the macroeconomy centred on a development of Hicks' IS-LM interpretation of the original *General Theory*. The focus was on equilibrium positions and the use of comparative statics (Samuelson 1948), combined with time-series econometric work to enable the parameterisation of models. But this had, as James Tobin's Nobel lecture identified a number of "serious defects" that were in need of "repair". (Tobin 1982: 172). He gave these as an imprecision about time, by collapsing everything into equilibrium analysis; a failure to fully identify relationships between stocks and flows; a failure to account for multiple assets, with different rates of return; and a crude approach to monetary policy in which the stock of money was held to be a variable under the more-or-less direct control of policymakers.

As Davis (1987: 112) put it, "the equilibrium solution to a traditional flow-based macroeconomic model implies values for the rates of changes of stocks that the model takes as given... The movements of these stocks through time may change [considerably] the short run equilibrium itself, and the associated prices and flows. Omission of these

stocks from a model may therefore lead to false predictions of the consequences of policy changes or of exogenous shocks to the system." By omitting to include revisions to stocks of (different) assets, the traditional IS-LM analysis was obscuring potentially important macroeconomic outcomes. A revision to this framework, incorporating flows alongside the stocks, could therefore in theory rescue the whole structure. Building on his earlier work in Brainard and Tobin (1968), (Tobin (1969) and Backus, Brainard et al. (1980)), Tobin here proposed stock-flow consistency and the construction of social accounting frameworks not as an *alternative* to the existing IS-LM framework but as necessary *improvement* on that theoretical frame.

This can be seen most starkly in his insistence that the necessary conditions to close the model – those of the budget constraint and double-entry accounting – were equivalent to "Walras' Law" (Tobin 1982: 173). Walras' Law, in Tobin's wording, states that the "excess demand functions of an economic agent must sum to zero for every vector of the variables that are arguments in any of the functions." It is a development and a generalisation of Say's Law to multiple, interdependent markets, and it forms the absolute dead-centre of any neoclassical attempt at model-building, since it guarantees that a system of decentralised, autonomous decision-making over the distribution of commodities can achieve a competitive equilibrium. Here, however, the claim is being made that the achievement of a position in which excess demands sum to zero for the sectors does *not* depend on the optimising behaviour of agents; we have, in fact, said nothing of agents' behaviour. Rather, the appearance of this strong equilibrium condition is tied to the presence of a budget constraint that acts as a real constraint on behaviour, and to the accounting convention of double-entry bookkeeping. By introducing stock-flow consistency, and therefore imposing the zero-sum rule on the matrices representing the economy, Tobin is offering a kind of short-cut to equilibrium: that the desirable conditions of general equilibrium modelling can be achieved *without* the need to specify inherently unknowable utility functions, or detail at length optimising behaviour.

This represents a distinctive take on SFC, compared to the (now dominant) post-Keynesian variant, and came to be known as the "Yale school" (Caverzasi and Godin 2013: 7). Godley and Cripps (1983), in an early attempt to synthesise the post-Keynesian case, made the larger claim that SFC should be treated as a general set of conditions for *any* macroeconomic modelling procedure, arguing that SFC *is* "macroeconomic theory" (1983: 44) – without the SFC conditions in place, macroeconomics (at least as far as the two

authors are concerned) cannot be performed. Tobin's claim is tighter: that SFC is, in effect, a representation of a neoclassical system but one "only loosely linked" to optimising behaviour of agents (Tobin 1982: 174) and (for that matter) to formal general equilibrium (Tobin 1982: 176). The explicit recognition of stock-flow relationships immediately implies, however, the recognition of explicit dynamics in the model, constituting a sharp break with the usual IS-LM treatment. The modelling of those dynamics, however, was in line with the general equilibrium process (first formulated by Leon Walras) of "*tâtonnement*" (Brainard and Tobin 1968), agents being assumed to apply a partial-adjustment factor to current state variables until an equilibrium was once again achieved. This is an overtly neoclassical treatment, in that it implies both the presence of meaningful equilibrium towards which agents gravitate as a result of their optimising behaviour; and, further, that the treatment of time within the model is similar to that within general equilibrium models more general. Time is simply an index of events, rather than a necessary sequence: the *tâtonnement* of agents is, in this sense, indifferent to time and to the presence of prior events: each grope towards the equilibrium is a discrete event taking place in continuous time. Later papers by Tobin and his collaborators at least hinted at a break with this concept, suggesting that for reasons of "convenience" it was worth imagining events occurring sequentially. The distance, nonetheless, from the post-Keynesian SFC tradition is still substantial.

Likewise, the absence of any specification of firms' production and pricing decisions within Yale School models sets them very directly apart from those Keynesian SFC systems that draw on heterodox theories of the firm. Backus, Brainard et al. (1980) has no explicit account of firm behaviour: the entire focus of the model, which is otherwise very substantial, is on asset allocation decisions by households. Tobin (1982: 179) proposes a net investment equation that is tied to a "natural" rate of accumulation, determined by "growth rate of its exogenous resources as augmented by technological progress." This leaves model without independent investment dynamics of the kind that post-Keynesian SFC research has tended to stress.

Further, there is no explicit pricing function for firms, this being assumed to be set via the competitive process and therefore arriving at the usual neoclassical condition of factor returns being equal to factor productivities. Tobin here provides three variants of price and output rules: a "Keynesian" model in which output is endogenous, but price predetermined; a "classical" variant where output is exogenously given by the capital stock, but prices are endogenous; and a "mixed" version, dependent on an exogenous Philips Curve inflation-

output trade-off. In all these cases, the underlying economy remains neoclassical, since even in the "Keynesian" case of endogenous *Y*, the long-run rate of growth and dynamics of the economy are determined purely by the supply-side. The endogenous *Y* here reflects merely the "hydraulic" Keynesian case, familiar from IS-LM analysis, in which an economy at a less than full employment equilibrium can expand output to the full employment equilibrium, and therefore is short-run demand-determined. At the long-run, full employment output, output is entirely supply-side determined.

An interesting paper, broadly within this approach, is provided by Patterson and Stephenson (1988), who adopt a specifically neoclassical approach to developing a stock-flow consistent accounting framework for the UK economy. They argue that asset revaluations have important subsequent effects on income, but that conventional national income accounting frameworks are "poorly suited to capturing such changes, primarily because they are not constructed on the basis of stock-flow consistency." (1988: 787). Using a definition of income derived from Hicks (1939), which in turn followed the work of Haig (1921), they argue from the basic Hicksian principle that a flow can be considered as income if it keeps net wealth intact.

They use this framework to propose a stock-flow consistent account of the holdings of assets and liabilities across the usual macroeconomic sectors. The model is motivated in a later paper by Patterson (1990), where it is used to provide stock-flow consistent measures of income by UK corporations – which therefore included revaluation of assets. These two papers are akin to extension backwards from Tobin's neoclassical SFC system: they move further away from the economic propositions contained in Tobin and Backus et al. in favour of providing a more robust accounting framework for the assessment of economic units.

This illustrates something of a difficulty within the Yale approach to SFC. By focusing very sharply on holdings of assets and liabilities, and ensuring that flows between their holders were consistent, they step away from a consideration of economic issues directly. They can approach the same problems that more conventional general equilibrium models have. The accumulation of financial liabilities, and the expansion of balance sheets, may not (as Minsky warned) simply represent the history of an optimal series of decisions by rational agents. Rather, the status of balance sheets themselves can have an economic impact – there can be a transmission mechanism from the stock, into the flow, and then (as a second- or higher-order impact) back into the stock. Richard Koo's "balance sheet recession" is one version of this (Koo 2008), in which the presence of highly indebted companies and

households forestalls recovery from the recession, but other, more complex interactions can be envisaged. Neoclassical models ignore this, focusing on flows only, and on net flows at that. The neoclassical SFC frame provided by the Yale school, while identifying a far more complex set of interactions amongst the different assets and liabilities that make up a real economy, move too far in excluding the dynamics of excess indebtedness, financial fragility, and so on, that have formed key parts of post-Keynesian theorising.

This is one of the sense in which SFC provides a "natural" continuation of earlier post-Keynesian theory. It allows the direct explication of complex interactions amongst different stock elements within the economy, and relates them directly to observed flows of income amongst sectors and agents. It is entirely possible to build a neoclassical version of this, losing some of the depth of these interactions but (relative to the "representative agent" paradigm) gaining, as Tobin suggests, a richness of asset classes and interactions amongst different asset-holders. However, the gains from following this research strategy do not seem as significant as those to be found in making a more substantive break with neoclassicism.

Post-Keynesian dilemmas

The relationship between SFC and post-Keynesianism has always been close, Victoria Chick describing SFC as one of the school's principal achievements (Chick 1995). Godley and Lavoie (2007), for their part, noting the Luigi Pasinetti's claims of a post-Keynesian "failure" to establish a "permanent winning paradigm" (Pasinetti 2005: 839) in opposition to the neoclassical mainstream, offer SFC as the means to organise the many (otherwise somewhat disparate) strands of post-Keynesian thought. Pasinetti's own description of post-Keynesian merits tended towards highlighting the research methodology, rather than on the content of the theoretical research itself (Pasinetti 2005: 841-844). Similarly, Sheila Dow's appeal for an "open" approach to the study of economics, this marking it as a distinctively post-Keynesian approach (Dow 2007), or the research focus of Tony Lawson and others in epistemological and philosophical questions (Lawson 1988), all tended to demarcate post-Keynesianism not as theoretical alternative to neoclassicism, with a hard core of robust and defensible claims about the world (Lakatos, Worrall et al. 1983), but more as a loose affiliation of related, philosophical questions about the nature of economics as such.

Arestis (1996), in an optimistic vein, has argued that, after moving beyond an initial *critique* of the neoclassical orthodoxy, post-Keynesian economics was now approaching a "coherence". He identifies three major traditions that post-Keynesianism has drawn from. The first is a focus on uncertainty, which determines the appearance of the institution of money (Minsky 1975; Davidson 1978). The second is "essentially Kaleckian", and most closely associated with Joan Robinson. It emphasises "effective demand failure", with investment driving the economy. It introduces a heterogeneity of agents, determined by their relationships as classes of asset-owners (or non-owners). And, as Arestis notes, it follows a line of thought right back to Marx's reproduction schemes. The third strand is an institutionalist line of thought that owes much to Thorstein Veblen, stressing the predominant role of institutions in shaping economic behaviour, and a closer attention to strictly microeconomic issues than perhaps appear in Kalecki and others (Arestis 1996: 113-114).

Arestis argues all three can, with more-or-less stretching, be brought into alignment within a coherent post-Keynesian system. The starting point of a monetary production economy (rather than a neoclassical barter system) immediately pushes money centre-stage; the treatment of history and time as meaningful in the development of the economy, with economic processes modelled as strongly non-ergodic, is another. Others have followed Arestis' lead, proposing reconciliations between post-Keynesianism and the circuitist school (Fontana 2000), or the presence of institutions in shaping expectations (Dunn 2000), amongst others. This may not, however, have been completely successful. Walters and Young, attacking post-Keynesianism *in toto*, record it as a failure: an excessive (and ultimately unproductive) concentration on the faults of neoclassicism helping disguise an internal incoherency. There is no "specific unit of analysis" in post-Keynesianism. There is no "distinctive theory of economic agency". Its striving after coherency is itself just a poor attempt to ape the "comprehensiveness" of the mainstream. It lacks a consistent methodology, and its appeals to "realism" are not sufficient to develop a theoretical organisation of the empirical evidence (Walters and Young 1997). Arestis, Dunn, and Sawyer, responding, attempt to deal with this broadside, but end up conceding much ground to their critics: defining post-Keynesianism by its distinctive concern with monetary effective demand, they end up favouring a "relatively narrow" interpretation of post-Keynesianism that excludes the neo-Ricardians and only partially includes the work of Kalecki (Arestis, Dunn et al. 1999: 545). This "relatively narrow" interpretation, however, allows for an apparently wide range of opinions on the single thing post-Keynesianism is

most identified with, theories of money (Arestis, Dunn et al. 1999: 539). It is hard, given this, to escape the impression that post-Keynesianism, by the turn of the millennium, had developed itself to the point of a critique, but had been unable to progress much further. Dunn's proposal that the "open systems" approach could be treated as the distinctive post-Keynesian claim appeared to pose more questions than it answered: that the post-Keynesians *failure* to provide definite methodological or theoretical claims was itself the definition of post-Keynesianism; a somewhat unsatisfactory conclusion (Dunn 2000).

IV. SFC AND POST-KEYNESIANISM

SFC as the resolution of post-Keynesianism

It is in this context that the role of post-Keynesian SFC becomes clear. SFC can certainly be presented as a robust alternative to *critique*, in seeking to identify at the centre of post-Keynesian thought a set of both techniques of analysis and commonly-accepted claims about the world that provide a distinctive research methodology. Godley and Lavoie's 2007 textbook is written with something like this purpose in mind, akin to that provided by Samuelson (1948) for the post-war neoclassical synthesis variant of Keynesianism. We will be using it heavily throughout this thesis, treating it as the synthesis of a great mass of existing work by both authors into a single, comprehensive system. Godley, as mentioned, has written on SFC issues since at least the late 1970s (and touched on them prior to that), with Godley and Cripps (1983), Godley (1996), Godley and Lavoie (2005) and Godley and Lavoie (2007) leading amongst his prolific output. Marc Lavoie has been active for a less extended period, but the major contribution prior to the *Monetary Economics* textbook can be found at Lavoie and Godley (2001), while Lavoie (2009) usefully summarises the state of play in relations between post-Keynesianism, the mainstream, and SFC.

It does not quite seem to follow, then, as Dos Santos (2006), that SFC was the "natural" outcome of this style of Keynesian thinking: there is a need to win the case for the construction of SFC, along broadly post-Keynesian lines, that does not follow automatically from the acceptance of a post-Keynesian set of methodological or epistemological principles. The sheer intellectual effort applied by post-Keynesian enthusiasts for SFC suggests as much. Godley and Lavoie note "alternative closures" to the SFC model in an appendix, including the neoclassical case of exogenous money as a basically special case (2007: 129-130). They prefer to present their own post-Keynesian variant of SFC as a kind

of general theory of the economy, under which particular theoretical cases can be presented. The view the SFC conditions of coherency and consistency as unbreakable, but (given that these constraints are met) alternative "closures" and "causalities" can be specified – a "closure" being the complete specification of endogenous and exogenous variables within the system, and the set of relationships proposed amongst them. Within the SFC framework, different closures are available, including the Tobinesque neoclassical closures. Indeed, Godley and Lavoie acknowledge their debts to Brainard and Tobin (1968) in providing the stepping stones towards their own treatment of household portfolio choice (2007: 15)

The allegedly "natural" relationship between post-Keynesianism and SFC can be seen most clearly in the treatment of the credit-creation process. Although not obligatory, specific inclusion of a banking sector and the direct treatment of monetary flows and stocks within the balance sheet lend themselves to treating money as *endogenous.* Money, in these SFC models, is created within the balance sheet and then circulates – typically as the result of a bank creating a deposit while it creates a loan, although direct government ("fiat") money can also be modelled for. This follows a clear line of thought in post-Keynesian research that the money supply should *not* be treated as an exogenous factor, but brought directly into the economic analysis and treated as subject to economic (rather than policy) impacts. Joan Robinson (1956) claimed as much in the 1950s; Nicholas Kaldor suggested the same, arguing strongly for "reverse causation" of interest rates (1970); and Basil Moore (1988) presented the classic "horizontalist" case for endogenous money supply, even if not all post-Keynesians entirely accepted his conclusions. Godley and Lavoie view endogenous money as one of the outstanding features of their own textbook SFC presentation (2007: 127-8), and preferable to alternative "mainstream" specifications.

In a similar vein, while Kaleckian mark-up pricing is not obligatory in SFC models, it has come to be closely associated with them as the most obvious means to introduce production motivated by monetary considerations within the balance sheet framework. Godley and Lavoie, again, synthesise their own and others' past work to present the case for treating firms as profit maximisers who respond passively to demand, but establish their own prices. This allows them, following Felipe and McCombie (2006), to treat the neoclassical production function as an "artefact" – an unhelpful relic within economics – on the basis of its empirical failings, and then to propose Kaleckian firm behaviour as a viable alternative (Godley and Lavoie 2007: 20).

Indeed, to the extent that SFC follows "naturally" from any post-Keynesian approach, it perhaps is closest to the "three balances" of the New Cambridge school in emphasising the closed and complete nature of the major macroeconomic relationships: everything is tied to everything else, with the balance sheet then providing levels of disaggregation away from the three core sectors of private, public, and the external balance. This is to adopt, it would seem, quite a different set of concerns from those more associated with Dow, Lawson, Davidson (1978), and other authors identifying post-Keynesianism as a methodology or epistemology for theory, rather than a theory as such. Concerns like uncertainty, or the status of economic facts in relation to the real world, do not enter and are not explicitly dealt with: in terms of Arestis' categorization, SFC is close to the second, Kaleckian strand, but has relatively little to do with the others. Without necessarily making the line of descent as clear as those circuitist school (Graziani 1995), the treatment of the economy as fundamentally a closed circuit of monetary events is very obviously related to Marx's reproduction schemes, and Schumpeter's flows of income, in addition to Keynes' own "circular flow" (Keynes 1936). The problems within post-Keynesianism are resolved by, rather akin to Arestis et al., a process of exclusion from the corpus.

There have, nonetheless, been attempts to integrate these different elements of post-Keynesian thought within SFC modelling. Dafermos (2012) provides an SFC version of liquidity preference theory alongside a treatment of uncertainty, both being tied into the "the decision-making process of households, firms, and commercial banks." (2012: 773). An exogenous rise in "perceived uncertainty", indexed with a single variable, can be a "root cause of a recessionary process" (ibid.). However, the treatment of uncertainty here is a little unsatisfactory: first, it is wholly exogenous, quite contrary to the treatment suggested within post-Keynesianism of uncertainty as endogenous to a competitive economy (Davidson 1996); second, it is a purely additive element within decision-making: it is not the basis on which decisions are made (as in the more usual post-Keynesian treatment), but something closer to the neoclassical version of uncertainty, that of "risk": an additional stochastic element within the economy that depends, ultimately, on our lack of knowledge about the future, rather than on the presence of uncertainty as such. Neither condition is ideal, and nor is the appearance of uncertainty as an index, clearly breaching the usual post-Keynesian claim of a kind of inherent uncertainty, irreducible to a number. It implies that we could change the name of Dafermos' "perceived uncertainty" variable to some other exogenous influence – sunspots would be traditional, following Jevons – and generate results that would have a similarly valid economic interpretation.

The issue that SFC runs up against here is that tension, buried in post-Keynesian thinking, between the alleged empirical "realism" of a model, and the need for theoretical coherence. It has, as Walters and Young rather suggest, something that has never been wholly resolved by post-Keynesians who, while rejecting the anti-realism of Friedman's classic methodological statement for neoclassical economics (Friedman 1953), do not then have a watertight account of their own methodology. Appeals to mixed methods and to "open systems" (Dow 2007) are insufficient, in the eyes of post-Keynesianism's critics, to resolve what appear to be significant gaps in the post-Keynesian account of economics. The proposal that SFC is the "natural" development of this putative research programme, or (less strongly) that it can start to resolve some of its dilemmas have to be seen in this light. It is not, however, so clear that SFC in practice has actually provided a particularly definitive answer.

Solving the models

This can be seen when attempts are made not just to develop the outline of a macroeconomy on SFC principles, but to develop formal solutions to the whole system. As Caverzasi and Godin (2013) point out, there are "two mains ways of solving an economic model: numerically and analytically". For the neoclassical school, while there may be significant issues involved in either – most notably as model complexity increases – there is an obvious order of priority. A model should *first* be solved analytically, demonstrating the desirable property of stability over time, and *then* this can be treated as the baseline case for simulations. It is, of course, possible to try and develop models backwards, using "atheoretic" empirical techniques (say an unrestricted vector autoregression), but it is precisely the potential openness of such methods that is treated as a problem: the sets of relationships that an atheoretical, backward-looking empirical model presents need not, it can be argued, hold for the forward-looking model that we wish to develop. Better, in the neoclassical case, to develop first a model, detailing the expected relationships between variables, and the restrictions needed to be imposed, and then test this model against reality than try to coax reality into the shape of a model. Of course, huge problems may still present themselves – supposedly cutting-edge Dynamic Stochastic General Equilibrium (DSGE) models are notoriously difficult to fit against real-world data, model development

(for all its scientific pretensions) being still something of a black art. There is, nonetheless, a clarity of method, and an ideal to which researchers can aspire.

For SFC, this clear relationship between empirical data and analytical claims does not exist – and, we would argue, to a great extent cannot exist. There is no obvious hierarchy of research approach between numerical solutions and the analytical, but the two embody different forms of knowledge and research methods. Numerical solutions can now be relatively quickly divined, even for very complex models, using a computer; Caverzasi and Godin (2013: 8) give a brief outline of the method: find the parameters; calibrate the model and find the steady state; with a steady state established, run numerical simulations. They claim that, since there are effectively no restrictions on the complexity of the model built – the number of sectors, variables included, proposed relationships amongst them, and so on – more "realistic" models can be created.

This is, however, a questionable realism. SFC models, of necessity, embody two strong theoretical claims about the world: first, that the relationships they describe are the best available representation of the relationships that obtain in the real world; second, that consistency applies across the whole matrix, with the zero-sum rule applying throughout. These are not theoretically neutral propositions: the claim that the behavioural relationships within a model are the best possible representation of the relationships that obtain in the real world means that other plausible relationships have been excluded. Where these relationships and their parameterisations have been obtained through econometric estimation, this process of exclusion is explicit. Second, as we have touched on (and as we will return to), the belief that consistency is a necessary condition for a monetary economy is not, in fact, correct; for now, we shall note only that this, too, contains a clear theoretical claim about the world – in particular, that the rules of accountancy provide the best representation of the allocation decisions of those within an economy.

Neither of these things are theoretically neutral. We are not approaching the data blind, or in an atheoretic fashion. At the same time, we are not restricting the model to a significant extent, which leads into the kinds of problems (Lavoie and Godley 2001: 296) indicate – we cannot know for sure if any given point of stability in the model is global, or merely local. Dos Santos and Macedo e Silva (2009), in presenting a model of financialisation in SFC form, indicate that the sheer mathematical complexity of even a fairly minimal SFC model (the backwash from the quadruple-accounting rule) can be prohibitive. The logic of simulation

will not be immediately clear, in the absence of an analytical solution, and the path to any point of stability determined numerically may not be clear – even if the point is itself relevant, given the possible presence of other locally stable points. Starting parameters themselves may be arbitrarily selected and, given the demands of calibration and the requirement to build stable models, may become increasingly arbitrary as the model develops – subject to revision on ad hoc basis.

All of these issues point back in the same direction: that numerical solutions to SFC depend on an appeal to empiricism, but that – in practice - the pure appeal to empiricism is compromised by the dependency on some theoretical claims. The needs to observe coherency and to find points of stability, thus rendering the model tractable, themselves create barriers to a purely empirical approach. It cannot be guaranteed, from numerical simulations alone, that any proposed set of results derived from an SFC model are especially robust – a problem that will only magnify with increased complexity.

This is the problem with appeals to "realism": without following Friedman's strongly anti-realist claims about the methodology of economics, it should be clear that merely reproducing reality does not help a greater understanding of that reality. A map on a scale of 1:1 would be useless; and while SFC does build in some minimum conditions to allow its own internal coherence to function, this is both a deviation away from the appeal to pure empiricism (as conducted in an atheoretical VAR) and, at the same time, neither baseline condition by itself is enough to allow the reliable exclusion of any given set of relationships or parameters.

If we turn instead to analytical solutions, we have (as might be expected) the obverse of these issues. An analytical solution will generally be, of necessity, derived from a smaller and less complex model than those obtainable through numerical methods, but this should not necessarily be confused with a reduction in "realism". It is exactly the combination of (some) theoretical restrictions and the (plentiful) complexity of results that poses a challenge for the interpretation of numerically-solved SFC models. It is not clear what "realism" would obtain if it is not possible to be certain any given stable point or observed set of dynamics emerges from any particular set of relationships. Analytical solutions, by their nature, avoid this issue: it is perfectly reasonable to argue that greater "realism" can obtain as a result.

However, any SFC model contains within itself two direct appeals to empiricism – first, that the presentation in the balance sheets and transactions matrices directly reflects the actual balances of stocks and flows in the economy; second, that the restrictions applied in the zero-sum constraints are in fact realistic accounts of economic behaviour, a claim that is particularly empirical in the case of the accounting rules. The analytical solutions provided work within that set up. The claim for SFC's superiority over alternative methods is that it embodies particular empirically observed features of the world: that the balance sheets we see in front of us are the best possible representation of the economic reality, and that there would be no other better system available for its analysis. This is a strongly empiricist claim – it says, at root, that the economic data we have is not just reasonably good, but must be the best possible system for representing the economy. Any errors appearing will be contingent, rather than systemic. In the case of an analytical solution, we do not use direct values; rather, we would be operating with their algebraic ghosts within the SFC system. An unexamined empiricism would here turn into an unexamined set of theoretical claims – about the completeness of the representation in particular.

In neither case are the underlying problems with the post-Keynesian approach successfully resolved. We can see them re-emerging in one of the most ambitious recent attempts to apply the SFC approach to a real-world economy, the Levy Institute's ongoing modelling of the Greek economy (Papadimitriou, Zezza et al. 2013). This is an SFC model of Greece, estimated from quarterly data over the last three decades, and derived from the Levy Institute's US modelling. It builds in the New Cambridge results concerning the three balances, and adds alongside them holdings of assets and liabilities across the major macroeconomic sectors. It consists of 68 equations in total – an enormous number, clearly well beyond the reach of an analytical solution, and therefore dependent on simulation methods. This is, however, where some difficulties appear: the simulation results appear robust, and have delivered stark results about the impact of EU/IMF/ECB austerity on Greece. But as the authors note, breaks in trends and the weakness of Greek data more generally have meant the whole system has to be treated with some caution. This is deeper than simply a data-collection problem: since the model is solved numerically, and since it is so complex, either of those features could be producing spurious results somewhere within the simulation: and a simple process of path-dependency would be enough to turn a misspecified structural break, or a plain accounting error, into a seemingly permanent economic feature. In the absence of an analytical solution, it is difficult to distinguish interacting parts of the whole model.

Of course, this is not to deny the potential utility of an SFC model over and above the more conventional modelling strategies that work in general equilibrium settings. Events since the financial crash of 2007-8 – and indeed the crash itself- have exposed some of their particular inadequacies and in a number of decisive respects (to be explored more thoroughly in the following chapter) SFC represents an advance. A post-crash survey of the macroeconomic literature (Bezemer 2009) credited Godley and his collaborators as amongst the very few economists who both anticipated the crisis and detailed its proximate causes, in the build-up of household indebtedness, and provided a formal model to demonstrate this (Godley and Zezza 2006). Likewise, similar flow-of-funds arguments have been applied for the eurozone, suggesting a more prolonged crisis than conventional models would point towards. Kinsella and Aliti (2012) used a stock-flow consistent methodology to simulate the impact of sharp austerity measures in Ireland, their model correctly predicting that the shock would be far greater than general equilibrium models implies. Khalili and Kinsella (2011) have presented a model of contagion effects for a small open economy, that allows the interactions between indebted households and firms' own decisions' in the event of a crisis to be presented in a natural fashion. Similarly, Dos Santos (2005) exploration of income and distribution effects, through a disaggregation of the household sector, allowed a more convincing description of the inequalities associated with financialisation than has been obtainable using general equilibrium methods. Barwell and Burrows (2011) have used flow-of-funds data to show that, for the admittedly extreme case of the UK, the immediate causes of the crash were the gross imbalances that emerged on financial actors' balance sheets, and the relationship between these balances and the productive economy.

However, Kinsella (2011) elsewhere has argued that stock-flow consistent models are best treated as "thought exercises" largely due to their lack of microfoundations. Caversazi and Godin (2013), in their own literature review, have followed a similar line of thought, suggesting that recent efforts to include agent-based modelling (ABM) techniques within stock-flow models could present a beneficial line of research enquiry, claiming that the "combination of the flexibility of agent-based modelling with the consistency between stocks and flows of the system provides a framework that ensures the compatibility of real and financial variables" (2013: 12). The focus of this paper, as we get into more detail in the next chapter, is on the criteria of stock-flow consistency themselves, not on the behavioural relationships within the model, so we will not be considering whether ABM can viably resolve some of the difficulties SFC runs into in its behavioural

specifications, and generate plausible-seeming results. Seppecher (2012) provides one sophisticated example of ABM within an SFC frame, finding that labour market flexibility is not associated with improved macroeconomic performance.

Our concern here, however, is whether the alleged structure of stock-flow consistency can be considered genuinely consistent and internally coherent; nonetheless, whilst ABM methods have an appeal and, given the theoretical crisis of representative agent models, and the proliferation of computing power, are becoming increasingly fashionable, they appear to offer a step away from the deep insight of post-Keynesian SFC that the macro informs and structures the micro (Pasinetti 2005). Whether the two paradigms can be usefully matched to each other remains an open question, and one beyond the limits of the current paper.

Conclusion

This chapter has provided an historical and critical introduction to SFC models, attempting to show how the current, post-Keynesian, treatment of stock-flow consistent principles is a development of three separate strands of prior research: the circular flow models of (classically) Schumpeter, Marx and Keynes; the procedures of national income accounting, as extended by Copeland's "flow-of-funds"; and, most distinctively for post-Keynesians, the treatment of money supply as endogenous and not merely a veil on real transactions.

We attempted to show that this background in theory has helped drive current SFC research in particular directions, most especially following the publication of Godley and Lavoie's *Monetary Economics* in 2007, which this paper will treat as providing the paradigm model. The line of intellectual travel taken, however, has still left a series of unresolved theoretical dilemmas and inconsistencies within SFC modelling. The next chapter, nonetheless, seeks to demonstrate the superiority of SFC over general equilibrium modelling.

CHAPTER THREE

GENERAL EQUILIBRIUM AND STOCK FLOW CONSISTENCY

Introduction

Marc Lavoie has elsewhere argued that SFC fulfils one of Pasinetti's "constructive features" of the Cambridge Keynesian school – "the need for internal consistency" (Lavoie 2008), 333). The possibility of organising the otherwise significantly variegated schools of heterodox economics around a single framing device is, of course, highly appealing. When set against the apparent rigour and obvious uniformity of the dominant neoclassical paradigm, the lack of cohesion in heterodoxy looks like both a serious intellectual and political weakness.

But to what extent does SFC constitute a genuine alternative to the dominant paradigm of neoclassical macroeconomics? Research, although as we have seen now gathering pace, remains in practice at an early stage, and in any case constitutes only a tiny fraction of the immense volumes of neoclassical work now being produced – both inside academia and out. Nonetheless, it is useful at this early stage to examine closely some of the strong claims made for SFC modelling, with a view to suggesting refinements (or rejections) of particular lines of thought as needed.

This chapter starts by developing a simple, theoretical general equilibrium model of the macroeconomy, of the kind used to construct more complex Dynamic Stochastic General Equilibrium (DSGE) models. A number of problems within the model are highlighted. A simple SFC model is then developed to show how some of these features can be excluded. The aim is to both introduce the core SFC model and its claims, but also to show that whilst SFC ditches some of the more obviously unpalatable features of general equilibrium modelling (and neoclassicism more generally), it retains more similarities than perhaps some of its proponents would wish.

I. GENERAL EQUILIBRIUM MODELLING

General equilibrium and the macroeconomy

The idea of the *macroeconomy* – of the whole economy organised as a system of related institutions – only re-entered the mainstream of economic thought from a combination of factors: the publication of Keynes' *General Theory* helped systematise for a mainstream theoretical audience some of the key relationships between aggregate variables, particularly following explicatory work of John Hicks (1937); the construction of increasingly functional national accounts from the mid-1920s onwards, and the publication of Kuznets' 1934 national accounts for the US in particular helped provide the empirical foundations on which theoretical work and policy prescriptions could be based; the Second World War, with its demands for effective planning and national accounting further accelerated the drive; and the steady progress of mathematical techniques in economics, helped further define the subject. By the mid-1960s, at least, economics was divided into two branches – that of microeconomics, concerned with the relationships amongst agents, and macroeconomics, concerned with the relationship amongst aggregates. The latter was dominated theoretically by a variant of Keynes' *General Theory* system, the "Hicksian synthesis", combined with some econometric specifications of key aggregate relationships, most notably the Philips' Curve employment-inflation trade-off.

This sharp distinction between the micro and the macro, however, came under pressure as the macro models themselves appeared to lose their explanatory capacity. The crises of the late 1960s onwards helped popularise a series of revisions to the basic Keynesian structure, the notable amongst the first being Milton Friedman's expectations-based adaptation of the basic Philips Curve, resulting in a long-run "natural rate of unemployment". These modifications had a general tendency to reintroduce the concerns of microeconomics with market clearance and (following Muth) the rationality of expectations. They were given a more systematic treatment in the Lucas Critique (Lucas 1976). This is the classic statement of the inadmissibility, in macroeconomic modelling, of behavioural variables not defined by strict rationality. Any rational agent, observing a model in use, would be able to adapt their behaviour to the assumption in the model so as to maximise their own utility. It is therefore not possible to use macroeconometric modelling consistently on anything other than a strictly microfounded basis. Correlations that were observed in the past may turn out to be spurious for future events, particularly given the presence of the Critique.

Microfoundations and models

It was this line of thinking that helped steer macroeconomics, over the last few decades, towards its preference for analytically microfounded models based on the axiom of rational, forward-looking intertemporal maximising behaviour, and market clearance – with greater or less deviations from the latter, depending on preference. Dynamic Stochastic General Equilibrium (DSGE) became something approaching the gold standard – irrespective of well-known difficulties in calibrating and using the models (Buiter 2009).

Policymaking, within this environment, began to be thought of as a kind of game for policymakers, in which decisions they made had to be accounted for (like any other game) in the decisions of other agents, all operating with a common knowledge assumption (Kydland and Prescott 1982). The net result of this was to, first, help shift macroeconomic policymaking away from directly interventionist methods, and towards the development of a passive government model, given theoretical expression in the New Consensus in Macroeconomics (NCM) (Arestis 2009). Second, it helped reinforce the tendency within macroeconomics towards a focus on strictly theoretical concerns: developing and refining the model, rather than providing fresh policy insight, in the belief (as expressed by himself in his 2003 American Economics Association Presidential address) that "the problem of depressions has been solved. Macroeconomics should move on to other subjects." Having solved essentially all the major questions, orthodox macroeconomics had little more to offer policymakers beyond short-term forecasting and some general prescriptions concentrating on the supply-side.

The fatal conceit of microfounded models was that the Lucas Critique, which depended on the inherent instability of *observed* parameters, arising from the act of their observation, could be solved by attempting to build models around *unobserved* parameters: the underlying structures of tastes that existed somewhere inside the rational agents' heads, these preferences then driving their observed behaviour. Subsequent attempts to resolve the issues of calibration that arose, often by introducing, in somewhat ad hoc fashion, deviations from strictly rational behaviour (Weber 2000); more recently, the rich body of literature developing around "behavioural economics" has driven more consistent efforts to align the strict requirements of rationality conceived as a dynamic programming problem, to the "rationality" of actual human beings (Akerlof and Shiller 2009).

As Robert Solow has suggested, however, this is asking for corrections to a view of the world that is a "simple, extreme… and irrelevant special case" (Solow 2008). The belief that choices about fundamentally unobserved parameters, based on a particular mode of

deductive reasoning, could reasonably or consistently be applied to heterogeneous economic agents, is fundamentally flawed: it lacks any reasonable methodological or epistemological grounding.

Indeed, the situation is somewhat worse than this since, as we have suggested earlier in covering the post-Keynesian literature, the economy is beset by a fundamental category of uncertainty. This is distinct from the "risk" that the DSGE models otherwise focus on, in the sense that it is precisely *not* an additive stochastic forecasting error that, if aggregated across individuals, can approach an expectation of zero over time. Rather, it is constitutive of the economy itself: it is structured into both what it means for individuals to make decisions, and for how economic institutions – most especially, as the post-Keynesians argue, that of money – actually organise themselves. In particular, DSGE models are only "dynamic" in the weak sense that they allow for the adjustment over time of agents to random "shocks", here conceived as deviations from a fundamentally stable underlying structure – itself derived from assumptions about agents' behaviour. Within this framework, whatever deviations are introduced to that behaviour – and however consistent they may appear to be with some results derived from experimental psychology – the modelling will never function correctly. Systemic shocks with multiple impacts, like the crash of 2008, will appear solely as an edition of an exceptionally rare, exceptionally large exogenous impact: rather than, as the evidence suggests, a surprisingly (and increasingly) frequent occurrence globally (Claessens 2013: 26). The focus on individual behaviour disguises the aggregate.

Yet those aggregates cannot be so easily excluded. The most elementary accounting for a representative agent's behaviour will include a budget constraint. This will be dependent on both the agent's wealth, and their income, and will provide the hard barrier against which the optimisation is specified: the dynamic problem the agent needs to solve is precisely the maximisation of a (given, unobserved) utility function through a series of decision about the amount of labour supplied and holdings of forms of assets.

By itself, this is an open-ended question: it implies no further alterations to any other agents' sets of balances and, indeed, given the nature of a "representative agent" modelling procedure, no other agents actually exist. Yet, as SFC insists upon, all forms of financial transaction *necessarily* involve the movement of both assets (on one side) and liabilities (on the other). This is how financial objects exist in the economy – including credit or fiat money. By ignoring, in practice, the double-sided nature of these transactions, DSGE

implicitly presents the economy as a system of *net* rather than *gross* flows of financial assets. Assumed, beneath the representative agent modelling, is the presence of a completely passive contrary balance sheet that allows the agent to make her decisions over the types and range of any particular asset class that exists.

This is a problematic representation, for two reasons that we will cover in more detail shortly. For now, however, the system as presented is left open and underdetermined, with no restrictions on the dynamic path of the economy over time. Closure is provided by the assumption of competitive factor markets, in which factors of production are paid their marginal products, and in the assumption that all firms are owned by households. The combination of both restrictions acts to ensure that, in this real-terms economy, all flows of real output return back to the factors of production – and then, ultimately, back to the household that, in turn, allocates available resources.

Buried underneath this, of course, is a development of Say's Law: the assertion that, since markets clear, demand must equal supply: since all suppliers are owned by all purchasers, and all purchasers are owned by all suppliers, Say's Law (or, more technically, Walras' Law) must hold in all states of the world. The system is both closed, and – via optimisation – finds an equilibrium steady-state. Over time, it will be ergodic: mean-reverting around a trend.

A bare-bones general equilibrium model

We can, then, see the problems involved by using a rudimentary DSGE-type model, derived from the textbook presentation in (Blanchard and Fischer 1996: ch.4). For a single, representative household, with Ramsey saving behaviour, selling its labour-power and holding a single asset other than money, the household faces an optimisation problem to maximise its own utility given asset holdings over time.

Money is incorporated via the short-cut of presenting it directly in the utility function. This is standard procedure in these exercises, and can be presented as functionally equivalent to a more comprehensive specification of money as a necessary technology to facilitate exchange (Feenstra 1986), as in applying the Clower constraints to the objective function (Clower 1967). Note for now, however, that this is a weak specification of money as both solely *outside* money – outside the banking system, which does not exist in the model – and with money acting fundamentally as a means of exchange and little else. Based on

(Sidrauski 1967), the key maximisation problem for the economy is that faced by the "representative agent" household. In the absence of a government, with c and m as consumption and real money balances per capita; r and w as the real rates of interest and wages respectively; and C, K, M and N as the nominal consumption, nominal capital stock, nominal money balances, and the population,[3] we have the following objective function:

$$\max V_s = \int_s^{\infty} u(c_t, m_t) \exp[-\theta(t-s)]\, dt \text{ s.t. } C_t + \frac{dK_t}{dt} + \frac{dM_t/dt}{P} = wN_t + rK$$

This can be solved as a problem in linear optimisation, although more complex, non-linear specifications of the *u(.)* utility function may involve some linearisation of the underlying function, perhaps through taking logs.[4] On the basis of optimising decisions taken by the household, confronting a series of (clearing) markets and holding an allocation of resources, the model can be closed by assuming competitive factor markets and a constant returns to scale technology accessed by firms. The production function gives us national income:

$$Y_t = F(K_t, N_t) = C + \frac{dK_t}{dt}$$

And, with constant returns to scale, we can normalise to per capita terms via *Y=F(K/N,1)=f(k)* to gives us these optimality condtions:

$$r = f\ (k)$$

$$w = f(k) - k\ f(w)$$

That is, factors are paid their marginal products in equilibrium. This is, by definition, a stable and complete specification of an economy. Critically, here, we can see already that the limited conception of money (as outside money, and as a direct component of the utility function) allows that no monetary crisis can exist: there can be no breakdown in the functioning of the money system. Fluctuations, in practice, occur solely on the real side. In the so-called "New Keynesian" extensions of this basic model, imperfections are introduced, creating the possibility of deviations, over extended periods of time, away from trend as a result of failures of market to clear. But these (often ad hoc) additions to the underlying model do not change its core features in any meaningful way.

[3] Population here treated as interchangeable with the labour force, given a constant participation rate.
[4] This introduces further difficulties in that much of the complexity of the potentially non-linear relationships are assumed away to ensure a stable equilibrium point is reached. This difficulty is not, however, central to the argument that follows.

Net versus gross balances

It can be seen immediately that the above is strictly a *net* representation of asset holdings. Even with the simplified, single-asset presentation as here, the structure of the model concerns solely discrete choices over stocks of assets. It does not capture the flows of the different forms of wealth, ignoring the *gross* balance of assets held.

This is an omission, because the same net holdings of assets may in fact cover for quite different gross holdings, showing quite different underlying financial flows. By, in effect, disguising these gross holdings and gross flows, netting off assets and balances can lead to peculiar results, as Victoria Chick has noted. The argument that "only net private sector wealth is relevant to private sector spending [the net wealth doctrine]… contains a fallacy," since existing debt "will discourage consumption (encourage saving) in order to accumulate money to pay it off, but it is precisely in order to spend that one goes *into* debt." The first part relates to portfolio holdings at the *start* of the period; the second relates to *within-period* changes to holdings, with the stock of "outstanding non-money claims" at any point in time being seen as liabilities by the issuer, but assets for those holding them. "If the burden to the debtor cancels the positive value to the holder, the net wealth doctrine predicts that no expenditure will take place; net wealth has not increased." But this then "begs the question" as to why anyone would contract debt in the first place, if changes in debt produce no changes to net wealth and therefore no changes in consumption. This is precisely an issue in which the distinction between stocks (held at the start of a period) and flows (changes within a period) matter greatly, and where it is therefore necessary to examine *gross* holdings of assets. (Chick 1977: 79-80)

This relates directly to the concept of equilibrium employed within general equilibrium theory. As Foley (1975) neatly demonstrates, with an assumption of "perfect foresight on average", there is no distinction to be made in asset markets between stock and flow equilibria. In rational expectations models, then, there is no difficulty in constructing equilibrium models around only stocks or only flows, since equilibrium in one implies equilibrium in the other. As Foley and Sidrauski put it earlier, in describing Arrow-Debreu equilibrium:

> "in this situation each individual knows all future prices in all contingencies, and these future prices actually occur. Each firm or household can choose a path for investment or consumption, and the choice of path simultaneously

> implies a portfolio of assets at each instant. Under these strong hypotheses there is no need to distinguish… between stock decisions and flow decisions, because they are always mutually consistent" (Foley and Sidrauski 1971: 4).

Under these circumstances, neither stocks nor flows matter greatly – should equilibrium hold. Now, we can argue that, for any given person at any given point in time, the actual distinction between a stock and a flow may not matter too much: their immediate holdings of money balances, for instance, will appear to be a stock if held in their pocket (or their deposit account), but a flow the instant they are moved into transaction. This flow of funds would immediately move back into being a stock once the remaining cash is returned to their pockets, or the debit card returned to a wallet. The lack of a clear stock-flow differentiation may appear trivial from the point of view of a single agent at any given point in time, given precisely the ability of money (to which we will return) to move flexibly between the two states.

However, the triviality of this problem translates into a fairly dramatic fallacy of composition for any scale larger than the individual household or firm. The most obvious (because the largest) example of this is in the international flows of financing between states. The Great Moderation engendered enormous flows of financing between different states which, on a *net* basis of financing, appeared to represent an immense imbalance between the developed and the less-developed world – or, more precisely, between the US and China. These directly related, it seemed, to imbalances on the balance of trade (visibles and invisibles), with the US current account deficit running to 2 per cent of *world* GDP by 2006. Fast-growing developing countries, led by China, on the other hand ran immense trade surpluses, balancing the deficits out elsewhere, but also promoting colossal capital inflows that emerged particularly (and perhaps notoriously) in China as foreign reserve accumulation by government. Although some bravely argued, during the good times, that this seemingly stable imbalance was "Bretton Woods II", given the relative stability of exchange rates, the onset of crisis provoked a reconsideration.

On the basis of the observed imbalances, Ben Bernanke has been vocal amongst those arguing that the crisis was the product of excess savings by fast-growing countries in the developing world (Bernanke 2005). A "global savings glut" emerged, the product of a confluence of independent factors that nonetheless then contributed directly to the excesses of financialisation in the US and elsewhere. But as (Borio and Disyata 2011) have convincingly argued, this is a case that can only hold if *net* rather than *gross* flows of

financing are considered. The excess savings case is not consistent with the evidence on interest rate movements, which rose in the US between 2005 and 2007 without denting capital outflows in China, and improvements in the current account since 2008 have been accompanied by declines in the interest rate (Borio and Disyata 2011: 4) As the US current account began to deteriorate from the 1990s onwards, global savings also fell, implying no clear causality as predicted in the excess savings model.

Instead, Borio and Disyata note the distinction between *savings* (conducted in real terms) and *financing* (conducted with financial assets and liabilities). The two, as they correctly state, need not be identical in the aggregate for a monetary economy with even a minimally sophisticated financial system. For the globe, they can clearly be quite distinct: and it is this distinction that means the correct focus, globally, is on the flow of *gross* financing. "The same volume of saving can go hand-in-hand with widely different changes in financial assets and liabilities." (Borio and Disyata 2011: 7). Financial flows will typically "greatly exceed" savings, since there are multiple ways in which final expenditure can be financed.

On this basis, the US emerges as an immense exporter of financing to the rest of the world, in gross terms, as well as a major importer, with both flows rising astronomically since the 1980s. The bulk of financial inflows did not, as the gross accounts make clear, originate in China, East Asia, or other developing parts of the world: they came from Europe (Borio and Disyata 2011: 15). On this basis, the authors trace the expansion of finance (and its crash) far more back to purely US domestic policy issues, and to the "excess elasticity" of the financial system, than to underlying shifts in the balance of real funding across the globe. The gross picture is completely different from the net.

The same applies to national economies, even in the closed country case – as we will be focusing on in this paper. A recent Bank of England research paper shows that a concentration on net funding aggregates by policymakers during the Great Moderation may have blinded them to emerging fragilities that would have been apparent in a gross, flow-of-funds setting (Barwell and Burrows 2011). By imposing a distinction between assets and liabilities, and making explicit the gross flows of financing through the economy, SFC allows a richer (and, we argue, more accurate) description of how a macroeconomy functions than do general equilibrium models.

Outside versus inside money

Aside from the empirical evidence, the failure to distinguish net from gross flows contributes directly to a theoretical contradiction in the model .The standard neoclassical presentation relies on the modelling of outside money: money created outside of the banking system and held as a rotating stock. Net of other liabilities, it is therefore an asset of the private economy. “Under the gold standard, gold coins were outside money; in the modern fiat money systems currency and bank reserves, high-powered money or the money base, constitute outside money.” (Blanchard and Fischer 1996: 193). Generally, this is allied to (if rarely explicitly modelled as) a conception of the relationship between the supply of high-powered money as directly related to the reserves available to banks, through a money multiplier process. The result is that the money supply is exogenous to the system – that all money functions (in effect) as outside money, since the relationship between the money base and the outside money is completely mechanical: given banks’ fractional reserves, a stable money multiplier exists.

This is (as we shall see later in the paper) deeply problematical. The presence of purely exogenous supply of money – often mediated, weakly, by the presence of a Taylor-type rule to link interest rates back to output – imposes on the whole system a set of deeply unconvincing outcomes. The immediate outcome is that the banking system, to all intents and purposes, does not exist: it is a pure intermediary with no existence independent of the central banks’ own policy rule. This can, as we shall show, be revised, but the revisions are fundamentally corrections *against* this initial specification.

Ponzi issues

However, by not defining clearly the roles of the banking system, and leaving (therefore) money as a purely exogenous stock, a critical issue is created for the model’s coherence. We have touched on the optimisation problem for the household earlier. Under the conditions of free capital market, and given no satiation point in the utility function, the optimisation problem for the household becomes trivial: it is simply to borrow an increasing amount over time, using current borrowing to repay previous debts and so maximising consumption. Net indebtedness per capita will be rising at a rate of *(r-n)*, forever. This is obviously not plausible.

The solution generally applied is to arbitrarily deprive agents of the opportunity to choose this path, through creating a transversality condition for the optimisation problem, often referred to as the "no-Ponzi game" condition. For the model above, we can define *a* as the per capita stock of wealth, giving us (for debt as negative wealth):

$$\lim_{t\to\infty} a_t \exp - \int_0^t (r_v - n)\, dv = 0$$

In other words, that the rate of household debt cannot increase asymptotically faster than the interest rate, as a natural constraint on household behaviour. With a positive marginal utility, it can hold as a simple equality. There is – or appears to be – an obvious intuition lurking behind this: clearly no household can actually go out and, in order to finance both current consumption and debt repayments, simply demand more credit from the bank. Or, if they can repeat Charles Ponzi's trick, they can, like the maestro, only do it for a short amount of time.

But this is dubious on a number of levels. The first problem is exactly its arbitrariness: while it is true that we usually observe that households cannot borrow at an increasing rate forever, this is as a result of the operation of credit markets – precisely the sector of the economy a real-side model such as this ignores. It is possible to include credit constraints in models such as this but this does not remove the need for a transversality condition within the optimisation problem.

This leads to the second issue: the arbitrary selection of a condition that allows the optimisation problem to become bounded is determined by the need, given optimisation, to impose a boundary condition on the underlying function. The transversality condition is a necessary condition for the solution of optimisation problems where either the terminal state for the planning horizon, or the terminal time at which it arrives, are variable. In order to close the problem – specify a single, dynamic solution path over time – an additional condition must be introduced. Since the optimisation problem in solving DSGE models is open-ended, in the sense that the whole economy is presumed to be infinitely-lived, agents rationally account for this, and that therefore the planning period of interest is infinite, a transversality condition has to be used (Chiang 1992: ch.5). This may bear some relationship to an economic problem - households cannot borrow at an increasing rate forever – but the condition itself is not resolving that. Rather, it describes the condition that must be satisfied at the end of the time period – that is, beyond the effective planning horizon.

This is fundamentally not the same problem: the problem of the conditions the whole economy may or may not be required to satisfy (either in reality, or as a modelling requirement) cannot, in conditions of decentralised decision-making (as is assumed with DSGE) be the same as the conditions any optimising agent may or may not be required to satisfy. There is a mathematical requirement for the transversality condition to exist, or optimisation fails. But that *mathematical* requirement cannot be simply read straight into the *economic* condition facing any individual household. The no-Ponzi game condition, in other words, is an illegitimate leap from the micro level of rational decisionmaking by economic agents, into the macro level of the whole economy: it blurs the distinction between the micro level of decision making that model states is occurring, with the macro level of optimisation that the model presumes to solve for. The issue here is the presence of a "representative agent": if the agent is truly "representative" of households, the agent *cannot* simultaneously act as if they represented the whole economy. The entire purpose of DSGE modelling is to grant macro models the assumed necessary microfoundations. We seem, instead, to have introduced a macro outcome via the backdoor.

It is the absence of a convincing specification of the financial system that generates this failure. That failure to specify the financial system properly, in turn, derives from a failure to specify the functioning of money properly. It is here that the problem of money's *outside* status is most acute. With all money essentially functioning as outside money – that is, outside the banking system – it appears as *net wealth* for the economy as a whole. Inside money – that generated inside the banking system – does not have this feature, appearing as both an asset (for households and non-banks) and a liability (for banks). Increases (or decreases) in the supply of money have no impact on net wealth, since the balance sheets, by definition, balance.

Outside money does not behave like this. As the money supply expands, net wealth, in effect, increases. While it can be argued that this has no real welfare implications (Fischer 1972), it impacts directly on the no-Ponzi condition. If all money held by households is outside money, constituting net wealth, it constitutes a stable means to repay prior debts. But the no-Ponzi condition holds that debts cannot explode: they must be conditioned to grow no faster than the rate of interest payable. A household holding a source of net wealth, however, driven by borrowing, could simply net off this wealth against their borrowing. All borrowing made in any monetary form, if that monetary form is outside wealth, could be used to overcome the implicit restrictions of the no-Ponzi condition. The

fact that they are not allowed to do this is inconsistent with either the existence of the no-Ponzi condition, or with the presence of outside money. The model can be solved mathematically, but its *economic* interpretation starts to look a little dubious. The assumption underlying the no-Ponzi condition is that there is nothing, ultimately, outside of the financial economy: debts cannot be magically repaid, at the end of the planning period, from an external source. But the assumption of outside money is precisely that money *does* constitute such a source external to the financial economy and therefore *could*, in theory, repay the debts.

The specification of money commonly used in DSGE, then, undermines the conditions by which analytical solution to the model can be provided. By failing to correctly specify the function of money, standard DSGE models render themselves internally inconsistent: mathematical solutions arrive at the expense of economic interpretation.

Abstraction and mediation

The overriding issue is that of levels of abstraction. The claim that DSGE-type models are "microfounded" obscures the necessary difference between the different levels of abstraction at which an analysis may claim to operate. There is no plausible reason offered – beyond the (basically circular) justifications of axiomatic consumer behaviour – for the representative agent, or even a set of such agents, to correspond to any particular feature in the economic reality. The problem is not that the description at the macro level is not microfounded: it is that the elision from agent to macro is impermissible, given the different the presence of an economy that is, in practice, mediated by money and commodities – an economy that does not, in contradistinction to the neoclassical claims more generally, partition neatly into "real" and "nominal" sides. All economic activity is *necessarily* mediated by the presence of money and commodities; this mediation is not simply a veil, but changes the form of the activity, both at the level of the activity itself and – more pertinently for the discussion here – at the level at which these features can be discussed.

Money has an inherently social character: it is wholly meaningless to speak of a private or individual money; and even where theorists have, on occasion, proposed the existence of a *privatised* money, this done with the explicit purpose of allowing the privatised money market to find a better form of the social money than it is to provide literally

"individualised" form of money. It is this inherently social character of money that imparts the necessary levels of abstraction in considering the functioning of the economy: the totality of the actions of the separate individuals and institutions that constitute the economy will be mediated by the presence of economy-wide structures, of which the decisive structure is money itself. Even where economic activity can be performed separately from money as such – as is suggested, for instance, in "efficiency wage" theories that imply a social, non-monetary character to the performance of effort within a labour contract (Shapiro and Stiglitz 1984) – they can only be performed strictly as an adjunct to the already-existing social form of money.

The clash between the representative agent, which may not be able to borrow infinitely and forever, the need to close the system on the basis of that agent's presumed optimising behaviour, and the impossibility of these conditions existing alongside outside money that is held to characterise the money form inside the standard neoclassical macro model, is one (and perhaps the strongest) example of the failure of the "microfoundations" to match in reality the presence of macro structures that actually create economic and social life. Nor is it the case that such microfounded models proved to be any more consistently reliable than earlier, arguably cruder "Keynesian" models. Paul Krugman argued, over a decade ago, that "microfounded models have not lived up to their promise" (Krugman 2000: 24), while after 2008 these complaints have multiplied. An assessment, post-crash, by the US Federal Reserve found that DSGE models were "very poor in forecasting" (Edge and Gurkaynak 2011: 17).

II. STOCK FLOW CONSISTENT MODELS

The challenge from stock-flow consistency

SFC models present a distinct challenge to this version of economic reality, in that they very explicitly pose the existence of social structures as their starting point, and then work from this towards the behavioural relationships amongst the structural elements. The three critical features of SFC modelling are, first, the presence of money considered as *inside* money – that is, credit-money generated and contained within the financial system – and, second, the double-entry bookkeeping identity between assets and liabilities. This latter is then combined with hard budget constraints for each of the sectors of the macroeconomy under consideration, and it is the combination of the latter two conditions that then

creates SFC as a *complete* representation of the economy: that is to say, within the scope of the real economy that is presumed to be modelled, all possible flows and stocks of value are assumed to be modelled, since all flows most arrive from somewhere and exit to somewhere, and all sectors are constrained by their own budget balances.

This inversion of the major neoclassical precepts – that the macroeconomy must be microfounded; that behavioural "rationality" must prevail throughout the model – is performed on the basis of a strict adherence to the entirely conventional presentation of the national accounts, familiar since the 1940s. The direct descendants of today's SFC models are, as we have seen, Richard Stone and the Social Accounting Matrices, as steadily improved by statisticians of national income (see chapter 2). It is the sweeping nature of this challenge, of course, that makes SFC such an appealing alternative to a mainstream of macromodelling that appears, on a number of substantive questions, to be incapable of providing reliable or even coherent answers.

In Marc Lavoie's account, SFC consists of:

> "... essentially four things… First, as mainstream authors usually insist, agents or sectors face budget constraints, and these must be explicitly taken into account. Secondly, as part of the budget constraints, there are financial constraints, so that an explicit and complex financial sector must accompany the production sector. Third, all sectors of the economy are intertwined with one another, and the links between these sectors must be explicitly recognized. From this arises the saying: everything must come from somewhere and go somewhere, without black holes. Fourth, the evolution of the entire system can be characterized as saying that at the beginning of each period, the configuration of stock variables (tangible and financial) is a summary description of past history. From there, transactions plus capital gains yield the stock variables of the next period." (Lavoie 2007: 1)

The critical elements, for this paper as for other authors, are the accounting and budgetary constraints that mean (in Lavoie's words) "everything must come from somewhere and go somewhere". The accounting constraint is that of double-entry bookkeeping: for the book to balance, each entry as an asset must be balanced by its appearance as a liability; in parallel, each entry as a *use* of funds must be matched by its appearance as a *receipt* of funds. This is a pure accounting convention: it does not, by itself, have a direct economic

meaning, but it must be attached to a behavioural specification to do so. This behavioural function will specify the relationship, for that sector, between its accounted flows of funds and other sectors and entries within the system, given the parameterisation of the whole system. It is only when the accounting identities have also a behavioural element attached that they become properly economic considerations, showing how the behaviour of different elements within the system is matched to the disposal and use of funds.

The budget constraint is a different issue. The budget constraint represents a real constraint on the activities of a sector or unit within the economy: no sector or unit can spend more than they receive (or have access to) in any one point of time. This follows from the presence of money as the necessary means of payment within a transaction, and from the definition of property rights, in which assets and liabilities held by others are not assumed accessible. (Theft can, obviously, take place, but it cannot be systematically organised.) Budget constraints therefore bind actions, and so have a direct economic meaning.

The textbook case

Wynne Godley and Marc Lavoie have provided what amounts to the textbook for SFC in their *Monetary Economics: an integrated approach to credit, money, income, production and wealth* (2007). The "classical" (Michell and Toporowski 2012: 174) SFC system they develop involves three matrices, intended to indicate the system of assets and liabilities held, and movements between them, for the whole economy.

The principal one of these matrices is the "transactions matrix" shown in Table 3.1 below, which is based on Godley and Lavoie's Table 11.3. This records all (potential) real and monetary flows of funds taking place within the economy and can be thought of as an abstract version of the flow-of-funds accounts published by most developed countries. Each column represents a different sector within the economy, which, following national income accounts, is typically divided into households, firms and government, but with the addition of banks and central banks. Each row indicates the use of funds within the system for a particular purpose: consumption by households, investment by firms, and so on. The defining feature of the whole transactions matrix is that each row and each column must sum to zero. For each row, the principle involved is that of double-entry bookkeeping: every flow of funds within the economy must come from somewhere, and go to

somewhere. It is for this reason that the principle of observing gross, rather than net, flows is so critical to the whole representation. On the other hand, each column sums to zero because it is assumed that each sector faces a budget constraint, out of which it cannot break. Both these justifications for the zero-sum rule, then, have an economic justification: later chapters will explore whether either can be justified in practice. Throughout, a *positive* entry represents a *receipt* of funds; a *negative* entry represents a *use* of funds, in line with obvious accounting principles.

In general, the analysis that follows will be reduced still further from this closed-economy case to consider solely the private sector. We will drop government and central banks, and instead present something closer to Wicksell's "pure credit economy" (1934), in which private banks supply the financing needed initially to ensure production and the circulation of commodities takes place. In reduced form, this matrix is then:

Table 3.1: Transactions flow matrix

	Households	Firms		Banks		Total
		Current	capital	current	capital	
Consumption	-C	+C				0
Investment		+I	-I			0
Wages	+W	-W				0
Firm profits	$+F_f$	$-F_f$				0
Bank profits	+Bf			$-B_f$		0
Deposit interest	$+r_d.D_{-1}$			$-r_d.D_{-1}$		0
Loan interest		-r_l.L-1		$+r_l.L_{-1}$		0
Change in deposits	-ΔD				+ΔD	0
Change in loans			-ΔL		+ΔL	0
Total	0	0	0	0	0	0

It should be clear that, even in this reduced economy, the introduction of each additional sector or flow significantly complicates the potential set of relationships. Since each flow has its opposite counterpart, every new element introduced has an exponential impact on the total potential complexity of the entire construction. This can make SFC models difficult to impossible to solve analytically, prompting the use of simulation methods to find solutions. This is the counterpart to Copeland's (1948) "quadruple-entry system": each change made in any cell in the system must, given the zero-sum requirement maintained throughout, also produce an impact in three other cells, so as to maintain the zero net balance on both the rows and the columns.

The structure, then, already contains some distinctive claims about the world, based on the argument presented in Godley and Lavoie and adhered to by subsequent researchers. At first, we have no capital accumulation of any sort: firms investment spending is purely on single-period commodities, perhaps to be thought of as raw materials. Note here that the investment funding is, in effect, retained within the firm sector – it is marked as a transfer from one firm to another, and therefore, in the aggregate, has no impact on other sectors. The remainder of firms' spending is on wages for households, who are assumed to supply labour *as demanded* within the set up. To finance their expenditures, firms borrow an *initial* sum of money from the banks, who supply this in the form of a loan. This is a critical point, to which we will return in subsequent chapters. These loans are held as a stock, but a rate of interest is demanded of them, as indicated. Profits, finally, are sent back to households, on the assumption that all firms are owned only by all households in the aggregate.

Those loan funds then end up in the hands of households. They are paid wages, but the monetary form of these wages is that of bank deposits, marked as a positive change in the matrix above. They spend on consumption goods, and this spending then makes its way back to firms. Banks, for their part, issue only loans to firms, and create deposits when doing so. They are owned by households. There is no equity in this simple version of an SFC economy, and no allowance as yet for capital gains. Nonetheless, we can see already that a series of key relationships amongst macroeconomic aggregates has been established. In particular, we can note that, from above

$$Y = C + I = W + F_f + F_b + r_l L_{-1}$$

This is a standard national income identity, considered from either final consumption or final income viewpoints. Note, for now, that a *stock* (in this case of loans) is marked as existing at the beginning of a period with the -1 subscript. *Flows* are, in this matrix, marked solely with their letter; *changes in stocks* (which is to say, a flow over the period affecting a stock) are marked with the Greek symbol delta, equivalent to the *end period level minus the beginning period level*. The complications of periodisation will be considered more thoroughly in the next chapter.

The system of equations, if taken as a whole, is overdetermined: any one equation is implied by the others. This gives rise to an important result, in which it is only necessary, for the *n* equations within the system, to determine *(n-1)*. The final equation, the *n*-th, will

be completely determined by the others, given the twin requirements of accounting consistency and balanced budgets. Breaking either (or both) of these rules, of course, renders the system undetermined, with serious implications for the model as whole. Later chapters will look in more detail at this.

From accounting identities to behavioural equations

This system of linked balance sheets, however, is simply descriptive of the economy. It records the flows (and possible flows) between the different sectors and across different kinds of asset classes. What it does not do is show the relationships between those sectors: it does not contain any *economics*, as such, since there is little reason given for any part of the system to relate to any other. There are no causal inferences that can be drawn from the system at this level of generality. It is a constrained system, nonetheless, since we have demanded that every flow "comes from somewhere and goes to somewhere", and that budget constraints are binding on whole sectors. But it contains no causal relations of any kind. To begin to infer causality, we need to introduce a further set of constraints, binding the system of separate sectors to each other and relating fund movements within each sector to others.

One issue, which will appear later in the treatment of firms'expectations, is the asymmetry inside the quadruple accounting rule. The budget constraint has a real economic content: in a monetary economy, a unit's budget is an absolute bind on its freedom of action, in the absence of theft, gifts, or bribery. But the double-entry rule is much weaker. We will show later how, if we expect firms (in particular) to behave as profit-maximising institutions, the double-entry rule may not be observed, in the sense that some flows will be unaccounted for.

These accounting rules, then, should not be thought of as "behaviour" of individuals, or groups of individuals, in the manner of the representative agent models considered above. Rather, this is method to describe how parts of the whole system, the entire macroeconomy, can respond to each over time. Typically, at least until the microfoundations revolution of the late 1970s, these behavioural equations would be econometrically derived from historic data, the challenge in doing so being that of ensuring the time series econometrics avoided the classic problems of simultaneity, autocorrelation, model specification errors, and so on. The assault on these Keynesian econometric models

zoomed in exactly on what was held to be their naiveté in proposing that whole elements of the economy could behave in a way that was (potentially) inconsistent with the manner in which individual agents would behave; and that the parameterisation provided by such econometric exercises, along with the presumed behavioural elements of the derived equation, was strictly backward-looking: rational agents, it was argued, would in fact form forward-looking, rational expectations as to the future behaviour of economic variables of interest to them.

As discussed, it was on this basis that increasingly technically sophisticated New Classical and DSGE models came to be developed and operated. We have addressed some of the concerns that these, in turn, have raised for researchers, particularly in their own weak specification of money, and in their failure to account for the totality of flows of funds within a macroeconomy, collapsing gross flows into only net. We will not, for the remainder of this paper, look in more detail at the appropriateness or otherwise of behavioural equations, and the best means to specify them; our focus and interest here is on examining the claims for coherency and consistency that the SFC matrices themselves present. There is a natural logic to this: the behavioural equations that the whole dynamic system must introduce are themselves secondary to the grand claims of consistency and completeness that the whole system should observe; the behavioural conditions, in other words, cannot themselves breach the binding constraints of matrix consistency. They are therefore strictly secondary to the rules of the matrix as a whole.

In addition, however, the introduction of transactions matrices and the demands for consistency across them appear to be the more genuinely innovatory part of the SFC framework; what can be argued to be the reintroduction of Keynesianesque behavioural equations, of a pre-70s vintage, whether through adaptive expectations, or the derivation from time series data of modelling parameters (as opposed to argumentation from first, optimising, principles) can be thought of as a retrograde step, back into a pre-rational expectations world, or as the wholly necessary reclamation of an otherwise unfairly buried tradition within macroeconomics as such. The relative merits of apparently “naïve” Keynesian models versus the more sophisticated DSGE specifications, compared to empirical observation, are not compared in detail here: although we believe, in general, that the Keynesians have the edge. It is, however, a concern for another time.

Back to "Keynesianism"

To some extent, at least, the rise to prominence of SFC represents a return to an earlier literature and set of modelling techniques, dominant before the turmoil of the 1970s – both economic, and theoretical – and the rise of models more inclined to embody the presumed neoclassical virtues. Its defenders would, of course, claim that this is reclamation of good practices that were lost: the reliance on empirical reasoning and numerical solutions ahead of technical or analytical sophistication; the reappearance of the social and the aggregate as meaningful categories apart from the individual and separate; and the use of econometric techniques geared to both (Kenway 1994).

Godley and other SFC models, in common with earlier "Keynesian" literature, are clearly operating in defiance of the strictures of neoclassicism. The (assumed) behavioural relationships are those that can be derived from statistical methods, and strictly backward-looking. They are not populated with rational agents, but instead rely on those derived "behavioural" equations to show how the complex mass of elements interact within the model. The consistency that in standard microfounded models is taken from the behaviour of the "representative agent" itself is here provided by the strict dependency on an accounting identity.

The challenge here is in justifying the claims made about consistency and the budget constraint. With both of these two in place, the SFC presentation does indeed have the economic justification claimed of it: every entry within it is contained by the logic of the whole the system, which itself has an economic justification. We have noted that the budget constraint can be justified on economic grounds within a monetary economy enjoying strong property rights. It is less clear, however, that the accountancy rules consist in anything other than pure convention. They are therefore somewhat arbitrary.

Regulating the circuits

Regulation here, in practice, is left to the decidedly "sociological" attribute of "norms", well expressed here by Godley and his collaborators:

> "As there is a limit to the extent to which stocks of debt can be allowed to rise relative to GDP, there is a corresponding limit to the extent to which the financial balances can (be allowed to) fluctuate, implying that the ratios of

> stocks to GDP have *norms* that can sometimes be used to evaluate strategic options." (Godley et al. 2007: 2. Emphasis in original)

This, naturally enough, leaves open the question of how these norms are established. Godley and others have left this as a simply econometric question: the observed stability of the system over time in the past corresponds simply to how the system really is, in some sense. While this is intuitive, and as a first pass can operate well against the data, it does not answer some of the more obvious criticisms made by the neoclassical schools.

The fatal flaw in both DSGE and SFC models is their naiveté of representation: either assuming that the underlying deep parameters of agents' choices can be trivially reduced to an optimisation problem – perhaps with ad hoc adjustments – in the case of DSGE, which really does represent agents' behaviour; or, for SFC, assuming that the presentation of economic aggregates contained within the national income accounts and flow-of-funds really does show the macroeconomic aggregates concerned. Both cases allow an approximation to the observed behaviour of the economy, and this may be more or less accurate; but the degree of "more-or-less" accuracy is both unknown beforehand and necessarily subject to the uncertainty that the problem of representation involves.

Representation and microfoundations

Certainly, influential post-Keynesians have made very strong claims for the primacy of the balance sheet representation: not just that it is a *representation* of a capitalist economy whose true processes remain unknown, but that in a certain sense it *is* the capitalist economy, being a direct *presentation* of the processes that drive economic outcomes. Hyman Minsky claimed that "an ultimate reality in a capitalist economy is the set of interrelated balance sheets among the various units, so that one way every economic unit can be characterized is by its portfolio: the set of tangible and financial assets it owns and the financial liabilities on which it owes." (Minsky 1975: 118)

This is an even stronger claim to reality than would be made by, for example, the old-fashioned macroeconometric Keynesian models, which would (at their strongest) simply claim to be a statistical derivation of observed prior facts. The parameters they contain are contingent on the measurements previously made, and on the statistical and econometric techniques used to derive them. They contain no further content – and it is precisely that

absence of a necessary relationship to the "deep" (Lucas 1976) parameters of the economy that opened them up to the Lucas Critique in the first place.

The claim that the balance-sheet presentation is a direct record of the underlying economic processes – of its deep macroeconomic structure, perhaps conditioned by the range of institutions and social norms – is, then, the direct equivalent to the DSGE models claim that the fundamental structures of agents' preferences are the deep structure of the economy. Both depend on the very strong claim that what amounts to a theoretical imposition on the available data is, in fact, the true representation of an underlying data-generating process.

The difference, of course, is that in the SFC world the representation is immediately observable – derived, with more or less facility, from the national income accounts. DSGE models make no such claim: at best, their strong assumptions about the behaviour of the "representative agent" are derived from the axioms of consumer behaviour, themselves derived from some combination of first principles of rationality, and revealed preference theory. The gap between the observed reality, and the strong claims made for the deep structure underlying this reality, is profound. But it is exactly the presence of this gap that allows a refutation of the Lucas Critique: it is because agents cannot respond to inherently unknown and unobservable variables – ultimately, to their own preferences – that the Critique fails.

This cannot apply to SFC. There, the representation, to all intents and purposes, *is* the reality. The two are indistinguishable. The Lucas Critique fails here for a different reason: because, by definition, the SFC representation is a complete set of all possible stocks and flows within an economy, there is no possible means by which any agent could alter the structure of that economy – at least, to the extent that the representation of the economy can function. They are doubly bound by the structure, and the zero-sum rule. The presentation of the economy, is by definition, the actuality of the economy.

Complexities

What applies at the aggregate level applies, by the same logic, to the separate elements of the representation: to each sector, and to the relationships between the sectors. Because

the representation is *by definition* complete, there is no way for any "agent" (or sector) to break with the necessary bind of the quadruple entry rule. Every action taken *automatically* has a consequence elsewhere. It is therefore impossible for any "agent" or aggregation of agents to act in such a way that they can change this set of relationships. The parameters that describe the behavioural relationships between sectors, however derived (whether by simulation or econometric estimation) are incapable of being altered by the agents (or aggregation of agents) within the representation, precisely because of the bind of the quadruple-entry rule. If we imagine a sector to be a single actor, for it to change its own parameters *necessarily* implies that other parameters, outside of the sector, must change, because its own holdings of assets and liabilities are themselves the holdings of assets and liabilities of other sectors. The SFC matrix is the relationship between the sectors; the behavioural functions estimated underneath a subset of that relationship.

This, however, creates two sets of (related) problems that parallel related issues in DSGE. In the first instance there are no clear rules on how the parameters within the model should be found. It is theoretically possible econometrically estimate the entire parameter set. But given that the statistically observed prior relationships between sectors are bound also by the definition of the accounting matrices for the whole economy, we cannot be certain that the estimates we generate are robust: the estimates are, in effect, overdetermined by the (assumed) presence of the SFC matrix. The presence of the SFC matrix is equivalent to a restriction placed on all elements of the covariance matrix to be estimated.

Similarly, while it is possible to calibrate, through simulation, the behaviour of the models' elements, there is no clear selection mechanism that would allow the reasonable targeting of the parameters involved: since every sector is related, via quadruple-entry, to others, the sequencing of parameter adjustment can be assumed to affect other parameters in unknown ways. In this instance, the attempt to isolate any particular sector for adjustment in its parameters is under-determined by the presence of the wider SFC representation. Like DSGE, the process of calibration of a complex model

Both of these are additional to the severe complexity of SFC models, driven precisely by the quadruple-entry rule ensuring that each additional sector or sub-sector incorporated automatically generates a multiple number of additional relationships with other sectors, each to be specified and estimated. Even a minimally simple SFC model will suffer from the

parameterization problems highlighted above. In all instances, at best a process of trial and error can be used, although this will become rapidly more complex with the expansion of the transactions matrix.

The solution generally proposed, by Lavoie, Dos Santos, and others, is to rely on simulation methods (Lavoie 2008). A Levy Institute discussion paper (Caverzasi and Godin 2013) identifies a further, possible, quasi-solution in the form of a discussion around the results of the model. Such narrativistic and descriptive arguments are not, in any formal sense, "solutions" to the model, but they can offer a way to structure an argument that the formal solutions may not, bringing mixed methods and insights from outside the model (indeed, outside of economics) to bear. Clearly, exercises of this kind have fallen out of favour in recent decades, as the formalisation of economics – particularly within the neoclassical school – has proceeded apace, but earlier practitioners viewed discussions of this sort of as a vital part of developing economic analysis. Deirdre McCloskey has elsewhere argued that a rhetoric of maths and scientificity prevails in economics (McCloskey 1983), and in favour of the use of "thick" descriptions and narrative (McCloskey 1988). Presentationally, if the intention is to convince an audience of non-specialists, clearly the narrative from has significant merits, and – even for a specialist audience – many of the concerns of political economy cannot be reduced easily to a formal modelling exercise. Nonetheless, we concentrate in this paper on the formal structures of SFC, recognising that it is these structures that act to determine even narrative exercises in analysis.

III. MONEY AND BANKING

The neoclassical view of the banking system

Toporowski makes a useful distinction between "critical" theories of finance, which see finance as systematically disturbing the "functioning of the modern capitalist economy", and "reflective" theories of finance, in which financial markets are determined by circumstances outside those markets, in the "real sector". Neoclassical finance theory is pre-eminently a version of the latter, with financial markets passively reflecting "real" economic data, the "fundamentals" (Toporowski 2005). In its most highly-developed theoretical form, neoclassical economics argues that the presence of complete markets for

all goods and services, and rational agents, provides the necessary and sufficient conditions for a completely efficient utilisation of society's resources. General equilibrium emerges as the spontaneous outcome of decentralised decisions by rational agents seeking to maximise their own utility given resource and technological constraints. The actual economic institutions existing in such a world, like money, are something of a sideshow relative to the benign actions of an invisible hand.

As discussed earlier, neoclassical economics, in positing the existence of a perfect market, removes any theoretical basis for the existence of financial intermediaries. If agents really are rational optimisers, and markets really are complete, the entire economy can efficiently function without the need for any form of financial intermediation. Agents would simply contract amongst themselves.

The principle issue for the standard view then becomes the existence of intermediaries: if markets really were efficient, and if agents within those markets were, by definition, well-informed and rational, the presence of major financial institutions becomes a little unfathomable. Well-informed, rational individuals could contract with each other without any need for an intermediary of any description imposing an additional cost. Analysis of banks and financial intermediary functions took a backseat during the postwar decades: the canonical neoclassical paper (Modigliani and Miller 1958) quite explicitly claimed that the value of a firm is dependent only on the present value of its assets. Its financial structure, and hence relationship to a wider financial system, is irrelevant, since any particular debt leverage selected by a firm can be offset in the portfolios of individuals to suit their own risk preferences. That, in turn, implied that investors would not concern themselves with formal risk-management, since their portfolios would already be optimally diversified, given their preferences (Doherty and Tinic 1982). Institutions simply do not matter in a perfect capital market.

Mainstream policy debates over the period tended, whether posed by Keynesians or their monetarists, to focus on the stability of monetary demand and the desirability of controlling the money supply. The financial system was, throughout the Western economies, both subject to heavy regulation, itself the product of earlier banking crises in the 1930s, and generally pushed into a subordinate position relative to the state and corporations in investment decision-making.

It was the breakdown of the "Golden Age" (Hobsbawm 1994) that encouraged the expansion of banks and non-bank intermediaries – as measured by volume of funds under management, or range of operations performed – and, in parallel, efforts by the mainstream of economics to better model banking and financial institution behaviour. Neoclassical models tended to fix upon the appearance of banks as *deviations* from the perfect competition model, appearing in the system as market-led fixes for market imperfections elsewhere. Prior to the development of the economics of information in the 1970s, a theory of banking that was wholly consistent with the neoclassical axioms of consumer behaviour, and Arrow-Debreu general equilibrium, could not plausibly exist. (Freixas and Rochet 2008: ch.1)

The presence, then, of financial institutions in the actually existing capitalist economy requires some additional explanation. The dominant view is that formalised first by Leyland and Pyle (1977), with important subsequent contributions from Diamond (1984), Boyd and Prescott (1986), and codified in Freixas and Rochet (2008). This holds that financial intermediaries appear essentially as a result of information asymmetries: at its simplest, potential lenders hold loanable funds, but are not well informed about potential borrowers; and potential borrowers hold private information about their investment projects, but do not hold funds. The financial intermediary is the means by which this asymmetry of information is overcome – information is costly, but by centralising and processing information financial intermediaries can overcome this transactions cost barrier. It should be noted that by introducing financial intermediaries as the result of market imperfections, the core structure of the neoclassical theory is left unchallenged. Markets should function as the theory described and, if they do not, an essentially ad hoc theoretical innovation is used to explain why.

Transactions costs and information asymmetries

The introduction of transactions costs, in the style of Coase (1937), creates one set of justifications for the existence of banks. If we hold that financial intermediaries' principle function is the transformation of assets between classes (Fama 1980), and then further assume that the transactions costs present in such transformations create substantial economies of scale or scope, then it becomes optimal for rational agents to seek intermediaries to perform such transformations.

Alongside this, portfolio theory suggests another line of attack. Variations in risk aversion amongst investors, and the desire to diversify assets with potentially correlated returns could both lead to the pooling of risks (Pyle 1971). Again, in the presence of transactions costs, economies of scale can be used to justify the existence of specialised pools of liquidity, rather than transactions enacted between individuals.

Extensions of the underlying premise could encompass agents' information about banks' own liquidity, to model for the appearance of bank runs in a fractional reserve banking system (Diamond and Dybvig 1983); or to explain the existence of credit rationing (Stiglitz and Weiss 1981). Both cases create the possibility of rational bank failures, emerging directly as a result of the banks' functions.

Diamond and Dybvig (1983), like earlier economic history writing on crises (Kindleberger 1978), present a "sunspot" model of bank failures, building on the influential work of Bryant (1980): with long-term investments costly to liquidate in an uncertain environment, if depositors believe other depositors will withdraw, it is rational for them to behave likewise. Banks therefore can fail solely because they become subject to self-fulfilling prophecies, unrelated to real phenomena. Two potential equilibria – panic, and stability - appear as the model's outcomes, but selection of the actual equilibrium point is arbitrary. Nonetheless, this relatively parsimonious model became a foundation for later work.

Equilibrium selection has been modelled explicitly, in a game-theoretic setting, by Rochet and Vives (2004) where the game to be played is assumed to be drawn randomly from a broader set of "global games". Players hold imperfect information about the game they face, and so an equilibrium appears as the risk-dominant equilibrium for the entire set of sub-games.

An alternative approach was to model the banking system as imperfectly competitive markets, with banks earning economic rents from their monopolistic control over access to banking services. This accounted, it was suggested, for the presence of positive bank profits, and so the continuing existence of banks as an institution (Klein 1971).

What both approaches had in common was, first, the implication that removing barriers to competition (whether informational, or through market power) would improve efficiency; and that, second, the behaviour of banks as institutions could be treated as distinct from the behaviour of financial markets. Where markets deviated from the general equilibrium ideal, banks and financial intermediaries would appear; but, having accounted for the

presence of those financial institutions, modelling of the financial system could proceed along neoclassical lines. The *institutions* were defined by the *market*, and its specific features. They could therefore be treated as an analytically distinct problem from other features within the market – most particularly, the way the markets handled risk.

Endogenous money

The distinctiveness of SFC in this regards, at least in its post-Keynesian variant, can be seen in its explicit representation of the process of credit creation, and the endogenisation of the money supply as (solely) credit money, created inside the banking system to meet demand. Unlike the conventional, neoclassical theory, banks and bank behaviour are not just modelled – they, and the creation of money, are central to the representation. The key insight is that money, like any other financial attribute of the economy, is both an asset and a liability. A representation of a money balance in one place *must* also include its representation as a liability in another. All money within the model is inside money, in sharp contrast to the outside money of the conventional model.

This provides the basis for the representation of the money creation process as the unique property of the banking system, through its ability to generate credit money as both a deposit (a liability for the bank, an asset for the debtor) and a loan (a liability for the debtor, an asset for the bank). These deposits can be created essentially on would-be debtor demand, with the only restraint on banking behaviour being essentially their own willingness to expand their balance sheets and manage the risks involved – leading, in some cases, to credit rationing.

Money, risk, and uncertainty

Moreover, the institution of money in a world beset by uncertainty has (in the post-Keynesian reading) distinct consequences. They relate directly to what has emerged as the distinctive treatment of uncertainty within the post-Keynesian tradition, broadly identified. This tradition, growing particularly from the work of the Hicks (1980), Kaldor (1977) and others in the later 1970s, has based itself on a re-interpretation of Keynes' own writings. Against the neoclassical interpretation, as developed notably by the younger Hicks (1937), pre-war, and Samuelson (1948) after WW2, post-Keynesianism has stressed the continuity of Keynes' concern with risk, uncertainty, and expectations throughout his life and work.

Conventional presentations of the "neoclassical synthesis" of Keynes' work, typically through the use of the IS-LM standard macro model, develop a deterministic view of the macroeconomic world. The principal macroeconomic relationships can be described by a few linear (or linearisable) equations relating in consistent fashion the propensities to save, invest, consume and hold money.

Instead, post-Keynesians have come to stress the inherently unknowable character of economic events in the future, following Keynes' own writings on probability. This lack of knowingness moves uncertainty from being, as it is treated in the neoclassical world, a species of "risk", taken as an *epistemological* problem, to something akin to an *ontological* problem for the whole economy (Davidson 1996). It is, in other words, not a problem of knowledge, or its lack – the future being unknown simply because we do not know it – but of a constitutive problem for the economy: the future is unknown because, outside of limited confines, it is unknowable.

It is this feature of the economy that makes money, in turn, the most desirable instrument for the handling of uncertainty. It is because money itself is simultaneously liquid – it can be converted into any other commodity available to buy – and yet can be reliably stored – it is a continual store of value – that its holding can be presented as a "hedge" against an uncertain future. This is precisely the logic that Keynes presented in the General Theory, in explicating the three different demands for money: that the desire to hold positive money balances, given the opportunity cost of those holdings, was directly tied to the desire to (as far as possible) ward off uncertainty. We will return to those features of money and uncertainty in later chapters.

Conclusion

This chapter has briefly described a neoclassical macromodel, and outlined some of the critical problems with its functioning. Models built along these lines are empirically of limited use and, worse, not internally consistent: the use of net rather than gross balances, organised around a general equilibrium concept, excludes (or can exclude) activities of interest to the modeller by excluding economically relevant information. And the use of a weak specification of money, essentially operating as inside money, given limited conception of the banking system, implies a related incompatibility with the need for a general equilibrium model's internal consistency.

We presented a very basic SFC model, based on Godley and Lavoie's textbook, to demonstrate briefly how SFC can attempt to overcome some of these issues. We highlighted a few further concerns, many of which are returned to later in this thesis, before moving on to a consideration of the role of banks, money, and uncertainty in the neoclassical case and in the post-Keynesian viewpoint largely embodied in Godley-Lavoie SFC models. These issues are, again, only raised here as they form key parts of the argument of later chapters.

CHAPTER FOUR

TIME AND THE PROBLEM OF INVENTORIES

Introduction

We closed the previous chapter with an examination of some of the weaknesses of the standard, neoclassical view of the macroeconomy, and an introduction to the stock-flow consistent (SFC) alternative. We suggested that its explication, simultaneously, of the credit-creation process and its representation of the state of both flows between units within an economy, and the *gross* balances held by those units, represented a distinct improvement over the neoclassical state of the art, and that it bore distinct resemblances to the "circuitist" school of economic thought. In addition, the nature of the SFC modelling procedure is such that it is not well-suited to the type of methodological individualist approaches taken within the neoclassical paradigm.

Having introduced the core principles of SFC, by way of a critique of the more pressing problems within the neoclassical theory, this chapter attempts to provide the foundations of how to consider the macroeconomic representation provided by the SFC matrices as it relates to the real processes of production and distribution. Time is critical to this; whereas the neoclassical school in general treats time as a mere index of events, marching continuously and inexorably into the future (and with, if we assume perfect capital markets, its own effective "price": the rate of interest), SFC and other heterodox schools begin to force a consideration of time as a property of the system itself: that time is not just the order that things happen in, it also describes the *necessary* ordering of things, and that this ordering is itself central to developing effective models of the macroeconomy.

The first section, then, at a very high level of generality, considers the implications of modelling time as a discrete or continuous variable, briefly critiquing the work of a prominent defender of continuous time. It argues for discrete time modelling as the only effective way to model properly economic (rather than simply dynamic) processes.

The second section, building on this, considers the definition of flows over time, examining different plausible conceptions of income, and relating these to decisionmaking. Turning to the canonical SFC model in Godley and Lavoie (2007), we find that although in general an economic valuation of matrix elements is provided, they inconsistently use a hybrid

valuation for inventories. This opens up the whole matrix to inconsistencies: either firm behaviour is inconsistent with profit maximisation, or the balance sheet no longer balances. In the case of the latter, it becomes clear that the whole matrix system no longer closes and that the potential for monetary imbalances opens up on the basis of financial imbalances. Uncertainty affects real production decisions, which in turn impact on financing; these then feed in to the monetary conditions prevailing.

I. DESCRIBING TIME

Time in equilibrium settings

As described, SFC models rely on a distinctive, sequential approach to time, in which a discrete series of interconnected events. This necessitates, in turn, introducing a distinction between the *start* and the *end* points of each sequence – referred to here and throughout as the "time period" or the "modelling period". General equilibrium models do not, in general, treat this as a meaningful distinction, as a result of their underlying assumptions. Foley (1975), touched on briefly in the previous chapter, rigorously demonstrates that with "prefect foresight" – equivalent to rational expectations – as the whole period shortens to some arbitrarily small length of time, the "beginning-of-period" ("stock") equilibrium is internally consistent with the "end-of-period" ("flow") equilibrium. However, this consistency collapses if expectations are imperfect. The strong implication here is that stock-flow consistency is as a necessary alternative to general equilibrium only when expectations are imperfect; as later chapters will explore, we treat this as a *general* condition of economic life, based on arguments provided by the post-Keynesian literature. It is the presence not just of uncertainty, but of a particular kind of uncertainty that cannot be reduced to risk (and that therefore cannot be entered into a rational expectations formulation) that opens up the requirement for a rigorous treatment of time as a sequence, rather than time as variation from equilibrium.

Discrete vs. continuous time

The central distinction, between SFC models and those in more conventional economics, is that of the explication of time not as an *index of events* (generally referenced by continual increments in a reference number, *t*), but as *structuring principle*. The economy, in this

view, is not what comes spontaneously into existence as the result of the actions of autonomous individuals under the influence of their own preferences, but is something structured separately from its inhabitants, having an existence before they did, and providing a specific, institutional means through which sequences of economically relevant actions can be performed. This is the nature of determining a deep distinction between stocks and flows: the movement of one from the other is the movement through a sequence of events in the economy that can be known and modelled for. The time period, in this view, is not just a single point during which decisions are simultaneously made and enacted. The time period itself is the plane in which the structure of events is described, and that it follows from this that the *start* of the period, and the *end* of the period are distinct moments in the progress of the economy through time. There is then a distinction, if this holds, to be drawn between the time that exists *within* the time period, where the sequencing of events is described, and the period that exists *outside of* or at the *ends* of the time period.

For the canonical SFC model in Godley and Lavoie, this structure of events can be described mathematically as a relationship between those parts that are fixed with respect to time within the period, and those that change with respect to time inside the time period. The former are stocks, which change only at the ends of time periods; the latter are flows, which alter during time periods, but, logically, have no existence outside of the modelled period. The relationship between the two can, at the very highest level of generality, be described mathematically, with S as the stock at time period *t*, and F as the flow during the time period *t.*

$$S_{t+1} = S_t + F_t$$

Any given stock at the end of a time period will be equal to the level of that stock at the start of the time period, plus the volume of flow *during* that time period (which can of course be negative). The strong implication of this is that, after *t=0*, all stocks are a record of historical flows; the amount of any stock existing, after the initial *t=0* levels, must be equal to the volume of flows which have impacted on it. There are, in other words, no leaks from or additions to the system: its state at any given point in time is a complete record of both its pre-history (given in the initial level of stocks), and the flows that have taken place until time period *t*. This gives us:

$$S_t = S_0 + \sum_{i=1}^{t} F_{t-i}$$

It should be noted, for now, that this explicitly includes an initial period (the initial stock) that is distinct and separable from the subsequent flows. All this, in the Godley and Lavoie model, is modelling time as *discrete* periods: as self-contained periods, set against the general flow of time (indexed in *t*), during which economically meaningful activity takes place. This activity follows a particular structure; the art of economic modelling, in this case, lies in the correct description of the sequencing of activity, with the SFC system showing the complete functioning of the economy.

Observed time, however, is continuous: one event occurs after another, always irreversibly, and sometimes with causal links. We do not observe discrete units of time, but rather we arbitrarily impose discrete units on a fundamentally continuous procession of events. Following this, Steve Keen has argued forcefully for the use of continuous, rather than discrete time in the modelling of the macroeconomy on "at least four grounds" (Keen 2009: 163-4):

1. That discrete economic events are dispersed through time, and therefore (as in the physical sciences like "radioactive decay in physics") should be modelled continuously;
2. Time dependencies in discrete-time models "often force unrealistic compromises on the modeller";
3. "..all entries in the equations are flows" in continuous time, with stocks "in a continuous time model are the value of the system states, which are given by the integral of the flows";
4. Time dependencies are "more easily handled in a continuous-time form" as different processes operate at different rates ("beat to a very different drum") and the necessary time-lags differ in complex fashion.

Point (1) is an argument by analogy. It is not, however, a priori true that what applies in one field of knowledge is applicable in any other; for this claim to operate, we would need also to have a convincing reason for thinking that rules applicable in one science are transferable into another. As we shall shortly state, for social sciences – and in particular for economics – this is almost certainly not the case, but (even without that strong claim) it does not constitute an argument for the adoption of continuous time modelling in

economics. (2), somewhat similarly, is a weak statement: it may be the case that "unrealistic compromises" are "forced on the modeller", but this is the case for *any* modelling procedure. The difficulty is between choosing different types of "unrealistic compromises", not between compromises and no compromises. The argument does not hold.

(3) and (4) are the strongest parts of Keen's hypothesis. They constitute a claim about the ease with which real data can be fitted against a continuous time model, marking it out as a more efficient modelling procedure. However, in making this distinction, what we have argued as the core part of SFC's appeal threatens to disappear. It is precisely because the matrices provide a *sequencing* of activity, for a given period, that they have the potential to represent (in abstract form) the logical sequencing of economic events occurring in real world and in continuous time. But it is a *necessary* abstraction from that real world to introduce the notion of a time period as a separate element within that continuous time, during which economically relevant events can occur. More formally, the set of all times **T** must contain a sequence of discrete and non-recurring periods:

$$\boldsymbol{T} \in [t = 0, \dots | \theta_t \quad)$$

The modelling procedure describes the common sequence of operations, but each period is itself distinct because each period operates on a given set of stocks arriving from either outside the model (t=0) or from previous sequences. The stocks are the relationship between periods; the flows are the relationships within.

The within-period/without-period division is critical to the functioning of SFC models precisely because this is the window within which economically meaningful decisions can be made. Outside of this window, at the start and the end of the period being modelled, all stocks and all flows once again balance. Keen argues that *continuous* time can be imposed on the model, by reference to calculus. With S as the stock, and F as the flow over time, we have:

$$\frac{dS}{dt} = \int F_t \, dt$$

An infinitesimally small discrete period approaches continuous time, as a definitional principle of the calculus. But to collapse discrete time periods in this manner, and the grounds that this allows an approximation towards the continuous, is to reduce the periods during which economic decisions that are fundamentally *inconsistent* with the balance-

sheet principle can take place to a period length that is asymptotically approaching zero. The within-period is when decisions that affect final balances occur; at the end of the period, consistency (by definition) once again must hold. So in other words, a continuous time model, if it retains consistency, must also be a model in which equilibrium is the general condition of its existence, rather than the particular condition. There would, in this case, be little recommend in choosing an SFC representation of the world over a more conventional neoclassical model, which might in addition claim the advantages of microfoundations and greater internal consistency.[5]

Further, the initial period, in this modelling, is *not* a separate element in the whole model. It is simply a flow that hasn't moved yet. But this is to ignore precisely the presence of historical distributions of assets (real and financial) that give the economy we see today its character. In continuous time modelling, this necessary presence of history – or, if you like, a pre-history, existing prior to the modelled period – is occluded by the assumption of continuous time. The distribution of assets prior to modelling may well be arbitrary from the point of view of the model as such – they are simply a given arrival. But this is precisely why they need to be treated as distinct from the modelling period, and *not* bound by the laws of the model.

Keen's own modelling swerves around these two problems through the introduction of an accounting device that in turn allow his presentation of the transactions matrix to become imbalanced. He claims loans can be modelled as a "a record of account" (Keen 2006: 7), but this record of account, he stresses, is "*not* a bank account" (emphasis in original). Rather, it is a note of the obligations owing from the firm to the bank, and it is payments flowing from these obligations, rather than the obligation itself, that he treats as the point of economic interest. This is itself questionable: although Keen introduces, later, the possibility of repayment of the whole loan, its repayment is treated as a distinct operation. The loan and the money it arrives with is created "instantaneously" (Keen 2006: 8), but the flows of repayments the loan engenders take place over time. In the absence of default, he models these as a smooth flow of repayments that, if taken as an integral over time, can be thought of as a stock.

[5] A point similar to that Pontus Rendahl has made elsewhere in debating Keen, claiming "All GE models (including DSGE) are stock flow consistent." Quoted in Lainton, Andrew (2012), "Some notes on Pontus Rendahl's review of 'Keensian Economics', available at http://andrewlainton.wordpress.com/2012/12/06/some-notes-on-pontus-rendahls-review-of-keensian-economics/

This is, however, not wholly accurate: first, repayments need not arrive as a steady flow, as implied in treating the *discrete* repayments as if they could be modelled in *continuous* (and therefore differentiable) time. A *single* (non-defaulting) firm making repayments may well be able to be represented as a smooth, continuous flow of those payments; but firms in the aggregate may not, since the timing of initial loans may vary. Even if every repayment schedule follows the *same* path through time, it is *not* necessarily the case that aggregating these identical repayment schedules will result in a smooth repayment path. There is an obvious fallacy of composition that emerges if we attempt to simply summate all these repayment paths, if firms have taken out loans at different points in time.

We can shows this fairly simply. Assume two loans of arbitrary amounts L_1 and L_2, taken out at times T_1 and T_2, with $T_1<T_2$ and repayment periods of τ_1 and τ_2. We can set $\tau_1=\tau_2$ for ease of demonstration; it has no substantive bearing on the result. For simplicity, we set the interest rate to zero; again, this does not change the result. M_1 is the repayment rate from the first loan, and M_2 is the rate from the second.

With time indexed by *t*, this creates a discontinuous repayment structure, M_{total}, as below:

$0<t<T_1$:	0
$T_1<t<T_2$:	M_1
$T_1+T_2<t<T_1+\tau_1$:	M_1+M_2
$T_1+\tau_1<t<T_1+\tau_2$:	M_2
$t>T_1+\tau_2$:	0

The total repayment is given by $\int_0^T M_{total}\, dt$. Both the amount repaid and the repayment rate have clear discontinuities at their start and end points, M_1, M_2, $M_1+\tau_1$, $M_2+\tau_2$. The total repayment can be calculated, despite these discontinuities, and at any point outside those transition points, the repayment rate may be smooth. But we cannot say that this applies to the whole curve.

At any given point in time, the volume of repayment will in fact vary erratically: dependent on both the dating of the initial loans made *and* on the repayment schedule for each loan. The dating of the initial loan will, in reality, depend on decisions made by individual firms, and relate directly to their own financial position, expectations, and so on. These decisions cannot be easily aggregated precisely because, even in the simplest possible case (with all

repayment schedules following an identical functional form), these repayments vary over time.

This problem is not solved if we allow that repayments over time follow a probability distribution, each repayment arriving at any point in time with a variable probability, on the basis that we do not know what the individual repayment schedules are. The aggregation of different and unknown probability distributions is possible, of course, and via the central limit theorem these can be assumed to approach the normal distribution as the number of distributions increases. But this problem of the unknown forms of the repayment schedule (which can therefore be approximated to normal given a sufficiently large number of firms) is not a problem in the probability of repayment at any given point in time: it is a problem of the flow of repayment at any given point in time, which itself depends on aggregation of (unknown) repayment schedules commencing at variable intervals into the past. It cannot be reduced to a probability distribution because the form of the distribution is itself dependent on the timing by which repayments are made: the probability of a repayment by any given firm at any one point in time is related to the time at which the repayment is due, since the repayment schedule commences at some variable point along the interval of total time.

This problem can be resolved if we periodise our model with reference to the initial time period when a loan was contracted, and over which it will be repaid, and allow the repayment schedule to vary within the period. At this point, with the initial loan treated as a start-of-period stock, and the end result being a zero loan stock held by the firm, the problem of the fallacy of composition in aggregation of multiple loan periods is resolved. We have simply declared each period to be exactly the production period over which both financing is raised for that period, and during which time financing is spent. We have, in other words, moved straight back into the discrete time world Keen wished to avoid.

This illustrates a more general problem. The discrete time periodisation matters because, in reality, the timing of investment decisions is *not* taken, conveniently, by some benevolent planner. Decisions to invest are taken by individual firms on the basis of their individual financial positions and expectations of future demand. These individual decisions are, of necessity in a monetary economy, decentralised: the existence of money itself, used as the means of payment for investment decisions, guarantees this much. If we wish to

convincingly model a monetary economy with decentralised investment and production, we cannot use continuous time to do so, since the implication is that investment decisions are taken by a *single* firm, with a single repayment schedule.

This is not simply a matter of necessary degrees of abstraction. The presence of time is fundamental to the functioning of an economy. It is in better dealing with time that the SFC modelling procedure claims to hold its superiority over neoclassical modelling. The correct method of modelling that time, however, is *not* then to introduce it as a continuous variable. Mathematically, the only coherent way to do this is to treat that continuous variable as the integral of a series of infinitesimally time periods, over which variables alter. This is not appropriate, however, because the time that matters to the economic model is the timeframe over which economically relevant decisions are taken. For the *individual* agent, whether firm, household, or otherwise, this time period appears to be continuous, and is experienced essentially as a continuous flow. For the whole economy, however, we cannot simply aggregate these continuous experiences of time because a clear fallacy of composition emerges in the behaviour of the economy as a whole.

For the aggregate, the correct periodisation is necessarily in *discrete* time, because the decisions taken by individual agents cannot be reduced to a continuous time period. In the current discussion, it is the decision to invest by individual and decentralised firms that provides the initial impetus for the investment over a period of time. This interval of time (against the continuous, real-world time) is best thought of as the period over which any repayments arising from the initial period of investment must be made. This period can be thought of as an arbitrary, discrete unit length against the continuous, real-world time, and that unit length can be thought of as standard across production units for the sake of simplicity. Nonetheless, it must exist as a discrete interval of a time period shorter than infinity, and longer than zero plus some arbitrary constant. It cannot exist as the interval of the asymptotic limit approaching zero against real world time.

It is the presence of money, as the decentralised, privately-held unit of payment in which payments are made for autonomous investment decisions that forces this reliance on discrete rather than continuous time as a modelling requirement. If decisions to invest in general are decentralised and made in money terms, the decision to actually motivate investment for any particular firm will be tied to the inherent uncertainty of such a world:

the uncertainty that necessarily exists in an economy of decentralised units and money payments. This uncertainty, although a social feature of the economy, appears to each individual unit within the economy as its own particular uncertainty. Expectations about the future, and plans for further investment, are developed on the basis of an understanding of that uncertainty, with payments made on the basis of plans formed using the money unit of payment. It is, therefore, the capacity of money to both start and complete cycles of investment, with (in the formal description of the circuit) money entering the start of the circuit and then exiting at the end, that allows real-world time to become partitioned into discrete units, dependent on the decisions made by the decentralised and fundamentally autonomous firms making the investments. It is necessary, then, in a money economy with decentralised investment to allow discrete time periods to be modelled, since in a fundamental sense the precise timing of the decisions to invest and the amount to invest are outside of any general social control and necessarily unknown to the outside observer. It is money that creates investment period, and a money economy – rather than one with real-goods payments, say, or wholly centralised investment – that demands discrete-time modelling.

The consequence, then, of introducing continuous time is to abstract from the real conditions of the economy's organisation and replace them with a mathematical convenience, in the form of integral calculus, that glosses over the real differentiation that necessarily exists amongst competing production units in a monetary economy. To remove the presence of *stocks* as a distinct element within the system – distinct, and separable from the flows – is to remove one of the fundamental and, it is argued here, necessary elements of stock-flow consistency, replacing instead with something closer to the "flow-flow consistency" (Taylor 2008: 640) of Keynes' or Kalecki's original work on the macroeconomy. If we suppose that stocks and flows can be easily treated as equivalents, non-additively, we dissolve this distinction entirely.

The elision is made from capital as a whole, in the aggregate, to capital in particular, existing as a single unit, under the guise of describing the whole system: a parallel procedure to that enacted in the standard DSGE model, through the "representative agent", but here introduced without the presumed benefits of microfoundations and optimal behaviour. The conditions under which economic choices are made by separate actors, in fact, are also reduced to a minimum by collapsing the necessary period of their actions to a

minimum point so as to sustain a continuously differentiable representation of the economy as a whole. Money, as the bearer of economic autonomy for individual agents, and competitive conditions of production are abstracted away from, rather than being foundational for the understanding of the economy, with the differentiated parts of the whole being reduced to a smooth consistency. Economics is replaced by an engineering problem.

Time in a monetary economy

The accumulation of stocks, and in particular those stocks that generate income, introduces further complications. Capital is the name of the distinct part of the economy that is adapted to the wider flows, but itself is (quite fundamentally) not a flow, and cannot be reduced to one. It stands (in this sense) in opposition to time, as recorded in the set of flows within the SFC matrix. Nor is it, as we will consider in the next chapter, reducible (as in the Ricardian and neo-Ricardian settings) to the summation of historic elements. The difficulties that capital causes for essentially *any* version of economic theory – whether in its pricing, or in its earning a positive return – can be attributed further to the difficulties caused by the presence of time as such. The process of development is both sequential, in which flows emerging at one point are captured in another – just as SFC shows – but also subject to the presence of distinct elements that are accumulated, and fixed relative to the flow.

It is the appearance of *differentiation* of elements of the economy with respect to time that argues, also, for the need to consider time not as the continuous movement along a curve, but as a series of discrete intervals. The introduction of discrete intervals also aids the focus on specific sequences of interaction within the economy. Causality matters, in the traditional, Humean sense; the weaker concept of Granger causality, popularised in the use of large VAR models, is appropriate for a conception of time as a smooth process, and therefore of equilibrium as the key to conceptualising the economy. But once time is considered, in practice, as discrete, we are pushed towards also considering the connections between those intervals of time – that is, between the necessary and logical ordering of processes within the abstract economy – and, further, towards an appreciation of time not as a single continuous mapping for all available objects, but as a whole that is

identified by its differentiated parts (Althusser and Balibar 1970: 99-101). Different temporalities operate within an economy; this is generally, if weakly, recognised by the common distinction drawn between the short-run (commonly, that point at which only one factor of production can be varied in a neoclassical model) and the long-run (that point at which all factors can be varied).

Neoclassical growth models attempt to collapse the one into the other: the appearance of equilibrium over time, and therefore of all variations away from a stable "steady state" as deviations from the temporal equilibrium path, is a means by which the assumption of ergodicity within the model is sustained. It is a longstanding objection to the neoclassical system by post-Keynesians that the real economy is nonergodic (Davis 2010): that the correct differentiation to make, therefore, in considering its operations and modelling its behaviour over time is not to find a "steady state" path (effectively treating all deviations from this path as errors within the model) but to identify the real processes of economic dynamics. That, in turn, has helped define a particular concern with the sequencing of economic processes, and of the causality within the model that (although assumed away by equilibrium modelling) is critical to the behaviour of the economy over time.

It is in the consideration of how economies change over time that a core issue within SFC modelling emerges – that of accounting for income. Godley and Lavoie, to maintain consistency in their approach, use a particular definition of income, derived from Haig (1928) and Simons (1938). They define it as consumption, plus the change in wealth, the reasoning being that consumption must have arisen somewhere as an income, and that changes in wealth capture important price and valuation effects (Godley and Lavoie: 140).

II. INCOME CONSIDERATIONS

Defining income

At the heart of the treatment of income is the issue of its *definition*. If we move from the essentially static conception of the economy implied in the neoclassical, general equilibrium framework and towards something that exhibits genuine dynamics then, as we

have seen above, a number of new complications begin to emerge. It is not at all clear, in a dynamic setting, what we should mean by even as basic a concept as income. Clearly, units in the macroeconomy earn something: there are observed transfers of monetary and real resources, and these transfers form a complex whole. But within that complex whole, the question of definition asserts itself. As a later chapter suggests, profits – incomes generated for firm owners in excess of initial funding – become a distinct problem at the level of the macroeconomy. For individual entrepreneurs, it is no great issue: they have no need to fret about where the revenues they earn come from, and could quite happily make a profit while (in theory) every other unit was earning a loss. But, unless we declare (implausibly) that the whole sector should be bound by a zero profits condition, losses and profits across individual units balancing each other to leave net zero profits for the economy as a whole, the paradox of positive net profits must emerge in a monetary economy with decentralised production. Income flows that present no problem at the micro, in other words, can become a macroeconomic issue.

Since, however, this is a monetary, rather than a real, economy, those incomes must be measured in monetary units. And if the flows are measured in monetary units, the issue of accounting for those flows emerges, in a way that they would not for a real-terms economy: there, flows of income represent a real transfer of resources, there being no need to maintain also a record of the monetary transaction that the income was related to, since the monetary side was (as in the classical dichotomy) either irrelevant or (as in the New Keynesian tweaks) a deviation from the real-terms general equilibrium.

This means, then, that the problem of income in monetary terms presents itself in the first instance as an accounting issue: what is the correct means by which incomes for units should be recorded, given the presence of money and earnings in monetary form? The critical issue here, again, is that of periodisation: given that money flows across units, is income determined by the flows that appear *within* the time period under consideration, or by those that take place *between* time periods, as measured by changes in the value of stocks held? There is not much a priori reason to favour or disfavour one over the other; in practice, the decision has tended to be driven by the purposes of the analysis.

Historically, accountancy has tended to favour within-period flows, as recorded by the income statement, and economics, the changes in the values of stocks held, as recorded by

balance sheets, reflecting the different purposes of the two disciplines. The accountancy definition is, by its nature, *backward-looking*: it examines the record of transactions that have occurred, and determines the flow of incomes on this basis, as the difference between revenues realised and costs consumed (Mitchell 1967: 762-3) Economics has, by attempting to determine the net values of stocks, adopted a *forward-looking* definition of incomes, since the value of stocks will change depending on *expected* future incomes relating to those stocks. Income, in this case, can be defined (following (Hicks 1946: 172) "the maximum value which [the consumer] can consume during a week and still *expect* to be as well off at the end of the week as he was at the beginning." (emphasis added). This is close, but not identical to, to the Haig-Simons definition Godley and Lavoie use.

The differences between initial definitions emerges in the two separate conceptions of net worth. In an accountancy definition, this is simply assets minus liabilities, with assets valued at *historic* costs. Under the economic definition of income, net worth is the current value of assets, *plus* the net present value of future receipts, minus liabilities. In a general equilibrium setting, this difference would in practice disappear: the historic cost of any asset acquired would be the same as its expected value, since with perfect capital markets all assets would be priced at their expected future income streams, as the efficient markets hypothesis predicts (Fama 1970). It is this thought that helped motivate the shift towards mark-to-market valuations for financial corporations over the last few decades, on the assumption that this would provide a more accurate basis for the valuation of large, complex financial entities like investment banks. As things turned out, it was the mark-to-market procedure that helped both arguably overvalue clearly deficient companies like Bear Sterns or Lehman Bros prior to the debacle, and then (once the crisis had kicked off) helped accelerate their demise. Adrian Tobias and Hyung Sun Shin argue that mark-to-market rules introduce a more general procyclicality to markets, exaggerating existing movements as asset repricings are factored into financial firms' balance sheets (Tobias and Shin 2008).

Actually existing markets, unfortunately, fail to abide by the rules of efficiency, and it is exactly in recognition of this fact that SFC and other alternative modelling procedures have been devised. This, however, removes the easy correspondence that would otherwise exist between the (backward-looking) accounting measure of income and the (forward-looking) economic measure.

The accounting version of income, however, effectively presupposes what amounts to a form of barter economy, akin to that presupposed by general equilibrium modelling. It is central to any definition of money that it not just acts as a means of conducting transactions; it is also a unit of account, and (if hoarded) a store of value. It is its role in facilitating not just *temporal* exchanges, but *intertemporal* exchanges that gives money this character. Its use as purchasing power can be "generalised in two different directions, across commodities and over time" (Bhaduri 1986: 89). The accountancy measure, though, closes this open-endedness of the monetary form by supposing that all flows that have occurred can be netted off from each other without reference, in addition, to the presence of variations in their monetary value with reference to existing stocks. That is to say, the variation in value of existing stocks of assets (and liabilities) does not enter the equation and, therefore, money's character as a *generalised* means of exchange and valuation is curtailed, since if this was a *generalised* use, it would be necessary to also take account of the valuation of flows relative to the stocks of available financing. Money has a use, on this basis, in only a *single* "direction": not as a unit capable of facilitating intertemporal exchanges, but as one only capable of temporal use, since its existence as a stock (that is, as something held over and against time) cannot be accounted for. The practical consequence of this is that the accounting measure of income takes no heed of the changes in the general level of prices, assuming the existence of a "stable monetary unit" over time (Mitchell 1967: 770). The relationship between stocks of assets (financial and real) and the flow of monetary value that otherwise exists has been lost.

An income measure derived in this way, then, excludes the operation of money as a unit of account and store of value. It appears as a mere facilitator of temporal exchange, with the income measure derived being one that exists "as if" money was a pure token for exchange, rather than money as such. The generality of its existence is lost.

In addition, the use of an accountancy definition of income abstracts from the presence of uncertainty. All previous flows are, by definition, known with certainty, since they have already occurred. Future values of assets, however, are subject to the uncertainty that prevails in any economic system. As we have indicated, it is fundamental to the post-Keynesian account of a capitalist economy, with decentralised production decisions and where money exists, that uncertainty is of a definitional character to understanding the

economy: all decisions must take place against a generalised background of social uncertainty, rather than the merely additive "risk" that neoclassical economics supposes prevails. Deeper yet, it is generally held that money is the pre-eminent social institution by which this uncertainty can be dealt with, precisely through its use as a store of value.[6]

This brings us close to some of the singular problems with reliance on balance sheets and accounting definitions in attempting to construct models of the macroeconomy. It is in the issue of uncertainty that the accounting definition, or anything approaching it, becomes most problematic. We are operating in SFC with an economic model that places huge store on the use of money – as credit-money, pre-eminently as inside money – as the means by which all economic transactions are performed, and, if not performed, the measure by which are all units are valued. Money, its creation, use, and disposal are central to the entirety of the operation of the mode in the way that it simply is not for more conventional, neoclassical modelling strategies. It is absolutely essential, then, that the consistency that is claimed for SFC representations applies not just across the balance sheet, or as an *accounting* feature: the operations of the model need also to be internally consistent with its own claims to be a model of a monetary economy.

Money in the post-Keynesian view is the central social institution for dealing with uncertainty. Uncertainty is related to time, but not reducible to it: it is the combination of both time's irreversibility and future events' unknowability that introduce uncertainty. Were either to be removed as a feature of a sequence of events over time, uncertainty would also be removed: indeed, the standard neoclassical means for treating uncertainty as "risk" depend on something like this manoeuvre, converting uncertain possible future states to the status of contingent commodities, capable of being priced as if by comparison to each other. Time, to remove uncertainty, is crippled in one of its attributes to enable rational choices to be made.

SFC models seek to break with that, locating themselves as part of a tradition within in economics that has looked to the sequencing and *circularity* of events as the best available means to begin to abstract from the complexities of real social relationships and the construction of viable models and analysis. Within the SFC procedure, the question of earnings and income becomes paramount, because these are exactly the flows that allow

[6] The following chapter will cover this point in more detail.

the system of stocks to become connected and dynamic over time. Because SFC seeks to represent something of an advance over the earlier "flow-flow" models of Keynes and similar authors, the presence of *stocks* is central; because these stocks are not disembodied entities, or entities inspiring action at a distance – perhaps akin to revealed preference in neoclassical consumer theory – the relationships between stocks and flows requires explicit attention. Relationships between the two need to be made explicit for the model to operate; the balance sheet and transactions matrices, indeed, force this on the modeller. The fundamental conception of income, then, matters; as a definitional matter it must connect both stocks to flows and vice versa.

Godley and Lavoie, therefore, understandably adopt an economic measure of income, recognisably derived via Hicks' original formulation. This should, in theory, provide them with a sound basis on which to value the end-of-period stocks, given the system of prior flows as motivated by the behavioural equations. However, some confusions already start to creep in, in which the requirements of consistency that Godley and Lavoie choose to impose on the system force them away from a correct *economic* account of income, and into a (basically incorrect for these purposes) accounting definition. It is in the difficulties of dealing with the presence of uncertainty that the SFC system finds its weakest points.

Solving the Godley-Lavoie model

Stepping back slightly, the simplest version of their model can be solved analytically, making use of the quadruple-accounting rules. As noted above, the presence of both the budget constraint, and the double-entry accounting rule together ensure that the system is closed: that, in economic terms, "everything come from somewhere, and goes to somewhere", or, in mathematical terms, that the system is determined. With no capital accumulation, the analytical solution (shown in the appendix, from Godley and Lavoie's *SIM* model) reveals the unsurprising result that all income received by households is consumed entirely, and household net saving is zero, with no growth over time. It is a comparatively simple matter to see, at this point, how the comparison with a standard Walrasian general equilibrium fits: the quadruple accounting rules are the direct equivalent of the equilibrating mechanism contained in Walras' law and optimising behaviour. In the latter case, the "rules" needed to bring the model towards a steady state are behavioural. In the former, they depend on the structure of the balance sheets: we do not need an explicit

behavioural rule to generate stability, as the analytical solution shows. This is, however, a solution based on something a little like a sleight of hand: as Godley and Lavoie say, in extending the model beyond this simple point, that in this model "production is instantaneous: it did not require the passage of time" (Godley and Lavoie: 218). But as we have earlier suggested, it is precisely the process of accumulation (as a process operating through time) that makes time relevant: that stocks may vary from the start of the period to the end. The parallel here with static Walrasian general equilibrium analysis is of course exact: both models are, in the sense of being indifferent to time as a process, "static".

It is necessary to expand on this model, since it deliberately excludes the overwhelming fact of accumulation over time. First, the presence of the quadruple accounting rule means that only small additions to the baseline model can rapidly increase the complexity of the model beyond the point at which it can be plausibly solved analytically. A simulation method must instead be used.

Second, this complexity makes the relationship (or parallel) with general equilibrium harder to discern. General equilibrium models with growth, like the baseline Solow growth model, rely on the introduction of further behavioural rules to bring stability and closure to the system. In the case of the Solow growth model, this was through endogenising the capital:income ratio via the neoclassical production function, which ensured that the economy, over time, would develop on a "balanced" growth path, in which the major ratios (capital:labour and output:labour) are stable over time, and can be treated as equivalent to a static equilibrium.

For Godley and Lavoie, without the option of behavioural assumptions, building a stable model in a dynamic setting is far harder. Their path to a solution exploits the fact that the model is based on money, rather than real values. Since the system is fundamentally a monetary economy, the problem of accumulation must take a monetary form. By assuming that fixed capital, K, is owned by households, they can assume that household net wealth is the same as fixed capital, since both are valued in the same monetary unit. Credit money, supplied by private banks, can then be introduced as the means by which fixed K is accumulated, with the private sector now holding deficits (as a result of loans) upon which they are expected to pay interest. However, with fixed K in a purely monetary form, equivalent to net wealth, this is not a significant challenge: wealth (here, fixed K) can be

netted off against loans outstanding, since both are in monetary form. The double-entry rule requires that the appearance of fixed capital must be properly accounted for within the matrix, since it must represent both an asset and a liability, requiring the expansion of firms' accounts into capital and current expenditure, with capital accumulation (in this simple form) represented as a transfer from the capital to current accounts each period. An analytical solution remains possible (Godley and Lavoie: ch.7), since the system is closed and will drive itself towards steady state, on the basis of the assumptions made, even where the model begins initially a significantly long way from the steady state (ibid: 233-240). The parallel, again, with Walrasian general equilibrium should be obvious.

It is only, as we see, in the rest of this chapter, once some differentiation in the forms of capital accumulation is introduced that both analytical solutions become increasingly hard to find; and, as suggested below, the assumed equivalence with general equilibrium breaks down. We demonstrate that is only with the introduction of behavioural assumptions exactly matching those of neoclassical economics (that is, based on a particular form of optimising behaviour) that a genuinely dynamic stock-flow model, with productive wealth differentiated from wealth in general, and accumulation appearing over time, based on the Godley-Lavoie system matches general equilibrium.

III. INVENTORIES IN SFC

The appearance of inventories

The Godley-Lavoie model, and related SFC models, pose an innovation generally excluded from economic modelling: the explicit appearance of inventories, held by firms, as stocks that can alter over time and that are themselves subject to decision-making by agents within the economy. Inventories immediately create a distinction in the forms of wealth held within the economy: it is no longer possible to assume that capital is the same as wealth, since, whilst inventories held by firms are clearly part of their capital, "inventories" held by the household sector are assumed to be wholly consumed, and play no further part in the model as such. The same output changes its economic status depending on whose hands it remains in. Inventories provide, potentially, a means to model for the distinct

properties of capital without having to introduce a new class of assets, since the addition of simply an extra section on the balance sheet, inventories held by firms, immediately creates them.

It is inventories that appear, in the first instance, as a within-model index of the presence of wider uncertainty, prevalent in conditions of decentralised production. Inventories emerge in the baseline SFC model as the result of production occurring *prior to* sales being concluded. Production, then, takes place in conditions of uncertainty: while firms are assumed to fix their level output given the expected state of demand, and price according to a mark-up rule, they do not know for certain, ex ante, whether all their output will be sold ex post.[7] Inventories, then, function as an index of uncertainty: the presence of unknown ex post values induces firms to overproduce, relative to their expected sales.

There is little doubt that inventories matter, from a macroeconomic point of view. Although inventory accumulation accounts for a very small part of declared investment by firms, as (Blinder 1990: 85) argues, "the overwhelming importance of inventory movements in business cycles is one of those basic facts that seems to be inadequately appreciated". His estimates suggest that movements in inventory accumulation "typically account for 70 percent of peak to trough real GDP decline during recessions." (Blinder 1990: 1). Including them within an economic model should provide a credible means through which business cycle dynamics can occur.

From the point of the view of the balance sheet, initial sales are a positive addition to firms' current accounts – money arriving directly from consumers, and constitute a *source* of funds for consumers. Unsold goods, Godley and Lavoie argue, are an addition to current inventories, ΔIN. But the question then is how to treat this addition to the (real) stock of unsold goods on the (financial) balance sheet. With inventories held previously sold off before new production is added to the current stock, the important element is the net change in inventories. In the case of new unsold stock appearing in firms' inventories, they suggest that, from the "standpoint of accountants", these unsold goods can be treated as if they were sold by one department of the firm – the production department – to another – the capital department. This gives the signs needed to mark the changes on the balance sheet: on the production side, funds are (in effect) acquired, as inventories are transferred

[7] We can ignore, for simplicity, the desire of firms to hold additional stocks to deal with wholly unexpected demands.

over to the capital department, and are therefore marked positively; for the capital department, these inventories are an acquisition and so constitute a *use* of funds. As ever, a use of funds is marked with a negative side. The whole operation, then, is balanced within the firm: for its current account, the addition to inventories appears as a positive, and for the capital account they appear as a negative (Godley and Lavoie 2007: 251).

The logic here seems internally consistent with the balance sheet methodology Godley and Lavoie use. Assuming the firm has unsold stocks of goods after sales have taken place (and funds acquired from sales), these stocks become an item on its capital account, representing an acquisition of an asset rather than a use of funds, while for the production department, the opposite occurs. "From the standpoint of accountants" this all seems reasonable.

However, from the point of view of the economy, this is not correct. Uncertainty can work in the other direction for the firm: inventories can be held over from previous periods, and used to cope with unexpectedly *high* demand. But note, critically, that this implies an asymmetry in their use: while production in excess of actual demand produces an increase in the stock of *current* inventories, production insufficient to meet actual demand produces a depletion in the stock of *previous* inventories. We will return to this point shortly.

Inventories as a bridge between past and future

Remembering our distinction between accountancy (backwards-looking) and economic (forwards-looking) definitions of income, it should be seen here that inventories, if treated in the manner Godley and Lavoie suggest, constitute an uneasy bridge between two different conceptions of a firms' financial position and therefore its decision-making process. Firms produce on the basis of their expected sales, at the price they set. Output is whatever firms choose to produce, given their expectations. Additions to inventories, in this instance, constitute a failure of their existing forecasts: they emerge only as an error term, in effect. The *ideal* for a profit-maximising firm would be to run a long-run inventory position that was as low as possible given inherent uncertainties about fluctuating sales. In the short-term, inventories can vary over time and in response to changing market

conditions. The stock of existing inventories, as with other stocks, constitutes a record of prior forecast failures, plus whatever stock turned up at time *t=0*.

Firms, acting as profit maximisers, therefore will take account of their existing stocks of inventories when setting their production targets. For their simplest functioning model, and *in physical quantity terms*, Godley and Lavoie (2007) describe this as (Equation 9.1):

$$y = s^e + in^e - in_{-1} = s^e + \Delta in^e$$

The firm establishes a target inventory to sales ratio on the basis of (by assumption) maintaining a fixed capital:output level (Godley and Lavoie 2007: 286). Knowing, however, that "their expectations may be mistaken", firms only aim to produce a fraction of their inventory target, given the existence of current inventories:

$$in^e = in_{-1} + \gamma(in^T - in_{-1})$$

We can leave aside, for now, the specification of expectations formation: it is not directly relevant for the rest. Note, however, that this is all specified in physical quantities. But this is, very overtly, a monetary economy. There are both obvious problems of aggregation in lumping together heterogeneous goods in physical terms, although thus far we could treat *y* as a vector of produced goods without doing serious damage to the analysis. More importantly, since the firms are expected to repay its loan *in money*, it must produce profits *in monetary form*. They will produce physical outputs, but they anticipate receiving money. The *value* of the inventories in the money form therefore matters, aside from their physical levels.

That, in turn, means that the profit function must be described in money terms if the circuit is to be completed and credit-money supplied returned to the banks. Godley and Lavoie specify the relevant profit function as

$$F = S - WB + \Delta IN - r_{l-1} IN_{-1}$$

They label this "entrepreneurs' profits". Here, the capital letters represent the nominal values of the variables: *F* is the firms' aggregate profits, composed of sales revenues (*S*) minus money wages paid (*WB*). These two elements can be easily valued in terms of

current prices and current expenditure. Current profits are earned at current prices, by definition; sales likewise; and the money wages paid are simply the money advanced by the firm to secure labour's services. All of these elements are unproblematical, in their own terms, and given the balance sheet presentation.

The last two, however, are more complex. The final element represents the interest paid on the loans advanced. Loans were advanced by banks initially to secure production; these money loans were paid to households to secure labour, necessary to meet the firms' production targets. To the extent that households consumed that which firms were selling, firms' loans were repaid. To the extent that households did not, loans were left outstanding. If this is the case, then, the value of outstanding loans *must be equal to the value of the inventories held*. It is therefore the case that the cost of holding inventories is the cost of making interest payments on current loans outstanding. The two are identical in this instance.

The second-to-last term, *ΔIN*, is more complex. It represents the net change in inventories over the period, and appears as an *addition* to the entrepreneurs' profits because of its status as an addition to the firms' current account as an acquisition of *funds*, set against the firms' capital account acquisition of the *inventories*, and therefore loss of funds. This item ensures that the balance sheet remains, as ever, balanced, with each flow registering its equal and opposite reaction. The economic logic for this addition to profits is that inventories represent an acquisition of funds for the firms' current accounts, and therefore can be treated as a net inflow for the purposes of deciding their financial positions. The inventories themselves are an *asset* for the firms, held by their capital accounts. Godley and Lavoie imply that this definition of profits, in accounting for the changing asset position of firms is compatible with an *economic* definition of profits, recognisably derived from John Hicks (1946), in which "profit is the sum of money that can be periodically extracted from a set of business operations and distributed while leaving the balance sheet of the concern unchanged." (Godley and Lavoie 2007: 255) By incorporating inventories as a net addition to profits, they are ensuring that this condition can seemingly be met.

But these inventories, newly acquired, must be valued in money terms, since the firm itself owes money. Its position in pure physical quantity terms is of no relevance to a bank insisting on balances being paid in its own credit-money. The consideration that matters,

then, is the valuation of the inventories in terms of money. It is here that Godley and Lavoie's treatment of inventories, we argue, begins to fail.

The valuation of inventories

Godley and Lavoie argue that inventories should, indeed, be valued in money terms. This implies that the physical vector of inventories must be weighted by a price vector, giving the money value of the inventories concerned. However, given that inventories were acquired either at the *start* of the current period, or at some point in the past, it is not immediately clear *which* vector of prices to use.

Their argument proceeds as follows. On the assumption of a single common good produced, we can easily show that the change in physical inventories is

$$\Delta in = in - in_{-1} = y - s$$

With physical quantities marked again in lower case, this shows the change in the *physical quantity* of inventories is the same as the unconsumed output. "We now need," they go on to argue, "some relations to move smoothly from physical units to dollar values." (Godley and Lavoie 2007: 257). This, they propose, can be found by taking a nominal value of inventories, *IN*, to be equal to the volume of physical units produced "valued at cost." This, they claim, must be the case because "this is how much it actually cost to get and produce the inventories" (ibid 2007: 257). They give this as

$$IN = in.UC$$

Where *UC* is the unit cost of production, defined as the wage cost per unit produced *today*. There is, immediately, a problem here. The value of *producing* the inventories was certainly the cost of producing them. This much is banal. But the value on the firms' *current* balance sheet is surely not the cost of producing those inventories *again*. The cost "to get and produce the inventories" was not the cost today. It was the cost when they were produced.

The *value* to the firm today, on the other hand is surely the value it can receive from disposing of the inventory through a sale. This, after all, was precisely the argument for

treating the inventories as a net *gain* for measured profits. The current cost of the inventory is an irrelevancy. If inventories were a cost, as valuation at current cost would imply, they would have to be counted as a cost *against* the flow of profits distributed by the firm. The current cost valuation of inventories is, then, incorrect for the purposes of valuing the inventories given the definition of profits as that sum which can be extracted from the firm's operations leaving the balance sheet unchanged. Valuation at the cost of *current* production would *not*, in reality, leave the firms' true balance sheet unchanged, at least in the sense of not altering its net worth given its asset and liability position.

We can develop the issues here by opening up the inventory equation a little, following Godley and Lavoie's own presentation (2007: 257):

$$\Delta IN = in.UC_{-1} - in_{-1}.UC = \Delta in.UC + \Delta UC.in_{-1}$$

This apparently simple expansion of the previous equation, based on its total differentiation in discrete time, helps identify the real problems here. This equation claims that the changes in the value of the inventories is equal to the value of the change in the physical volume of inventories, multiplied by their current cost, plus the change in the current cost, multiplied by the physical volume of the old inventories. It bears a resemblance to the derivation Godley and Lavoie propose as the *general* rule "for asset stock, tangible or financial" that they use repeatedly (2007: 136). However, because the values used here are *costs* for the firms, rather than market values of the assets, the general rule cannot apply. The equation has very little economic content.

Godley and Lavoie have claimed that their profit rule is one of *economic* profits: that, following Hicks, it is based on a forward-looking notion of the stability of balance sheets given the disbursement of funds from firms' operations. But the decomposition of the inventory valuation formula makes clear that this is not, in fact, the case. The equation is partly forwards-looking, in the sense of using current values: the final term in the middle section shows current unit costs, UC, entering the calculation. Since inventories are produced at the *start* of the time period, at the end of the period this can be taken as the price of producing further inventories at the start of the next time period.

It is also, however, backwards-looking, in the sense that past values enter in the form of an *historic* cost, as can be seen from the first term in the middle section. By the same logic as

followed in the last paragraph, the value given for the unit cost of the preceding period must be the same as the value of the unit cost at the *start* of the current period: the final cost of one becomes the commencement cost of another. The real historic cost of producing the inventories was the actual cost to the firm of producing the inventories held. However, the *actual* cost of producing any given unit in the inventory can vary over time. An inventory item produced, say, five periods ago may not cost the same as one produced at the start of the current period. This, however, is the assumption made here: the structure of historic costs is collapsed into a single cost item, that of costs at the start of the current period. Had a market valuation rule been used, consistent with the other values entered in the balance sheet, this would not be a problem: all inventories held by the firm would be for sale at today's price, irrespective of their historic cost of production.

This cost price, however, appears to have no economic meaning: it is neither the resale value of the inventory, nor is it (unless costs are assumed to be fixed) the actual replacement cost to the firm of producing another inventory. Yet this term enters as a determinant of the final value, to the firm as measured on its balance sheet, of its current stock of inventories. There may be some *accounting* relevance to this figure, since it measures the flow of an income (the change in inventory value) under an accounting rule for incomes. There is no convincing reason it should, however, enter consideration for the firm in terms of its balance sheet operations.

We have, in effect, an uneasy amalgam of an accounting definition of income and the economic definition of income. The Godley-Lavoie claim to be sticking to the economic definition of income is trumped by their need to maintain consistency within the balance sheet presentation. This confusion has real effects. The firms' real net worth would in general change if profits were distributed according to the rule Godley and Lavoie provide, since the value of the inventories (at their sale) would *not* in general coincide with the value of their production today. The value of their production today is given by $UC=WB/y$, where WB is the total nominal wage bill. This will only equal the value of sales in the exceptional case when all existing inventories are consumed in their entirety by household spending. This, in turn, will only happen when both the households' marginal propensity to consume from income is unity (and so all income is consumed), and when the net addition to inventories is zero, a clearly exceptional condition only likely to prevail under perfect

foresight and zero growth. Under other conditions, a depletion of inventories would deplete a firms' net worth.

Inventories, the national accounts, and net worth

This confusion produces real effects when we attempt to relate the construction here to actual national accounts. With investment taking place (in a world without fixed capital) only in inventories, we have

$$Y = C + I = p.s + UC.(\Delta in)$$

With *p.s* as the price multiplied by sales measured in physical volume terms. The final element on the right-hand side is the expenditure *today* of firms on new inventories: clearly, this is equal to the cost today, multiplied by the increase in the physical volume of inventories. Using *S* as the nominal value of sales, and recalling from earlier that

$$\Delta IN = in.UC_{-1} - in_{-1}.UC$$

We can therefore rewrite the equation for national income as

$$Y = C + I = S + \Delta IN - \Delta UC.in_{-1}$$

Both *S* and *ΔIN* can be read straight from balance sheets as the volume of sales and the value of inventories. They directly correspond to the columns in the firms' current account of the balance sheets as presented (Godley and Lavoie 2007: 262). The final element, however, is peculiar. It is the value of the current-period change in costs of producing inventories, multiplied by the *old* level of inventories. This, again, has no obvious economic meaning or relevance: there is no reason to suppose this peculiar calculation would ever enter any firms' decisionmaking procedures. It is a residual element, the leftover product of the earlier confusion over historic and actual costs, and replacement versus resale valuation of inventories.

Godley and Lavoie excuse this by reference to the authority of the national accounts themselves, where a similar adjustment is made under the guise of "inventory valuation

adjustment". Balance sheets can be brought into alignment with the national accounts through the periodic use of this adjustment factor, applied ex post to accounts recorded. But this does not provide any theoretical basis for making the calculation. It remains a residual, theoretically unexplained, but necessary in practice because, as the US "Guide to the National Accounts" relates:

> "Inventory valuation adjustment (IVA) is the difference between the cost of inventory withdrawals valued at acquisition cost and the cost of inventory withdrawals valued at replacement cost. The IVA is needed because inventories as reported by business are often charged to cost of sales (that is, withdrawn) at their acquisition (historical) cost rather than at their replacement cost (the concept underlying the NIPAs). As prices change, businesses that value inventory withdrawals at acquisition cost may realize profits or losses. Inventory profits, a capital-gains-like element in business income (corporate profits and nonfarm proprietors' income), result from an increase in inventory prices, and inventory losses, a capital loss-like element, result from a decrease in inventory prices" (Bureau of Economic Analysis:5, fn.18)

This is reasonable, ex post, as a recording adjustment, bringing the elements businesses chose to record in their accounts into line with the presentation national accountants wish to make. That is the *ex post* case for the adjustment: a simple effort to capture unexpected gains and losses arising from the revaluation of inventories. However, SFC purports to be a modelling of the economy, and, in particular, one based on forwards-looking behaviour by firms and others as they adjust towards target incomes and profits. To operate, the model must operate in *ex ante* terms; whatever relationship is constructed between the flows of transactions and the stocks of variables is one that has a behavioural impact, describing the ex ante decisions of economic agents. Ex post adjustments can be justified in *accounting* terms, but not in *economic*.

One underlying difficulty here is the asymmetry within the quadruple accounting rule. As we have earlier suggested, whilst the budget constraint can (in the absence of theft or bribery) be treated as binding, setting an absolute limit to actions over which agents cannot cross, the double accounting element is much more slippery. There can be, in practice, occasions when this can be ignored: as we have seen, because the balance sheet is not a complete representation of economic reality, agents will (in practice) end up breaching its rules. In the key instance shown above, this will occur once a firm attempts to apply forward-looking expectations.

So the value to the firms' of inventories held today is not simply their value on sale today. Inventories, in this simple model, can be held over time with zero depreciation. They can therefore be disposed of at any point in time at the current price. Although firms are price-makers in this world, establishing a mark-up price to meet profit targets, they respond to expected market conditions as they do so. They are therefore not sure of the price stream arising from any stock of inventories into the future; nor can they know, without perfect foresight, when or if those inventories can be disposed of for any given market price at any given point in time. The real value of the current inventories for the firm, then, is an *expected* value, looking forward, rather than a *current* cost. The *change* in the value of inventories, ideally, is not backward-looking, but forward-looking, based on expected returns from the stock of inventories that is held.

In other words, the measure that is relevant is the expected value of inventories. But if the expected value of inventories matters to firms' behaviour, Godley and Lavoie's fundamental claim about the irrelevance of the measured net worth (2007: 30) *cannot* hold. Firm net worth matters to firm behaviour. Early on, they make the point that the liabilities to "'second parties', that is owners of equities of firms" (2007: 29) should be included in the balance sheet of firms as a liability against the firm, since otherwise the implication is that a claim held against the firm by other parties as an asset does not, in fact, hold its financial counterpart as a liability: the balance sheets, at a macroeconomic level, would not balance (2007:30). This carries the risk concomitant risk of introducing what they call a "counter-intuitive" result that a *rise* in the value of equities, reflecting an optimistic assessment of the firms' worth by the financial markets, would lead to a *fall* in its net worth. They further note that this could be avoided if accounting at historical cost was introduced, but this would lead to a failure of the entire macroeconomic balance sheet to balance out. They therefore resolve the problem largely by excluding it: firms' net worth is of "no practical significance", since all economically relevant activity takes place entirely within the balance sheet. Capital gains, when introduced later on, are purely a concern for households' (Godley and Lavoie 2007: ch. 11) portfolio decisions. Tobin's Q, the ratio of net financial value to replacement value is "interesting" but not relevant to any agent; not only are there "no mechanisms to… make it converge towards unity", as might be held in a general equilibrium setting, it has no impact on any decisionmaking (Godley and Lavoie 2007: 392).

However, given the problems that the valuation of inventories introduces, with the strong implication that inventory valuation must be both forward-looking and enter into firms' decisionmaking processes, if they are to behave consistently, this assertion by Godley and Lavoie cannot hold. The necessary grounds for it to stand are in contradiction with the need for the balance sheets themselves to balance: with historic cost accounting rejected by the authors as undermining balance sheet consistency, and with equity valuations ruled out on similar grounds, they are pushed into having to preserve an incoherent account of inventory valuation. This resorts, ultimately, to appeals to empirical evidence, and the authority of the national accounts, rather than to its internal, theoretical coherence; in effect, the SFC system here privileges the consistency of the system of macroeconomic matrices, against the internal coherence of the presumed behaviour of the individual units.

The correct valuation of the immediate addition to (or depletion from) inventories, from the point of view of the firm's *current* account, is their immediate resale value: firms' current accounts captures the flows of financing within this period. On the other hand, the change in the value of the *stock* of inventories is the change to its expected valuation, given additions to or subtractions from the actual stock of inventories occurring over the period. The cost of producing those inventories remains as before, but this cost does not now appear directly on the balance sheet: only the loan needed, in this model, to acquire the funds necessary to meet the cost appears.

IV. IMBALANCES AND UNCERTAINTY

The effects on the balance sheets

These changes, attempting to reconcile the inconsistencies in the current treatment of inventories, render the matrix unbalanced. Taking the firms' transactions account column, and applying the revaluation for inventories, here marked simply with an expectations operator, we find (following Godley and Lavoie, Table 8.1)

Table 4.1: Revised firm flows

	Production firms	
	Current	*Capital*

Sales	+S	
Change in value inventories	$+\Delta IN^e$	$-\Delta IN^e$
Wages	-WB	
Interest on loan	$-r_{l-1}.L_{-1}$	
Entrepreneurial profits	-F	
Change in loans		$+\Delta L$
Total	$\Delta IN^e-\Delta IN$	$\Delta L-\Delta IN^e$

The definition of entrepreneurial profits needs some attention. The value of inventories previously held as their replacement cost by both the firm and therefore (by assumption) the firms' owners who would receive the profits. This ensured that the whole column met the zero-sum rule. However, we have argued to reject the replacement-cost valuation of inventories, in favour of their resale price. For profits distributed in *this* period, the relevant valuation of a change in inventories is therefore their current-period resale price: it is a *current* measure, not a capital measure. Otherwise, the definition needs no further correction, beyond noting that the correct valuation of interest on loans is now $r_{l-1}.L_{-1}$, rather than using the substitution of $r_{l-1}.IN_{-1}$. This gives the final row:

$$F = S - (WB - \Delta IN - r_{l-1}.L_{-1})$$
$$S + \Delta IN^e - WB - r_{l-1}.L_{-1} - F = \Delta IN^e - \Delta IN$$

The difference on the current account is between the expected value of the change in inventories, and their value at market prices; and difference on the capital account is between the addition to loans, and the expected value of the change in inventories.

Firm net worth changes by

$$-\Delta IN^e + \Delta IN - \Delta L + \Delta IN^e = \Delta IN - \Delta L$$

That is, the current resale value of inventories minus the change in the value of loans. Given that inventories are produced at their cost price, we have *ΔL=UC.(Δin)*, as previously. Firms' net worth will alter to the extent that the current valuation of inventories at market prices varies from their cost of production. This reflects the position of inventories as (in effect) the sole tangible asset that the firm posses. Increases in the expected value of the equity would form a capital gain, boosting the firms' net worth. The treatment Godley and Lavoie propose for inventories, however, excludes the possibility of capital gain; there is no

compelling reason, in this new setting, why it could not be included as an adjustment factor to the balance sheet, as they propose for all other gains, and implying a Haig-Simon formulation of income for the gains-holders (2007: ch.5).

For the economy as a whole, this gain in firm net worth represents a gain in economy-wide net worth. However, since these assets are owned by the *firm* as a distinct entity, it does *not* follow that the net worth of the whole economy can be presumed to equal the effective "capital" (that is, tangible asset) stock. Or, rather, there will be distinctions within the net worth dependent on claims of ownership. With undistributed capital gains accruing to the firm as an entity, the distribution of the firms' ownership matters, since there are now capital gains arising that remain (in this setting) undistributed. Inventories are not any longer an adequate substitute for capital in general, since the presence of capital gains accruing to inventories ensures that it is now the ownership of capital that matters directly: households in general still own all of the firms, but it is not enough to describe the macroeconomic flow of profits to their recipients in the households since firms are acquiring capital gains, and these gains can only be held by specific owners, not by the generality of households.

Notice, too, that it cannot any longer be the case that the firms' balance sheet position has no impact on its behaviour: expected values of inventories matter, and the distribution of ownership (if equity is introduced in this manner) also impacts on the firm. A longstanding criticism of Cambridge Keynesian models, that they "trivialise" financial decisions (Blinder 1978: 83), can be answered through such means. The firms' complete production decision, ex ante, now looks like

$$Y = f(S^e, UC, IN_{-1}, IN^e,)$$
$$\frac{\partial Y}{\partial S^e} > 0, \frac{\partial Y}{\partial UC} < 0, \frac{\partial Y}{\partial IN_{-1}} > 0$$

The first distinction between this and the Godley-Lavoie function (Equations 9.1 et. seq.) is the use of the *value* of inventories as the decision variable, reflecting our claim that it is this value, not the cost, that is determinant. The second is the appearance of a distinction between the *acquired* stock of assets (the inventories, indicated in the third parameter) and the *expected future value* of the stock of assets (the last parameter). For now, note that this formula expresses a version of Tobin's q-ratio, in with unit costs entering as the

denominator and the current spot-market value of inventories as the numerator, $q=(IN_{-1}/UC)$. In both cases, the spot-price is the one to use, reflecting either the immediate disposal value of all inventories, or the immediate costs of further production. Following Tobin's logic, we can argue that firms have an incentive to increase their asset holdings when $q>1$, and decrease it when $q<1$, depending on market valuations. There is, then, contrary to Godley and Lavoie's insistence (2007: 392), a mechanism to force q to converge towards unity, once firms start to perceive the market valuation (rather than only the replacement costs) of their assets – which, in this case, are only their inventories. Others writing in the post-Keynesian tradition have highlighted the relevance of Tobin's valuation ratio to firms' decision-making, Rimmer (1993) amongst them, while an earlier SFC paper by Godley and Lavoie noted its importance (Lavoie and Godley 2001: 286).

However, this is more complicated because additions to inventories exist not just as a *flow* (or potential flow) into existing inventories, subject to the firms' control. We have claimed that the expected value of the existing *stock* will also enter the firms' calculations, dependent on the market valuation of those inventories treated as a potential flow of income into the future. This is the final parameter in the expression. Its derivative is left undefined since this will depend critically on the firms' own perceptions of uncertainty, which can be ambiguous, and on the type of uncertainty encountered: an anticipated increase in the expected future value of inventories need not need to an increase in current inventory accumulation if (for example) the expected increase is of a temporary duration, whereas a permanent increase could well produce that outcome. In both instances, it is not possible to say a priori how any given firm or firms will respond to this sort of uncertainty.

Nor is it necessarily even possible in general. It is critical to note that for our purposes this is not uncertainty that can be reconciled through some market mechanism. Precisely because it impacts directly on the firms' own production processes, influencing the flow variable under its direct control, it cannot be treated as a separable from of risk, subject to the usual rules of portfolio management. It is inherent uncertainty: the existence of an unknowable future impacting on decisions made today in an uncertain world. We will return to this point in a later chapter; for now, it is only necessary to note that (1) uncertainty has an impact on firm decisions over production; (2) uncertainty has an impact on firms' financial positions; (3) uncertainty of this kind cannot be reduced to "risk" and subjected to a *market* process of portfolio allocation.

Underdetermination

Inventories can only play this dual uncertainty management role imperfectly in the context of the SFC matrices. Our introduction of uncertainty has posed a potential wedge between the financial representation of firms' activities, as recorded in the balance sheet, and the real process of production that underlies this. With cost-valuation of inventories, all uncertainty (perhaps over future cost movements) is fundamentally exogenous to the production process: it does not intrude on the firms' decision-making procedures, which respond only to the changes in expected sales (an exogenous factor, determined by autonomous consumer preferences) and expected costs (again, exogenously determined by changes in technology or labour markets). It is once inventories are, we argue, correctly valued that uncertainty appears as a *necessary* and distinct consideration for the firms' decision variable, output to be produced. This is distinct from the portfolio decision of households, where real wealth can be allocated between different monetary assets, and the sole supply decision is that of allocating labour. Here, firms directly control the production of the asset, and directly hold onto its acquired stocks. It is this that lends the decision its asymmetric character.

But inventories only perform this task imperfectly because they are a real, not a financial, implement. They cannot simultaneously act as hedge against uncertainty, and arbiter of past uncertainty, without disrupting the balance sheet representation. The appearance of uncertainty in this form, entering as a consideration for firms' production decisions, renders the balance sheet unbalanced, as we have seen. A distinction emerges between decisions of individual firms, dependent on considerations of prevailing uncertainty, and the wider macroeconomy, since we cannot simply aggregate firms' capital gains to give a net worth for the economy as a whole: ownership, and therefore distribution of the product, matters.

This is a deeper problem than that of merely lacking microfoundations, which, as discussed, we do not view as especially detrimental to the exercise. It relates directly to the conceptualisation of major economic variables, and associated concepts like income and

(especially) profit. It is because inventories are being asked to do too much by SFC that these problems arrive. It is unclear whether they should be deemed *tangible* assets, and therefore quietly pushed into the firms' "net worth", or if they should be *financial* assets, and therefore have an impact on the firms' balance sheet position. This confusion arises because inventories form, in practice, something akin to capital: a form of accumulated asset that is produced in the past, holds a current value, and will affect production decisions into the future. Yet at the same time, they are the repository for the presence of uncertainty within the system: they are the point in the system in which uncertainty manifests itself, this uncertainty occurring in no other form throughout the SFC representation. They are required by firms both as a barrier *against* uncertainty, in that firms' target inventories are assumed to be nonzero, but, at the same time, they are the manifestation of uncertainty as such.

There are consequences, if we accept the critique offered here, for the coherency of the system. If we allow both that inventories should be valued on an expected value basis, and that firms will (therefore) take account of their own net worth when making production decisions, the matrix system is no longer determined. In their presentations of the system of the matrices, there are *(n-1)* equations determined for a set of *n* equations. With *n* equations in the system, because the system is (assumed) closed by the balance sheet requirements and the budget constraint, it must be the case that the with *n-1* equations known, the *n*-th is also known. This follows directly from the requirement for "coherency": since the zero-sum rule applies, the system must be closed, and therefore the final equation within the system need not (indeed cannot) be identified. This should seem familiar – it is, as Godley and Lavoie remark, the exact equivalent of the same rule in general equilibrium models, in which the system is determined at *n-1* equations because it is assumed, for Walras' Law to hold, that with all excess demands in the *(n-1)* demand equations at zero, the final demand equation must, by default, also be zero. Elsewhere, the two authors call this a "quasi-Walrasian" feature of their system (2007: 68, 404). It is, as Godley and Lavoie are keen to stress, not an equilibrium condition: it has no behavioural consequences itself, but the inevitable result of the accounting rules followed. It applies, critically, in the steady state of the model – the point of stability in which, akin to the balanced growth path in more conventional Solowian models, the major relationships of the economy (capital:output ratio, capital:labour ratio chief amongst them) stay stable.

This closure at *(n-1)* equations follows if, and only if, both the budget constraints and the double-entry rule hold. If we allow that this holds for all sectors in the economy, the system can be closed "without any equilibrium condition being imposed" (Godley and Lavoie 2007: 227). If, however, one or other (or indeed both) of those conditions are disrupted, the matrix as a whole will be incoherent. The final element, in particular, will be no longer determined by the prior elements, since one (or more) equations within the matrix will not itself be completely determined. We would need, in other words, some further rule to close the whole system effectively. In the absence of that rule, the matrix is open: the presumption of determination for the *n*-th equation does not hold and no globally stable solution can be found.

We have seen that if a forward-looking economic cost is applied to valuation of inventories (on the grounds that this removes an inconsistency with firms' behaviour), the matrix is no longer balanced in the firm equation. This renders the "redundant equation" in the Godley-Lavoie system no longer determined. The uncertainty now entering at firm level, at the level of production decisions, produces a distinctive macroeconomic effect in that the system is no longer closed.

This absence of closure is important. The redundant equation takes a particular form, dependent on the construction of the preceding set of behavioural relationships. Increasingly complex specifications of variable systems within the SFC framework allow different forms of closure (Godley and Lavoie 2007: 460). However, they will all share a commonality. Because the construction of an SFC model presumes the existence of a monetary unit, it must be the case that all subsequent behavioural equations and relationships described within the complete model will be related in terms of that monetary unit. But because this monetary unit is *produced within the model*, there must at some point be an equation that equates the *supply* of the fundamental monetary unit to its *demand*. This follows logically from the presumption that the money produced, once entered into circulation, circulates through the economy and returns to its point of origin: it is endogenous, credit money and must therefore act in this fashion. It does not arrive as an exogenous stock, in which case (by construction) any level of demand would be met by the same supply. Here, supply is endogenously determined. But if money follows this circular path, there has to be some equation, written in monetary terms, that allows for the closure of the whole system.

If the zero-sum rules are adhered to, this is trivially the case. Closure occurs where demand for a monetary unit equals its supply once all other behavioural relationships are shown to be in balance – the *(n-1)* rule, again. If either or both of the zero-sum conditions are broken, however, this relationship does not hold. We can see this for the inventories-only model presented in chapter 9 of *Monetary Economics*. The redundant equation in this instance is M_s=M_h, where the supply of money (M_s) is equal to its demand (M_d). Supply is determined by decisions of banks to grant loans to firms; demand for money is determined by the decisions of firms to create inventories and disburse profits. "There is neither need nor place for an equilibrium condition which makes the demand for money equal to supply" (Godley and Lavoie 2007: 292) in this framework.

Permanent imbalances and the "monetary excess"

However, this relationship no longer holds when the matrices become permanently unbalanced. We can see this by tracing some of the relationships between sectors in a simple SFC model with inventories, derived from *Monetary Economics* chapter 9.[8] They assume that firms hold a line of credit at banks, similar to an overdraft facility, that "the stock of loans is automatically increased when inventories grow and automatically repaid when they fall." (2007: 289) However, since we have defined the change in loans demanded by firms as now equal to the cost of production, and since (by assumption) firms supply all loans demanded, we instead have

$$\Delta L_s = WB = \Delta M_s$$

The expansion of the supply of money is equal to the cost of new production, which is (in the absence of productive capital) the wage bill. This is the initial injection of cash into the system.

Household have at present only one asset they can hold – that of bank deposits. They can choose to either spend their income, or increase their bank deposits. Effectively, deposits are the money form of saving for households, out of which they can also fund current consumption.

[8] We remove bank profits from the original for clarity; their inclusion makes no difference to the results.

$$M_{/h} = YD + M_{/h-1} - C$$
$$\Delta M_{/h} = YD - C$$

When the balance sheet balanced, it could be easily shown that M_s=M_h, changes in the demand for money being matched by changes in its supply, since every other equation in the system was closed. That need no longer be the case. In particular, the need for the distribution of entrepreneurial profits amongst households, which Godley and Lavoie recognise creates the demand for credit money in the system, now imposes itself strongly.

We can show this by looking at the demand for money. Aggregate household disposable income for the period is given by

$$YD = WB + F + r_m M_{/h-1}$$

Where r_m is the interest earned on deposit holdings and M_h is the household holding of money deposits, assumed to be held in the banking system. From the earlier definition of entrepreneurs' profits, and with all firms owned by all households in the aggregate, we have

$$F = S - (WB - \Delta IN - r_{l-1}.L_{-1})$$

Where, as before, the change in the value of inventories is given at their current resale price. Substituting this equation for F into the households' disposable income gives us

$$YD = S + r_m M_{/h-1} + \Delta IN - r_{l-1}.L_{-1}$$

This shows that household disposable income is ultimately the same as the sales revenue,[9] plus interest accrued on money deposits, with a further term dependent on difference between the resale value of new inventories, and the loan interest firms have to pay.

This last term is novel, reflecting the appearance of the valuation of inventories in the firms' decisionmaking process. We can simplify it to remove the presence of inventories by

[9] The wages paid cancel out: wages paid are spent on consumption goods, and therefore flow back to households through the profit function.

making use of the production relationships in the model. Unit costs are costs per unit produced, *UC=WB/y*, where *y* is the physical terms output *y=N.μ*. In the absence of capital, physical terms output is just the labour employed, *N*, multiplied by its physical productivity. Since the total wage bill is *WB=wN*, we have

$$UC.\mu N = wN$$
$$UC.\mu = w$$
$$UC = \frac{w}{\mu}$$

With the cost of additional inventories equal to *in.UC*, where *in* is the physical increment in the volume of inventories held, but the price of the inventories equal to *p.in*, the ratio of cost:price the two is therefore *(w/μp)*. Since the cost of the increment in inventories is the expenditure needed to secure them, WB, it follows that the increment in inventories is the new production (in value terms), minus consumption, minus the old inventory stock:

$$\Delta IN = \frac{w}{\mu p} WB - C - IN_{-1}$$

Since all inventories must be either sold or retained, in addition to the existing stock, we can substitute this into the expression for household disposable income to obtain:

$$YD = r_m M_{h-1} - r_{l-1}.L_{-1} + WB\frac{w}{\mu p} - IN_{-1}$$

With *S=C*, these elements drop out of the equation. From this new expression we can see that the total household disposable income will, for the end of the period, depend on net financial earnings. Wages earned enter the expression, but only as the product of a ratio of the balance between then wage rate offered, real productivity, and the sale price of goods. The final term is a hangover from the Haig-Simon definition of income Godley and Lavoie use, and that we retain: if income is consumption plus the *change* in wealth, last period's stock of "wealth" (here, the inventories held previously) is, in effect, a drag on current income.

This ratio is the critical part. If it is equal to unity, then there will be no problem closing the whole system. Alternatively, we can treat *(WB/p)* as the real wage rate, leaving *w=μ* as the

necessary condition to close the system. Of course, this is precisely the neoclassical case: with productivity equal to the wage rate, as is held to be the case in equilibrium the expression becomes simply that for real wages. In this instance, there is no problem in banks supplying (via firms) the requisite amount of funding needed to meet the amount demanded from households.

But in the SFC setting, there is *no* plausible reason to suppose that this applies. In general, without some binding conditions, the wage rate will not equal marginal productivity. In this instance, and without the binding constraints of the SFC construction – which, as we have suggested, are not themselves consistent with behaviour by individual firms – the supply and demand for money will *not*, in general, equate. There will be either excess demand or excess supply of money, depending on the $(w/\mu p)$ ratio. This is wholly in real terms; it cannot be settled by reference to the financial system alone. It emerges as a direct result of the presence of uncertainty impacting on production decisions taken by firms, which then, in turn, has a financial impact. These feed through into household incomes because we have assumed all firms are owned by all households.

This excess demand or supply of money balances appears as an *end-period* problem, relative to the supply of funding made by banks at the start. Whereas in either the original Godley-Lavoie case, or in the neoclassical alternative suggested above, money demand and money supply would be in balance by the end of the period, as a result of consistency (or equilibrium) prevailing within the period, that condition need no longer hold.

Money supplied will be equal to the WB. With all other demands for money balances met by bank credit at the start of the period, by construction, the remaining issue is to determine the relationship between WB and $WB(w/\mu p)$. It can be seen that with $(w/\mu p)>1$, there will be excess demand from households remaining at the end of the period that is unmet by banks' credit creation. With $(w/\mu p)<1$, there will be an excess supply of money. The balance here reflects the presence of wages in household's hands over the period: where the nominal wage is greater than the nominal marginal productivity (μp) of the goods produced, the balance of funding within the circuit shifts in the direction of the households as providers of labour; if the opposite applies, the balance shifts in favour of households as owners of firms, but this is only a second-order effect and so reduces their total disposable income.

The balance of ratio will, productivity gains aside, be determined by the relative strengths of firms and households in their respective markets. There are few reasons, a priori, to expect it to take a particular value. Productivity improvements will reduce household disposable income, since they can be earned as additional increments in the value of inventories held by firms, rather than distributed to households. If we follow the preferred Kaleckian mark-up function for firms, it is implied that real wages earned will be consistently *less* than their effective productivity, resulting in a permanent excess supply of money to the extent that firms levy a positive mark-up over costs, which, outside of perfect competition, will generally be the case.

Steady-states and dynamic solutions

We return, at the close of this chapter, to a consideration of the dynamic properties of the model. We will use again the *SIM* model, as presented in Godley and Lavoie, for clarity, and because it admits of comparatively simple analytical solutions. As shown in the appendix, this model has a steady-state level of income determined by the ratio of government spending to taxes, following the presence of the multiplier effect. But, as distinct from conventional macroeconomic modelling, in which (as Godley and Lavoie note, 2007: 86), it is too often assumed, rather than demonstrated, that an economy moves back to equilibrium, the process of the movement being assumed less interesting than the eventual resting point, SFC models can explicitly show the dynamics of the model over time.

For *SIM*, out-of-steady state national income can be found by substituting the consumption function back into the national income equation, which (through iteration) reveals the following dynamic equation (assuming perfect foresight):

$$Y = \frac{G + \alpha_2 H_{-1}}{1 - \alpha_1(1 - \theta)}$$

With α_1 as the marginal propensity to consume out of disposable income, α_2 as the MPC out of household wealth (assumed here to take a purely monetary form), θ as the tax rate on income, and *H* as the stock of household wealth, subscripted here to the previous period.

Household wealth itself follows the path:

$$H = (1 - \alpha_1)(1 - \theta)Y + (1 - \alpha_2)H_{-1}$$

Because SFC has explicitly modelled for the stocks of wealth and assets over time, even a very simple model such as this one, with perfect foresight, will immediately yield a far richer (and, we would suggest, more empirically plausible) set of dynamics than the equivalent neoclassical model, whether derived through comparative statics as in IS-LM analysis, or with a more complete dynamic specification as in DSGE.

Nonetheless, the exclusion of forecasting errors is here a problem: we have seen, in this chapter how the introduction of potential errors in forecasting leads to serious definitional problems for the standard SFC model – and that, in particular, even finding a steady-state solution to the model becomes problematic, unless further (neoclassical) behavioural constraints are introduced. Godley and Lavoie notes this difficulty themselves, in an appendix to their chapter 9, which first introduces inventories and expectations (amongst other things) to the basic SFC model (Godley and Lavoie 2007: 310-312). They also show that, with exogenous expectations, the model can produce a steady-state in which inventories remain permanently different from expectations. It would, of course, be possible to endogenise expectations, as we have shown above; but doing so creates more fundamental problems for their presentation of SFC than they give credit for in the text, problems that ultimately threaten to undermine its status as a coherent alternative to neoclassicism. This is something of a critical point: whilst steady-state solutions to SFC models can reasonably be provided, they are of interest largely because they offer a means to model, explicitly, the dynamics of the economy outside of the steady state. But if introducing at least some minimally plausible elements (forecasting errors, accumulations of wealth in different forms) then undermines the capacity of the model to show economically meaningful dynamics, the claims for SFC as a general procedure for modelling dynamic economies looks less solid.

Conclusion

This chapter started with an examination of the issues raised by time as an economic concept, and an argument for the use of discrete, rather than continuous time methods. Following on from this, the fundamental concept of income, as a flow over time relating to a stock, was introduced, and some ambiguities in its definition used to examine more closely some of the claims made for a standard SFC model. We found that the treatment of inventories, as the critical element within the model connecting the past, the present and

an uncertain future, was not robust. Correcting this, however, to be more consistent with firm behaviour led to inconsistencies in the stock-flow matrix presentation. We found that, in general, there would be an imbalance emerging in the would-be balance sheets, and that the question of ownership was therefore raised.

This led to the argument that the financial imbalance, emerging as a result of real uncertainty, produced monetary effects. Outside of the unusual neoclassical case, we found that an excess demand for money would generally exist in the presence of uncertainty affecting firms' decision-making. A final note on dynamics indicates that, whilst perfect foresight can provide

The next chapter builds on some of the results here to explore the issue of capital, income by factors in production, and the problem of profits in a monetary production economy.

CHAPTER FIVE

THE PROBLEM OF CAPITAL

Introduction

The previous chapter opened with a discussion of time in modelling, as an introduction into the importance of definition of flows within dynamic models. We indicated that the way in which a particular category of stock-flow relationship in the Godley-Lavoie model was handled was unsatisfactory, and demonstrated that their treatment of inventories was either (1) incompatible with firm behaviour, given profit-maximisation; or (2) incompatible with the accounting requirements of the balance sheets. On this basis we showed that a properly *economic* accounting of the value of stocks held by firms would lead, through the process of circulation of funds, to an imbalance in the demand for and supply of money. The impact of uncertainty on real conditions of production, via inventories, produced a financial effect that then fed into the money system.

Given this problem of definition of flows, we now turn to the problem of stocks. If the last chapter considered mainly the form of flows within the system, and how they can relate (or fail to relate) to stocks, this chapter examines stocks, and how they can relate to flows. Capital, as defined below, we treat as the pre-eminent form of the stock under capitalism: its existence is presupposed by the financial representation of the macroeconomy built into the balance sheets, as we show below. But capital brings with it a parallel set of concerns to those we have seen for flows, precisely at the point where capital is expected to produce its own flows of income to capital-owners. We examine pricing and distribution rules for capital under neoclassical conditions, showing that these contradict themselves, and then develop this Cambridge-style critique into a more general problem for any representation of an economy that contains capital.

It uses this argument to lay the foundation for a lengthier consideration of both the sequencing of events that SFC suggests, and the wider, related "circuitist" school, who have foregrounded considerations of logical sequencing within the economy. This section develops a particular anomaly within the circuitist school, that of the paradox of profits, as the central problem faced by the sequencing account of a monetary economy with decentralised production. The concluding section reintroduces SFC as a means to resolve this "paradox", indicating that it is not wholly effective as the distinction between initial

and final financing is not brought out sharply enough. This provides the basis for the discussion of Keynes' "financial motive" in the subsequent chapter.

I. CAPITAL IN THEORY

Capital as an economic problem

We have opened the discussion of SFC modelling with a presentation of an abstract macroeconomy, closely following the standard model in Godley and Lavoie (2007), which attempted to collate and synthesise a growing body of work in textbook form. This presentation has been as kept as simple as possible to avoid the complications that can rapidly be introduced to SFC modelling, and develop (as a far as possible) a critique on the basis of first principles. The previous chapter closed with an extended discussion of their treatment of inventories - a durable stock of goods produced by firms that can be sold to consumers, but which have not yet been sold. We found that the treatment, in leaving undistributed capital gains, was unsatisfactory from the point of view of either consistent firm behaviour, or consistency with the SFC balance sheet approach.

The presence of commodities that, while being produced within the system, are not wholly consumed in use but in fact contribute to further production is, of course, a standard feature of any modern economy; it would be difficult to imagine any plausible form of capitalism without capital of this sort, although of course for the purposes of exposition this can be modelled. Nonetheless, there are distinct categories of difficulties raised for economic theory by the presence of capital as such. These centre on, first, its non-exhaustion over a time period, given usually as the period over which production of commodities occurs. At a further level of abstraction this can be thought of as approaching the problem of time as such: that the economy is a dynamic system in which processes happen at definite points in time and in a given order. Capital, as a produced element that is not (necessarily) wholly consumed over a given time period immediately presents itself as an element within the system with a distinctive relationship to time as such. Second, the presence of capital as a produced element within the economy that is required for further production – including its own production – immediately invites the problem of circularity: what exits the production process at the end of the production period under consideration re-enters the production process at some point. Of course, the whole economy is (as has long been understood, (Quesnay 1969)) a circular system: but whilst in general this is a

process of transformation between different periods, for capital the circularity is immediate, in the sense that it will immediately, and as a necessary condition of its existence as capital, re-enter the production process.

Real wages, for instance, are earned by labour, and then spent; to the extent they are spent on necessities of life, future production is enabled, enabling the further payment of wages. But the relationship to circularity here is mediated by the transformation of the wages into commodities, and then, further, by what (for economic purposes) we can assume to be their complete exhaustion in use.[10] Capital commodities, by contrast, are functioning properly only as capital if they immediately enter production. That is why they are purchased, and offered for purchase. The circularity here is, at the level of production, immediate. To the extent that they do *not* enter the process of production, they are failing in their intended use, a point to we have touched on in considering the presence of inventories of unsold goods.

This combination of difficulties has acted to undermine and seriously complicate theories of capital. We will look at the outstanding example of this within neoclassical theory as a means to illustrate the parallel issues presenting themselves in SFC. We argue these issues repeat precisely because it inadvertently reproduces some of the more problematic aspects of the neoclassical theory.

The essential element here is the presence, as hinted, of capital as a *produced commodity*. Were it to simply fall from the sky like the proverbial manna from heaven – or, somewhat less prosaically, as the inheritance of previous accumulation outside of capitalist conditions (Mandel 1975) – it would not be a produced commodity, and the conditions of its production would not matter: this "capital" would exist essentially as something of a one-off "gift" to the system. And because it is necessarily a commodity, it exists – as must any commodity – as the combination of both a use-value and an exchange-value (Marx 1867: ch.1). Capital's use-value is its facility in production; production is a *system* of production within which capital operates. It is redundant to consider its existence as capital separately from that, whatever the status of the actual commodity may be: a computer, if used (say) to control robots producing cars is indisputably capital; if used to play games, it is a consumer good. Its use-value as capital lies in its relationship to a system of production; its

[10] There are, obviously, very many commodities purchased by workers that are not wholly consumed in immediate use, and that have a substantial useful life expectancy: cars, washing machines, books, and so on. These may also re-enter the market at some later date as second-hand goods. But from the point of view of the economy (rather than the individual purchasing the goods) they exit from economic use once they are purchased. Further re-appearances in the market are arbitrary from this point of view.

use-value as a consumer good lies with an (entirely separate) world of consumption. Its exchange-value, conversely, is determined quantitatively by a market process, like any other commodity. The direction of capital's circulation within the economy is determined by the combination of these two facts: its relationship to the system of production of which it could or does form part, and its relationship to the quite distinct circulation of commodities within market processes.

It is, then, generally incorrect to think of capital existing only as one or the other. It is precisely the inability to adequately account for both that determine the lacunae in the theories of capital we consider below, and that ultimately act to undermine the SFC claims about the presence of capital within the economy.

Transitions and phases

We should, in that case, think of capital not only as produced good, but as a relationship within the economy. If we conceive of a circuit of capital that integrates the separate processes of financing, production, and sale, and receipt of sales (with profits), a simple schematic presents itself, as first provided in Marx. The initial fund of capital as money, required to finance production, is *M*; this then becomes capital in its commodity form, which, in a modern, capitalist economy, implies the acquisition of separate commodities needed for the production of other commodities, plus labour power; these outputs are then sold, returning capital (through the process of sales) back to its original form as money-capital. This, however, will be in general an *increment* on the previous amount of capital offered. This increment was, in the first instance, the very reason for attempting the risky procedure of turning (safe) money into (risky) assets in the first place. With *M* as the initial amount and *M'=M+m* for the final amount, *C* can stand for the generic commodity production process. The whole circuit, then, runs to M-C-M'

The merit of the M-C-M' representation of the circuit of capital is that it alerts to two, fundamental, features: first, that the circuit is one of the expansion of capital; second, that the circuit is not undifferentiated: it is punctuated by transitions between forms. The first feature can be easily accommodated within the post-Keynesian system, and therefore within the SFC representation: it is no challenge to either the Keynes of the *General Theory*, or to Godley-Lavoie SFC models, to allow that stocks of money capital expand as the economy grows. On this basis, it would make perfect sense to talk of a "monetary

production economy", with money able to expand through time by encompassing production – leading production, even. In this respect, production can be presented simply as a subset of the overall expansion of the money-form over the circuit, M-M'.

The second fundamental feature, however, is more of a problem. The transition out of the (general) money form and into a (specific) commodity – even without the introduction of an explicit phase of production, not shown here – presents an immediate and obvious barrier to the classical dichotomy: if, instead of an effective separation between the money economy (on one side) and the real economy (on the other), there is rather a continual flow of relations between them, the classical dichotomy cannot hold in any meaningful sense. The nominal and the real intertwine, and relate back to each other, far from the rigid separation of money-leading-money and real-leading-real of the strict neoclassical theory.

That much can be dealt with within a post-Keynesian world. SFC emphatically does not observe the classical dichotomy, with money leading real production as a fundamental claim. However, the challenge here runs deeper. It is precisely at the second phase of the circuit, C-M', that the post-Keynesian representation has deep problems. The implications of the claim that if the production of additional monetary value is to be consistently sustained, there must intrude a commodity phase in the circuit of capital (even without specifying a production phase) cannot be contained within the concept of a "monetary production economy". It is the necessary opposition of the *particular* commodity form to the universal equivalent that enables the appearance of additional monetary value in the process of exchange. It is because the particular commodity opposes the universal equivalent that it is capable of being exchange for a different (greater) quantity of the universal equivalent. If the commodity was completely described by the money-form, it could not, logically, be exchanged in the exchange of equivalents for greater sums of money: at least, not beyond the haphazard occasional exchange, and it is precisely the systemic, continuous nature of the circuit that grants it is specific character as the form in which capital manifests itself.

It is because the commodity, at this level of abstraction, is not merely *identical* to its monetary form – it is in fact the diametric opposite of the money form, being necessarily particular – that it can exchange as an *equivalent* between two *different* sums of money. Its ability to do this is the expression of its opposition, as a commodity, to the universal equivalent in the form of money. This is how the contradiction between the relative and

the equivalent forms of value is reconciled: precisely the possibility of commodity exchange existing in which commodities exchange for different sums of money. Of course, for this process to become truly systemic – for the fundamental operation of capital to become not just an adjunct to the economic process, to subsume the whole of the economic process – it must also contain a production stage, during which the commodities purchased can be themselves systematically transformed and then offered for sale. This, however, represents a movement from the abstract towards the concrete conditions under which production, exchange, and distribution of the product actually occur.

In the most elementary and abstract representation of the whole process, M-M', the commodity as such disappears. This is the circuit of capital as it appears, on first brush, within the financial system, and at least at this level of representation, those theories that concentrate on the exchange of money within the system – that place the exchange of money and forms of money at the centre of their understanding of the capitalist economy – that appear to possess the means to describe the totality of the relationships established under capitalism. SFC and monetary theories of production are of this character, SFC especially so: by remaining at the highest level of abstraction available under capitalism, that of the balance sheet representation of assets and liabilities, the appearance of a *complete* representation of the real circuits of capital and reproduction of capital can be represented. In practice, this representation is incomplete: a gap is always present, registered within the balance sheet representations as the "net worth", or K – the capital seemingly accumulated as a mere residual within the process of the exchange of stocks and flows, rather than appearing as itself the driving element of the entire circuit, and thus of the entire balance of assets, liabilities, and flows between them.

From physical outputs to market prices

It is because capital must exist as both a use-value and an exchange-value that the conditions of its production matter. The relationship between the two, however, is not deterministic, in the sense that the use-value of capital – its use as a means to produce other commodities – provides the immediate guide to its value as an exchange-value. Since both capital itself, and its outputs, are traded in markets mediated by money, there is unlikely to be a direct relationship from the physical outputs of capital to either its price, or the price of those outputs. There is a necessary moment of transition between the two that

must be introduced. *How* this is introduced forms one of the core problems in any system of economics that attempts to model the totality of relationships within the economy.

Following the Lavoie and Godley baseline, the problem of the transition between the *physical* output of production and the circulation of values has so far not featured. It was quietly assumed away in the preceding chapter, even as we highlighted the difficulties caused in attempting to provide rational, consistent valuations of assets. So far, it appears possible to move seamlessly from physical output to the circulation of money values – the word Godley and Lavoie use is "smoothly" (2007: 257). But this smooth transition takes place through a sleight of hand: precisely because the SFC focuses *solely* on the spheres of distribution and exchange – even if this is not acknowledged – it is possible to abstract from production.

That does not, however, mean that the problems caused by the need to maintain a consistent asset value-price relationship as the transitions between the spheres of circulation have been resolved. Or, if they have, it is only on the same basis as Paul Samuelson's "eraser solution" to the Marxian transformation problem:

> "Contemplate two alternative and discordant systems. Write down one. Now transform by taking an eraser and rubbing it out. Then fill in the other one. *Voila!*" (Samuelson 1971: 400)

The problem is "solved" by ignoring it, and doing something else. In the case of the basic SFC framework, treating inventories as the sole form of capital good, the effect is that a significant index number problem is glossed over. For a closed, single good world, in which (of necessity) there are no distinct capital goods and no relative prices, this is not a problem. Anything more complex than this, however, breaks down.

In particular, the hinge of the Godley-Lavoie system is in the use of the unit labour costs (UC) of production as describing both the *productivity* of the production process, and establishing the *distribution* of its output. With *WB* as the wage paid, and *y* as the physical volume of output, it is defined as

$$UC = \frac{WB}{y}$$

The numerator in price terms; the denominator is in volume terms; *UC* itself is assumed to be a *price* measure of costs although in a single-good world the distinction for costs is not important. It should be clear, however, that if we loosen the stringent assumptions applied

here, the measure collapses. If we assume more than one good output, for *n* goods indexed in the (price) output vector *Y*, (price) wage vector *WB*, and the new price vector *p,* all symmetrical:

$$Y = [Y_i] \forall i = 1, \dots, n$$

$$WB = [WB_i] \forall i = 1, \dots, n$$

$$p = [p_i] \forall i = 1, \dots, n$$

Assuming, as usual, that prices are formed competitively and that the wage paid allows the consumption of any combination of the output *Y* (up to the value of the wage), we find that the transition implied in the *UC* can no longer hold. This is because the *physical* quantity of output cannot be summated without *first* being transformed by reference to a common value since the vector consists of different objects that contain (as outputs) no common property. But if we attempt to apply this transformation to the vectors above, we find that even with a single price system, as implied by the assumption of competitive pricing, they cannot be rationally valued in the absence of some additional valuation procedure.

We can present this, for the production side, in terms derived from Piero Sraffa (1960). With the notation as above, adding a profit rate *r*, and allowing the *n* commodities to be produced by a technology described in the (n x n) matrix **A**, where each a_{ij} element describes the amount of the commodity *j* needed to produce commodity *i*, we have for prices:

$$p_i = (1 + r)(p_1 a_{i1} + \cdots + p_n a_{in}) + WB_i$$

Sraffa argued that since there are *n+2* prices (the set of commodities, plus the factor payments *r* and *WB*) but only *n+1* equations, the competitive pricing system must be indeterminate. The neoclassical response to this was to indicate, correctly, that Sraffa had mistakenly collapsed input prices into output prices: the two would differ, in the presence of both a lag in production, input and output prices will (or at least could) differ over time and therefore cannot be solved simultaneously. General equilibrium would ensure that the excess demand equations were driven to zero, allowing the system to be closed through the presence of market-clearing and pre-given demand functions (Hahn 1982).

General equilibrium, then, could supply the additional mechanism by which prices could be determined; the classical labour theory of value could supply another. Whatever the case,

the system could not be closed on the basis of commodity prices *alone*: some further factor would have to be brought to bear before input prices could function as output prices. SFC occludes this distinction by reference solely to the (largely) market-valued matrix of operations. The accounting procedures involved *alone*, however, cannot be enough to close the system: we need to introduce either behavioural rules, with agents acting to close the system themselves, or to bring in some external method of valuation. SFC does neither and it is therefore not, in general, possible to have a price system that both allows for increased productivity *and* describes the distribution of the income on the basis of prices *alone*. Unit costs, as described in Godley-Lavoie, cannot close the system if productivity is changing over time.

This can be seen immediately in the unit labour cost equation above. In a one good world, we can retain some ambiguity about the valuation of *UC*: it is described as a cost per unit of output to produce *y* widgets "in the current period" (Lavoie and Godley 2007: 257), but with the numerator in money terms, and the denominator in physical output it is (in effect) a hybrid measure: cost-price per unit of output. This causes no difficulties where only one good can be purchased, but if additional goods are produced, there is no clear way to summate the qualitatively distinct units of output to allow a cost-price to be created.

General issues in the distribution of the total product between "factors of production"

The obvious mechanism for performing this transition is the appeal to the market itself. The formation of prices, in a money-form, provides an automatic standard of comparison for the entire range of commodities offered for sale. If we can provide some plausible link from real production into market prices we can rationalise the whole system of costs and deliver a common standard of measurement for value. This matters especially for capital, since the production costs of commodities in the past can vary from the costs today, making a valuation of the commodity difficult: it is not clear, a priori, whether valuation should be performed against historic prices, or current prices, and selection of one or the other may appear arbitrary. It was on this issue that the SFC treatment of inventories, as we have shown, fell into difficulties. Furthermore, as the case of inventory accumulation revealed, our valuations of these inventories have distributional impacts, outside of the case where all firms (accumulating inventories) are paying all factors marginal costs.

The claim of neoclassical theory is that it can provide an account of capital as a "factor of production" within a purely real-output "production function" which allows the question of production as such to be separated neatly from the issue of the distribution of that production. The production function describes only the set of possible outputs from the economy, from a given input set, with the distribution of finished output from that set of possibilities being then dependent on the choices of firms. If they are profit-maximising, they will select the optimum input set on the basis of marginal variations in the choice of input volumes, leading to a marginal productivity theory of distribution. Additional units of capital (or labour) will be employed by the firm until the point at which the cost of employing an additional unit exactly matches the addition to output it generates. Payments to factors of production are therefore, given optimising behaviour by firms, simply their marginal productivities. Under competitive conditions, with perfect capital markets, the cost of hiring additional units of capital is the rate of interest, and so the rate of interest will equate to the marginal productivity of capital, thus guaranteeing allocative efficiency.

Under the usual set of assumptions – exogenous technological change, constant returns to scale, diminishing marginal productivity, and competitive market conditions – the aggregate production function given above demonstrates what Paul Samuelson, writing in its defence, called three "parables" (1962): the real return on capital (assumed the same as the rate of interest in the neoclassical world) is determined by technology, as described by the rate of decline of its marginal productivity; greater amounts of capital reduce its productivity, and therefore its return (the rate of interest), with the inverse also applying; and the distribution of income between capital and labour is dependent on their relative scarcities and marginal products. The neoclassical theory of prices depends on a principle of (gross) substitution amongst factors: given a production function, each factor at use within that function can be substituted for other factors to obtain a given level of output.

In a one-good world, in which the output produced can function both as a consumed commodity (that is, it is destroyed in its final consumption) or as capital (that is, re-enters the production of future commodities), this is not a difficulty. In response to changes in the price of a factor, profit-maximising firms can shift away from that factor use and into others, thus minimising costs for the desired level of output. On this basis, downward-sloping demand curves for factors (including capital) can be easily derived, with the quantity demanded being inversely related to price.

These are, potentially, a powerful set of results, and are embodied in standard, Solowian, growth models. Downward-sloping demand curves ensure the stability and uniqueness of equilibrium (Garegnani 1990). But they depend, crucially, on a physical conception of capital: that inputs and returns can be measured in some "real", physical quantity, rather than as money. This allows the elision between the rate of return and the rate of interest, but it also allows that inputs and outputs can be readily and simply compared for the purposes of determining productivity.

All of these claims will be familiar. They depend on a number of assumptions to operate: competitive markets for factor inputs and production outputs, and gross substitution amongst factors being the most important. But even if we accept these assumptions, the standard story does not hold.

In the general two-factor case, with labour (L) and capital (K) paid their respective factor payments of wages (w) and rent (r) respectively, it must be the case that the output (Y) of a homogenous consumption good is equal to the sums of the factor incomes. With all values measured in terms of the output good, this statement is definitional:

$$Y=rK+wL$$

To simplify the following, we can normalise at $L=1$ and rewrite in per-labour terms (Bhaduri 1969: 535):

$$y=rk+w$$

Since this is a definitional claim, it must be compatible with any rule for the distribution of the product, including that of neoclassical theory in which factors are paid their marginal products. However, we can show that in general this will *not* be the case, and that therefore neoclassical distribution theory holds only under highly specific circumstances.

For a single firm, the marginal product rule might hold, since changes in the input of any factor demanded can be safely assumed (in competitive conditions) not to impact on the price of that factor, and therefore will not impact on the demands for factor inputs. This cannot hold, however, for the whole economy, since changes in the aggregate output must (from the definitional rule above) result in changes in the distribution of all factors. Therefore, changing the input demanded of one factor has an impact across the other factors.

For the whole economy, changes in the total product must equal the sum of changes in the factor payments:

$$dy=r.dk+dr.k+dw$$

The marginal product of capital is therefore:

$$\frac{dy}{dk} = r + k\frac{dr}{dk} + \frac{dw}{dk}$$

Capital's marginal product in general is equal to its factor payment, *r*, *plus* the impact on the wage rate of marginal changes in capital, *plus* the "income effect" of changes in the demand for capital on the price of capital multiplied by the whole capital stock. This is clearly substantially different to simply stating the marginal product of capital is equal to its factor payment; the neoclassical case will only occur when the other two terms are zero (as in the single-firm case) or when the two additional terms cancel each other out. As Bhaduri notes, this will in general occur when (following Samuelson 1962) the factor-price frontier is linear, equivalent to the same capital:labour ratio prevailing across all industries (Bhaduri 1969: 536) – an assumption either implausible, or implying a single industry, but in either case not a general condition.

In other words, what appears to be a generalisable theory about the economy decays rapidly into a very specific claim about certain sets of circumstances. If the economy exists *as an aggregate* – as a set of interrelated markets and processes - it will not, in general be possible to separate the distribution of the product from the conditions of its production. For the two-factor world above, even with other complications assumed away, the production relationship between capital and labour and the volume of capital employed both affect the actual distribution of the product.

A change in the input of capital will affect the wage rate and the rate of return on capital. There is a circularity produced that can only be assumed away in the Samuelson linear factor-price case. Prices will, in general, be affected by the distribution of income and the specific welfare claims made for the neoclassical case will not hold.

The Cambridge capital controversy and the problem of time

The general difficulties illustrated above stem from the treatment of capital as homogenous mass that can be easily reduced to a unit quantifiable by a single measure. The "Cambridge capital controversy" centred on the difficulties of providing a means to value heterogeneous capital goods, existing over time, against a common measure without running into insurmountable problems of circularity. Joan Robinson opened the post-war debate in 1953, with this classic statement of the problem:

> "The student of economic theory is taught to write O=f(L,C) where L is a quantity of labour, C a quantity of capital and O a rate of output of commodities. He is instructed to assume all workers alike, and to measure L in man-hours of labour; he is told something about the index-number problem involved in choosing a unit of output; and then he is hurried up to the next question, in the hope that he will forget to ask in what units C is measured…" (Robinson 1953-54: 81)

However, if more than one commodity exists, this clear relationship cannot operate. Since the measurement of capital as an endowment must be independent of prices and the distribution of commodities, a contradiction can appear if this measurement of capital as an endowment is different from that measurement used when the production technique is describing how an increase in the factor inputs (in physical terms) leads to an increase in output. Heterogeneous goods cannot be simply added to each other, since they lack a common unit of measurement: this is, perhaps literally, comparing apples and oranges. In real terms, the unit of measurement, as Wicksell, pre-war suggested, could be either the cost of their own production, or the present value of the future output stream produced. Each variant, however, involves time: either the original time of production of the input good, or the time period over which the output stream is valued. That, in turn, implies the need for an intertemporal measure, which in a world of (presumed) competitive markets, particularly for capital, implies a rate of interest measured in money terms (Wicksell 1934: 144).

The rate of interest, though, is precisely that which the pricing of capital inputs is supposed to determine. This circularity introduces two potential sources of changes in the valuation of the capital stock arising from variations in interest rates, known as Wicksell effects: the real Wicksell effect occurs when the price-weighted sum of the physical quantities of capital alters; the price Wicksell effect occurs when price changes force a revaluation on the stock of capital goods. The combination of both implies huge difficulties in the valuation of capital in most reasonable scenarios – that is, ones in which more than one produced commodity exists. (Wicksell 1934)

It was in resolving, or failing to resolve, this circularity that what became known as the Cambridge capital controversy revolved around. The combination of Wicksell effects, in turn, could lead to two, related, violations of Samuelson's neoclassical "parables": first, that a technique could be preferred at two (or more) different interest rates, with intermediary techniques preferred inbetween those rates, a phenomenon known as reswitching; second, that a lower capital:labour ratio could be preferred at a lower (not higher) interest rate, implying that the demand curve for capital is not always downward-sloping, a case known as capital reversing, or inverse capital deepening. In the case of reswitching, the claim that technical conditions would determine the real return on capital is violated, along with the claim that a greater quantity of capital leads to a lower rate of interest. Capital reversing also violates the latter claim, along with the claim that the distribution of income amongst factors of production is determined by their relative scarcities and marginal products. Both implied nonlinearities and, therefore, the possibility of multiple equilibria.

The challenge, then, is that if reswtiching or capital reversing (or both) can be demonstrated, the majority of neoclassical capital theory would fail to hold. Early on, this much had been theoretically conceded by at least some of the neoclassicals, (Solow 1955-56) immediately recognising that Wicksell effects mounted an insurmountable challenge to capital theory, but insisting on the *empirical* relevance of one good models. Assorted attempts were made at the level of theory to introduce different conceptions of capital and production functions, but to all intents and purposes these attempted to collapse analysis (via often questionable metaphors) back into a one-good world. Swan's "putty capital" (Swan 1956) and Samuelson's "surrogate production function" (Samuelson 1962) were both of this ilk.

By the 1970s, it was widely accepted that the aggregate production function could not be reliably used for modelling purposes, due to the prevalence of reswitching and capital-reversing (Samuelson 1966). Neoclassical theory moved, instead, into the adoption of Walrasian general equilibrium models, effectively sidestepping the core argument in capital theory. Rather than demonstrating a direct relationship between capital and prices relationship, as the earlier capital theorists had attempted to show, general equilibrium allowed comparative statics results to be demonstrated within an intertemporal system (Cohen and Harcourt 2003: 206-207). The Arrow-Debreu general equilibrium approach had the great merit of apparent generality. With few restrictions, and none of the

differentiability requirements that the earlier production function theory had relied on, it appeared to offer a solution to the price and distribution problems without the need for awkward underlying assumptions, and the serious inconsistencies of prior theory. Arrow and Debreu's use of the theory of convex sets allowed a firm's technology to be described as a feasible set out net outputs, with no further requirements necessary – or even the use of a production function (Arrow and Debreu 1954).

The existence of general equilibrium – which was now neatly proven – is not the same as its determinacy, however. The Arrow-Debreu framework could be extended, following Hicks' (1939) suggestion, by allowing the prices of commodities at different points in time to be treated as independent variables. This allowed a version of intertemporal trading to take place, transforming a static equilibrium model in to one that could incorporate dynamics. The extra degree of freedom introduced by intertemporal pricing, though, "opens the door to indeterminacy" of the equilibrium, since the prices of stocks produced in the past are no longer tied to the prices of factors currently under production (Mandler 1999: 41). Debreu (1970) had shown that for most economies, indeterminacy was unlikely, appearing only with some fairly implausible parametrisations of the model. Most plausible *initial* endowments of goods within the model would produce determinate outcomes. But if trading takes place over time, as Mandler (1999: 42-45) shows, indeterminacy reappears, since current endowments of capital goods will now depend on past decisions. The problem is that indeterminacy can be ruled out only by assuming that the initial endowment set is unbounded: once production actually occurs, and current endowments depend on both past endowments *and* past decision, that condition no longer applies – the feasible set of endowments is now constrained by the economy's own past. Agents now have the possibility of treating factor prices as nonparametric, attempting to alter their factor supplies to market in an effort to shift the price, and therefore breaking the principal rule of competitive markets. Again, it is the presence of accumulated goods over time that forces the breakdown of the system.

The problem can be resolved, in part, by assuming only a single, accumulable, capital good exists. But this sidestepped the fundamental problem raised by Robinson – that of heterogeneous capital goods. This was left unresolved, since capital goods were themselves now merely assumed to be one input into the set of production technologies. Garegnani had elsewhere shown that the Walrasian original concept of general equilibrium itself implied a "physicalist" conception of capital, with an exogenously determined

distribution of a pre-existing capital form ensuring the stability of equilibrium within the system. However, it was impossible on this basis to demonstrate a uniform rate of return for each capital good, and that therefore, in practice, most neoclassical theorists had earlier abandoned Walras' concept of capital for one measured in value terms (Garegnani 1990). By shifting back into a Walrasian world, the neoclassical school was dragging itself back into the difficulties of Walras' concept of capital they had earlier attempted to avoid.

The neoclassical response to this was, in the end, to point to the empirical applicability of the neoclassical models. Irrespective of the theoretical difficulties that the neoclassical theory may be glossing over, if the simplifications are made clear such models can provide empirical outcomes that are "tractable, fruitful, and policy-relevant" (Cohen and Harcourt 2003: 209). That appeal to empiricism has dominated the neoclassical school until relatively recently, when, as we have seen, the formalism of real business cycle and DSGE models began to hold sway – despite the difficulties in getting such formal models to fit empirical observations, a recent comprehensive Federal Reserve Board assessment for example finding them to be "very poor in forecasting" (Edge and Gurkaynak 2011: 17).

The Cambridge controversy is a generalised concern

The underlying issue, however, has not been resolved. The Cambridge controversy focused on the problems that measurement held for neoclassical theory. However, the same problems arise for any theoretical system in which there are simultaneously capital goods, *and* a common valuation in the form of money. The heterogeneity of capital goods requires a common measurement to determine their value, but measurement in money terms introduces a circularity to the determination of values. Although the neoclassical school attached a singular importance to the valuation of capital, since it wished to derive a downward-sloping demand curve in line with marginal productivity theory and thus ensure the stability and uniqueness of equilibrium, even without the necessity of that theoretical hinge, the problem generalises.

By definition, it must be the case that any commodities that are produced as an output, enter production as an input, and are not entirely used in production cannot be valued purely in terms of their output where there is more than one good, since the produced good (the capital good) forms also part of the input. This creates the necessity for an external valuation – a valuation that *can* be derived in terms of money. For the neoclassical

school, the need to enable production to be treated as a separate issue to distribution (and therefore holding that the return on capital is its marginal product, found by optimising behaviour), both reswitching and capital reversing emerge as immediate problems at this point.

For a system that holds some barrier between the cost of capital and the rate of interest (that is to say, any system where the classical dichotomy does not hold, money balances having real economic effects), this contradiction is less stringent. It exists nonetheless, since the production, use, and reproduction of capital takes place over time. It is the presence of time that guarantees the heterogeneity of capital, and thus guarantees that measures of capital value that do not exist independently of the value of capital will always be subject to the contradiction highlighted above. The rate of interest is simply the money-form of the valuation of time. In the conventional neoclassical capital pricing model considered above this is the form in which this contradiction emerges.

Although a system in which the rate of interest is determined in a distinct market, or through a distinct process – for example, in the market for loanable funds, dependent on portfolio holdings – there is a degree of slack introduced, the underlying problem still holds since ultimately the production and use of capital takes place over time, and that capital (by definition, as capital) enters the production of goods in future production rounds. The existence of a capital good today is therefore necessarily different from that of a capital good existing at some point in the future - a point that is well-made by theorists in the Austrian school, Friedrich von Hayek most notably, in considering the "roundaboutedness" of production (Hayek, Robbins et al. 1932). However far the problem of circularity is occluded by holding a separate determination of the rate of interest – that is, by having a monetary rate of interest dependent on monetary conditions, rather than a "natural" rate of interest dependent on real production – the circularity of this valuation must reappear because it relates directly to the actual circularity of capital in use.

It is therefore not the case that, in general, economic models incorporating capital will be easily able to avoid some manifestation of Wicksell's two effects, arising from the circularity. Since production takes place over time, the valuation of capital goods varies, as Solow (1955-56) noted: "the real difficulty of [capital] comes not from the physical diversity of capital goods. It comes from the intertwining of past, present, and future…" There is no a priori reason, in money terms at least, to select any given point in the lifetime of a capital good to perform this valuation, given that the money terms valuation is itself an

estrangement from the existence of capital as a use-value, that is as a commodity engaged in the production process. The appearance of a money relationship to any given unit of capital (of some indeterminate specific kind) is not the same as the relationship of that indeterminate form of that particular kind of capital to production, since it exists only as a result of the general system of exchange of commodities of which capital is only one particular kind. We cannot know in money terms, in advance and at the level of generality suitable for all particular forms of capital, whether a valuation of that capital should be performed at historic price, cost price, market price, future value or some other combination of specific price points selected from the capital commodity's existence. We cannot know this precisely because of the element of circularity the appearance of price has introduced.

In the case of SFC, this difficulty is somewhat obscured, on two grounds. The first is the appeal made to the accounting framework itself as the guarantor of a "sufficiently good" theory of value (Godley and Lavoie 2007: 250): not one that *necessarily* resolves all issues in valuation, but one that provides outcomes that are not going to be inconsistent with reality or with theory. The criterion of "sufficiently" good, however, is itself insufficient to provide a stable valuation for assets given the presence of exactly the circularity of definition for values in a monetary economy. The zero-sum constraints are not sufficient, by themselves, to rule out an indeterminacy of values within the framework. This circularity, highlighted for the neoclassical case, re-emerges in a very particular form within the SFC framework as a variant of the "paradox of profits" encountered in the literature concerning the circuitist school and the "monetary theory of production".

II. CAPITAL IN STOCK FLOW CONSISTENT MODELS

Capital in SFC

The second problem, however, emerges in the weak description of capital that SFC provides. By appealing to market prices alone as the criterion of value, SFC makes an "empiricist" claim to the reality of value within its system: value is simply that which we observe attaching itself to an asset in the market. But this is an even stronger commitment to empiricism than in other modelling procedures, since it is further reinforced by the appeal to *accounting* conventions (on one side) and what is more properly the *economic* convention of the budget constraint (on the other) to enable an economic meaning to be

derived from the system of matrices. The budget constraint has an undoubted economic content: in a monetary economy, with money forming the means of payment, and with a single sector operating a monopoly on their production, budget constraints must bind. If budget constraints bind, they establish the set of actions available to any actor. But it is not so clear that the accounting rule of double-entry bookkeeping can apply in the same way. It has a conventional character that does not lend itself to a directly economic interpretation: of course, the accounting position of the different units, and their net worth, matters to the decisions they make, but as long as the units remains solvent, no given accounting position at any point in time would have automatic consequences. The accounting rules only become truly binding where liquidity is constrained; they are not, themselves, a bind on actions. The accounts in SFC record, in effect, whatever the accountants have recorded – they depend directly on the effectiveness of the accounting procedures used in their construction. There is not an independent, prior and economic justification for their existence.

This produces immediate effects. Capital is introduced, in the Godley-Lavoie textbook case, only after the previous services-only and consumption goods-only economic models were developed. As the previous chapter attempted to show, the shift to durable consumption goods, capable of forming a stock of inventories held over time, posed serious difficulties for the coherency of the whole SFC structure. Notably, the presence of inventories produced capital gains that were not accounted for properly, being left as an extra distributional element within the whole structure. Uncertainty, affecting production, produced financial and then monetary effects. An analogous set of problems emerges once the SFC framework moves into treating capital proper.

The principal mechanism through which Godley and Lavoie do this is through the *revaluation matrix*, which seeks to capture capital gains made during the production period. An example is reproduced here, showing the changes in the valuation of stocks through capital gains as derived from the model in Godley and Lavoie (2007: 380). It is an expansion of their earlier presentations, which focused only on the capital gains or losses arising from bondholdings by households:

Table 5.1: Revaluation matrix

	Households	Firms	Government	Central bank	Banks	Total
Bonds	$+\Delta p_{bl}.BL_{-1}$		$-\Delta p_{bl}.BL_{-1}$			0
Equities of firms	$+\Delta p_{e}.e_{-1}$	$-\Delta p_{e}.e_{-1}$				0
Bank equity	$+\Delta OF_{b}$				$-\Delta OF_{b}$	0
Fixed capital		$+\Delta p.k_{-1}$				$+\Delta p.k_{-1}$

As usual, we will focus here on the production activities of firms. The behaviour of the purely financial elements in this matrix – the distribution of bonds and equities amongst households, banks, and government – is of less interest. An accounting system designed to capture the behaviour of financial assets and liabilities, unsurprisingly, does not face particular challenges from changes in the distributions of financial assets.

The final line, however, should immediately stand out. The accumulation of capital by firms (here assumed to be paid for through the issue of new equity) results *not* in a balancing of the whole system to a zero net change to net worth. This, until now, has been the common occurrence within the SFC system. Instead, a *residual* element appears – a change in net worth that is unbalanced by any other element in the matrix, and instead appears as a pure accumulation. Net worth of the whole economy, in other words, increases with capital accumulation by firms. And the net worth of the whole economy is equivalent, in this model, to the value of the stock of capital goods.

It is firms that make decisions over capital investment, based (in this version of the model) on some autonomous "animal spirits", current capacity utilisation, and the real cost of borrowing. Godley and Lavoie assume that the bulk of investment is financed out of retained earnings, a stylised fact consistent with theoretical claims by Kaldor and Tobin, amongst others, and with current empirical evidence (Godley and Lavoie 2007: 390). Their pricing decision, therefore, is modified to the extent that their price must pay for the costs of production, the costs of distribution of the surplus to equity-holders and creditors and, now, the cost of continued investment. The "Kaleckian" implication of this is that rates of capacity utilisation are "not constrained to their normal or standard levels", contrasting with standard Cambridge growth models, and with the classical view of investment (Lavoie and Godley 2001: 279).

The direct form of the investment function they use is not of immediate interest to us: they follow Dos Santos and Zezza (2005) in making the rate of capacity utilisation the decisive

endogenous variable. Other, more complex investment functions could be provided, perhaps to try and capture increasing realism, as in Lavoie and Godley (2001). Our concern here, however, is the structure into which any investment function might operate, not the applicability (or otherwise) of the function itself. As ever, then, we will be looking at the relationships imposed on the economy by the matrix form being proposed here, and attempt to examine whether these foundational claims are consistent with economic logic.

Firm financing of investment

Godley and Lavoie, in common with other SFC modellers, propose a distinct sequence of events by which firms, at the start of each period, choose their level of output and (now) investment over time. They incorporate, still, the target level of inventories and insist (as we have argued, incorrectly) on the valuation of inventories at cost, although we will leave this issue for now. The valuation of *capital*, on the other hand, is implicitly given by its market value: that is, its resale value if the capital stock were offered for sale. This, however, is never explicitly defined within the model as a whole. The value of capital is, instead, the residual element within the whole economy, appearing as the element left over after all other balance sheets balance. This residual is, however, actually the product of specific decisions made by firms to add to their capital stock.

The evolution of the capital stock over time is given by Godley and Lavoie as:

$$k = k_{-1} + (1 + gr_k)$$

This is presented in *physical goods terms:* it represents the actual accumulation of capital goods over time. As we have already shown, this formulation introduces substantial problems in the case where there is more than one capital good produced. Nonetheless, for now we can assume that a single capital good is produced, and that this therefore resolves the index number problem of summating heterogeneous goods. Firms attempt to finance their gross investments out of retained earnings, as far as possible, with loans still being needed to provide initial financing for wages and therefore for inventory build-up. In the investment function presented here, desired investment is determined by “animal spirits” (some autonomous demand for investment), current capacity utilisation, and the real price of borrowing. There is a seniority of disbursements, with creditors being met ahead of retained earnings spent on investment, and the equity-holders receiving dividends. The proposed investment function, then, is backward-looking: it assess the need

for additional capacity given the level of capacity utilisation today, although it could easily incorporate forward-looking elements by modifying the argument we are presenting here.

The first concern is the timing of the available funding. Loans are provided by banks to meet current costs in the form of wages. Firms then seek to provide for the desired capital investment out of retained earnings. They establish their desired level of investment on the basis of capacity utilisation in the last period (although, again, it would make little difference here if they relied on expected capacity). The financing of this is assumed to come from retained earnings, held in this period. Yet these earnings are not available until the period's end, after production has been made and sales realised. Without the realisation of sales, there are no retained earnings available for investment. We have to suppose that investment, therefore, takes place at the *end* of the modelled period, since this is the only point at which retained earnings would be available. Dividends would then be distributed from the remainder.

The demand for capital goods, however, exists over the whole period. At any given point in time, retained earnings held by firms will not be sufficient to meet this demand, by definition: until the earnings have been realised, the demand for capital cannot be met. At present, if the amount needed to meet the firms' demand for capital goods was insufficient, the firm is assumed to turn to bank credit to make good the difference. However, this would constitute an additional demand for *credit money*. If spent by firms on capital goods, it would add directly to the stocks of money in circulation. But from the current balance sheet, it is unclear where this *immediate* demand for financing, if met by increased circulation of credit money, would end up. It would be obtained by firms, then spent on capital goods, and presumably then circulate back to the banks.

The difficulty, however, is that there is no *within-period* guarantee that all monies released in this way would circulate smoothly back to the banks. If that can be guaranteed, the issue of additional funds for the purchase of capital is of no concern: the money is issued, circulated through the economy to purchase capital goods, and then circulated back to the bank before the period closes. As firms generate more retained earnings, the need for this additional financing gradually decays; its only legacy will be an increase in the firms' outstanding loans over and above that needed to fund the capital purchase: essentially a kind of small additional cost that would decline the closer the purchase of any given fixed capital was to the end of the period.

Money, however, need not circulate in its entirety within one period. Indeed, it is central to its functioning so far – as a store of value – that it can exist in multiple periods. In the current model, workers paid in credit money can retain these payments (in whole or part) as deposits held within the banking system, earning them interest. There is no reason to suppose they could not do this with further monies circulated. As an aside, the flip-side of this, of course, is that firms themselves retain no cash balances: all earnings are always either spent on fixed capital, used to repay loans, or circulated as dividends. Yet empirical evidence, particularly after the crash of 2008, suggests non-financial firms have a huge propensity to retain money deposits, topping £300bn for the UK alone.

Introducing a firms' own account would imply that firms, too, made portfolio decisions, rather than pure investment decisions, akin to the suggestions made earlier about the correct modelling of inventories. That aside, the additional monies obtained by households are of more a concern: if these additional funds, issued in lieu of retained earnings being available, are repaid back to banks within the period (and therefore, in this model, entirely spent on consumption by households), the model closes without problems. As long as the marginal propensity to consume is unity for this additional credit finance – or, what amounts to the same thing, workers in the capital goods industry spend all their wages – no problems emerge. For any marginal propensity to consume lower than one, however, this additional source of funding presents a challenge for the current balance sheet representation: we have an issue of funds, within-period, that is falling into the hands' of one sector – the households – without a clear liability relationship on the other side.

The following chapter explores in greater detail some of the implications of what Keynes called the "financial demand" for money. The important point to note for now is that while SFC offers a system that, at the end of the circuit of credit-money, appears closed, it is more problematic when dealing with the state of financing at the *start* of any given period. Again, we find that the demands of production impose themselves first as a financing requirement, and that this turns into a potential imbalance in the monetary system: we would find, with demands for initial financing met by the banks, that a continual monetary overhang would come into existence, in excess of the actual requirements of investment, for any positive level of investment in any given period of time.

"Overcapitalisation" has been introduced by (Toporowski 2008) as the "holding of financial liabilities in excess of these needed to start production". He argues that, under financialisation, the desire of non-financial firms to hold significant money balances has

grown, and that the demand for financing is not determined by prospective income streams as such (as in the conventional theory), but by opportunities to obtain finance and prospective capital gains. Michell and Toporowski (2012) have more recently introduced this concept into an SFC framework derived from Godley and Lavoie, with firms being now allowed to hold bank deposits as the simplest form of "overcapitalised" finance available to them. They show that consistency in the matrix can be maintained with this modification; we are sympathetic to this view, but will argue here rather that there are *additional* demands for financing that will act to disrupt financial and money markets.

Capital cannot be reduced to inventories

The initial Godley-Lavoie presentation, as developed in their *Monetary Economics*, develops a theory of capital investment in which investment by firms is initially adopted purely in the form of inventories (Godley and Lavoie 2007: ch.2). Later, as they extend the model, fixed (tangible) capital is introduced as a second item for firms to invest in, and assumed (for convenience) to be financed either through equity or retained earnings, leaving loans to finance pure inventory accumulation (Godley and Lavoie 2007: ch.11).

Clearly inventories form part of the capital held by a firm. They can be considered part of the circulating capital of a firm: that section of its investment that is, in general, used up either within a single production period, or within a comparatively short space of time. What marks inventories out as unique relative to circulating capital of other forms – raw materials, intermediate goods, and so on – is that they are constitute both an investment in capital (of a particular kind) and have the capacity to be immediately available for resale, even if the resale price may be significantly devalued. Using the distinction made earlier, within the M-C-M' circuit of capital, they are already – amongst the many forms that capital can take as a commodity – the closest, in practice, to the existence of capital as money. This, of course, makes them the ideal form for representation within an accounting matrix based precisely on flows of financing over periods of time.

However, this proximity to the money-form – that is, the presumed liquidity of all inventories – is exactly what makes them inappropriate as a form by which to understand capital as a generality. In the first instance, the pricing of *current* inventories poses no particular problems: they can be simply priced at current market prices, which may imply a

loss or a gain for the firm holding them. There is an obvious relationship between the inventory, and net wealth at this point.

For a one-good world, in which the same commodity (say corn) can be both consumed directly, or invested as capital, and in which all production lasts a single turnover period, this inventory-as-capital poses no especial difficulties. The difference between an inventory, and a capital investment, is merely that the inventory represents the good as unconsumed within the period, and the capital investment is directly invested at the start of the period, producing output at the end. In this instance, the good retains an immediate relationship to the money-form, since it is either consumed directly or at the end of the production period, and its costs can be compared across the period.

If we assume multiple goods, and (in particular) the presence of capital goods, potentially of variable turnover times, this simple comparison cannot hold. As we have seen, the pricing of capital presents a unique set of problems: an ideal system would reconcile both the pricing of the output with its distribution across society. The neoclassical production function claimed to do this, but does not withstand the Cambridge critique; general equilibrium theory offered a more general solution, seemingly without the reliance on calculus and the concept of adjustments at the margin, but this cannot be treated as a theory of capital as such because of the recurrent problem of factor price indeterminacy. Although initially delivering a promising set of results, further research revealed that general equilibrium solutions could be neither unique, nor stable, under plausible initial conditions.

SFC removes itself from these considerations through the construction of a series of matrices that are held to represent every stock and flow of economic relevance within the economy. If the combination of the budget constraints and the accounting identity hold, the system is closed and complete. If, however, there are “black holes” (in Godley and Lavoie’s phrase) at any point, the system will fail to close, and will be unstable. Inventories, if more correctly valued, constitute one such “black hole”; the funding of capital goods constitutes another.

This is occluded in their presentation precisely because, in effect, capital is collapsed into inventories in making both constitute the “net worth” of the whole economy. But this itself contains a further problem: since capital is valued at current market price, in their theoretical system, and inventories apparently valued at cost of replacement, the two are

not easily comparable. They cannot simply be added together without first specifying how the replacement-cost valuation of inventories can be made to equate to the market-price valuation of capital. The SFC presentation, with its reliance on accounting, has here provided too easy a route out of a serious issue in the valuation of economic outputs.

This affects the presentation of capital gains directly. At present, the revaluation matrix seeks to capture all capital gains made (or lost) during a period occurring as a result of pricing changes. For pure financial assets, this is not a problem, since each financial asset has a complementing liability that ensures the balances sheets still balance. For real assets – inventories and, now, capital stock – the situation is less clear: they at present cannot be priced commensurately to each other, and yet both end up as a residual in the net worth of the whole economy. Capital is in general valued at its market price, but inventories are valued at their replacement cost of production. These are two different things, and cannot be directly compared; we also know that, if these two goods are not the same, we cannot directly value them in money terms because of the circularity in pricing that is thereby introduced: this is the essence of the Cambridge critique. Capital gains (or capital losses) occurring for either inventories or capital cannot be compared: at any point in time, the revaluation matrix is potentially telling us very little about the state of the economy, given the possibility that the prices of both fixed capital and inventories – if they are not the same good – will diverge, and diverge in an a priori unknowable fashion dependent on real economic conditions.

Capital as past accumulation of commodities

What lies behind this occlusion is a specific theory of capital, derived (via David Ricardo) ultimately from Adam Smith. In this formulation, following a version of the labour theory of value, since all capital is the product of labour, any existing *stock* of capital can be considered simply the accumulation of prior *flows* of labour. Under these circumstances, the pricing of capital becomes a relatively simple condition: it is merely the summation of the prior labour exerted to create the capital, dating back to some distant point in the past. In Ricardo's hands, this enabled him to dodge some doubts of Smith's, and axiomatically assume that the labour theory of value still held: the accumulation of means of production translated, with no additional terms, into the accumulation of capital, and commodities could be very easily values in labour terms. Describing the production of stockings as the

accumulation of cotton, spinning labour, spinning machinery, and so on, Ricardo claims that "[t]he aggregate sum of these various kinds of labour determines the quantity of other things for which these stockings will exchange, while the same consideration of the various quantities of labour which have bestowed on those other things will equally govern the portion of them which will exchange for stockings." (Ricardo 1821: 15) The value of capital, here, is the accumulated historic value of its components. In stock-flow terms, capital can be presented without seeming difficulty as the *stock* that emerges from the accumulation of historic *flows*, appropriately valued. It should be clear, already, that some serious difficulties in the pricing of historic elements are here being glossed over, and we will return to this point.

This conception of capital as accumulation of historic production was resurrected by Piero Sraffa in his 1960 *Production of Commodities by Means of Commodities*, a work of huge subsequent influence on the development of non-neoclassical schools. Sraffa aimed to demonstrate (and to substantial extent *did* demonstrate) that the major claims of the neoclassical school regarding the separatedness of production from distribution, and the derivation of prices from demand and supply, was in fact largely incorrect, even in equilibrium. However, he further presented an argument for the presence of capital in which it could be reduced to the residual element in a series of commodities produced over time.

For now, we can note that, under these conditions, there is no worthwhile distinction to be made between net wealth, and the value of the capital stock: with all value derived (ultimately) from labour, and with capital as only the stock of accumulated labour, it can be seen very simply that the net wealth of a society, and the stock of its accumulated labour, are one and the same thing. Under these circumstances, the SFC elision between net wealth and the stock of capital would function without difficulty. Additions to the stock of capital would be a simple residual – the addition to the stock of capital would be only that part of the total output left unconsumed, simply equating $S=I$, ex post.

In fact, SFC represents (if anything) a retrogression from this point, since they do not incorporate either a labour theory of value (or some equivalent) that would allow net wealth and the stock of capital to equate easily. There is no external, non-monetary, referent for the value of past accumulations that would allow both net worth and net capital to become equivalent values, both under a common standard of comparison. The Godley-Lavoie presentation of the presence of assets accumulated under the firms' direct

control is unusual: they present first the case for inventories, and then only later develop this into the capital. The result, in practice, is a confusion between capital, inventories, and net worth (the concept used to disguise both). Net worth, a residual element within the economy as a whole, is left undefined; it appears as a kind of repository for the presence of capital and inventories, appearing in real-life balance sheets but not, in this instance, pinned down to a definite theoretical existence. This becomes a problem, as we have suggested for a similar situation in the preceding chapter, because it hides a distributional issue within the economy: different firms (owned by different households) will in practice hold different amounts of inventories and capital; the amounts they hold, at any given point in time, will in turn affect their demands for financing, alter the net balance of financing, and therefore have a wider impact on the provision of credit money by the banking system.

Conclusion

This chapter began with an analysis of the problems posed by capital for economic theory in general, before suggesting that the circulation of capital was the critical point to focus on. A number of specific problems were highlighted, relating to the problems of pricing heterogeneous capital forms, and it was proposed that both the neoclassical system and the SFC alternative both failed to adequately value capital.

That, in turn, lead on to a consideration of the problems caused for the financing of capital as presented in the canonical Godley-Lavoie SFC model. We found that the financing procedure they proposed was not plausible, given the need to obtain initial financing for the fixed capital, prior to retained earnings being available; and that, while the use of retained earnings for finance simplified the problem of fixed capital investment substantially, it do so only at the price of disguising this wider issue. This brought us to the problem of pricing fixed capital and inventories, with inventory pricing already a deep problem for the system. The appearance of “net worth” and the use of net worth as residual “sink” for both these two elements was not, it was argued, an appropriate treatment given that we cannot directly compare the valuations of either.

The following chapter develops the issue of initial financing further by looking closely at Keynes’ formulation of the problem and surrounding arguments, before using the

"circuitist" theory of production to provide a coherent basis for an alternative conception of finance.

CHAPTER SIX

ENTREPRENEURS, INVESTMENT, AND THE FUNCTIONS OF MONEY

Introduction

This chapter builds on the previous one to consider further some of the issues raised: the motivation for investment, the motivation to *fail* to invest – to create hordes – and the presence of money within a system of accumulation. It starts by examining the seemingly crucial role of the entrepreneur as the decisive element within a system based on Keynes, critiques this with reference to understandings of uncertainty, and then on the basis of this developed understanding of uncertainty. We move from this into a reconsideration of money as such, and attempt to show how the theorisation of money has consequences for the representation of flows of value.

The final section concludes with the critical points for the wider discussion, in two parts: first, that an irreducible "leak" is created from the system of flows within the economy by the presence of both money and uncertainty. We suggest that the one – in contrast to much post-Keynesian writings on the subject – is neither reducible to the means to deal with another, but that nor is uncertainty separable from the circuit in any sense. Second, it is the presence of this irreducible leak from the system of flows that undermines the purely self-contained SFC universe.

I. ENTREPRENEURS AND CAPITALISM

Profit as the motivation for the circuit

We have so far discussed the need to understand the sequencing of economic activities as forming a necessary, logical circuit of monetary and real flows over time. It is the presence of this circuit, and therefore the structure of the economy it presupposes, that must determine our understanding of how the macroeconomy operates; indeed, it is fair to say that the circuit *is* the macroeconomy: it is the conditions of existence needed for the maintenance of economic activity by large numbers of disparate individual units over a sustained period of time.

No circuit exists (or can exist) in general equilibrium, as we have discussed in an earlier chapter (Foley 1975). The question of expectations and therefore of motivation, in this sense, does not exist in the same way: *entrepreneurship*, considered as the activity of commencing cycles of production, does not exist, since factors exchange at marginal productivities, technical change is exogenous, and (in equilibrium) a zero-profit condition holds. All existing economic problems are already resolved in the condition of equilibrium, with the proper concern of macroeconomics simply being the conditions under which the equilibrium is restored as efficaciously as possible, given exogenous disturbances.

SFC, very clearly, sits well outside this tradition. As we have seen, it presupposes a sequencing of economic activity, forming a logical process through time, with a definite beginning and a definite end. We have, so far, examined the conditions appearing at the *end* of that cycle: the conditions obtaining after production has occurred, flows of resources and money have occurred, and the balance of assets and liabilities across the economy is settled. This chapter turns to the condition of origins: how does the circuit begin?

In making this turn, it is clear that profits as such have a critical position. The motivation for commencing the *circuit* of capital, and the flows that it engenders, is the *expectation* on the part of entrepreneurs (as business managers) that the return will be greater than the initial money offering. There is no motivation to the circuit beyond this point: the entirety of the motivation for investment, in the aggregate, is captured by the expression M>M'. Understanding the flow of money engendered by the decisions to invest, on the part of entrepreneurs – here defined as those in possession of the motivation to invest, but not (necessarily) the finance – means then attempting to understand, at the most abstract level, this movement from M to M', and the conditions under which these can occur.

If, however, we are talking about the *forward-looking* behaviour of units within the economy, we are of necessity moving into a world of uncertainty. We have already seen, in the preceding two chapters, how uncertainty over conditions obtaining after production has occurred can impact directly on the conditions of circulation of money and real commodities. The disruption imposed by the presence of uncertainty on production, as a real factor impinging on the production of commodities and their eventual sale, has consequences that stretch from the decision to produce (and the production that occurs), into the behaviour of financial assets and ultimately to the monetary system.

Mechanisms for dealing with uncertainty are therefore central to the economy. As discussed, we here will follow the post-Keynesian lead in considering money as the principal social mechanism through which uncertainty is managed. This, however, begs the question of who (or what) performs this management. We closed the previous chapter with an introduction to the problems created by the need to raise initial financing to commence fresh circuits of accumulation; this chapter unpacks this question. Entrepreneurship, considered as the means to commence fresh circuits of capital flows, hinges precisely on the question of uncertainty and its management, in a world in which both production (and realisation) takes time, and the future is unknowable. It deals closely with Keynes' writings on the matter, for two reasons: first, the obvious and immense influence of Keynes on the development of macroeconomics in general, and SFC-type models in particular; second, where Keynes' own arguments concerning uncertainty, finance, and the provision of initial financing stumbled, or where holes emerged in his line of thinking, they provide an invaluable reference point for the clarification of the issues.

Entrepreneurs at the centre of Keynes' system

Keynes, at least post-*Treatise on Money* stressed this point. The hinge of Keynes' *General Theory* system is the entrepreneur: the bearer of the "animal spirits" needed to drive the system onwards. This is the exogenous factor in an otherwise closed, circular system: that with investment, through the multiplier, acting to determine savings, and savings, through credit, feeding back into investment, the economy would otherwise form an entirely closed loop. It is "animal spirits", irrational, psychological urges that compel entrepreneurs to act, that break the loop and introduce a necessary element of indeterminacy.

It is, however, worthwhile unpacking Keynes' concept. Keynes pictured the economy as fatally overwhelmed – however organised it may appear – by a fundamental, ontological uncertainty. It was in response to such uncertainty that "animal spirits" were required, since it is only by acting somewhat irrationally, on the basis of faith, or hunches about the future, that entrepreneurs could choose to invest over the long term, given the presence of this uncertainty. Investment, in other words, is ultimately determined by a kind of irrationality: while, for the most part, it takes places within the system, it is always subject to a certain indeterminacy because it relies on the decisions of entrepreneurs.

De Brunhoff (1976) has criticised Keynes for introducing an "irreducible psychological mechanism" through this device. Indeed, it is at precisely the hinge of Keynes' system – the determination of investment – that his system appears to be indeterminate. We have stepped outside the realm of economic analysis, and into the psychological: something that more recent work on behavioural economics, like Akerlof and Shiller (2009), has attempted to pursue, directly filling in the limited account of entrepreneurial agency in Keynes with insights drawn from psychological research and the emerging field of behavioural economics.

We have, in chapter 3, discussed the limitations of this approach – essentially an extension of an earlier paradigm, that of providing "microfoundations" to the macroeconomy, and flawed because of it. There is, however, an important recognition by Keynes that the decision to invest cannot be represented solely as a mechanical procedure, akin to that proposed in a standard "hydraulic" IS-LM reading of Keynes' system. Older Keynesian macromodels would represent the entire economy as a stable system of relationships between different variables of interest, in which indeterminacy (of any sort) was essentially banished. Econometric estimations of the behavioural parameters could be taken, and these parameters assumed to be stable. It was precisely this set of assumptions, concerning both the estimation of parameters, and their use in forecasting, that led to sharp criticism from the early 1970s onwards (Lucas 1976). The microfoundations research programme was precisely intended to overcome these failings, populating macro models with rational agents and devising the routes by which the deviations of the macroeconomy from general equilibrium behaviour could be explained by asymmetries in information and other, similar, market imperfections. A formal indeterminacy was introduced through the use of stochastic errors in decision variables, although this had limited effective bearing on the functioning of the model.

Probability in Keynes

As those in the post-Keynesian tradition have noted, peculiarity of this representation of uncertainty – in which it is, fundamentally, an additive "error" imposed on an otherwise deterministic system – is that it is a substantial distance from Keynes' own approach to uncertainty. Keynes offered a sharp distinction between risk, originally defined as a logical relationship between entities, and uncertainty, which emerges in his writing not only as the

product of our limited cognitive capacities, or restricted knowledge, but when the logical relation of probability does not exist, or cannot be expressed numerically. The first two are *epistemological* questions: a probability distribution could exist, somewhere, but we lack the processing power or the information to apprehend it fully. The latter is *ontological*: it is a feature of life itself that no consistent probability distribution can exist in some situations.

Whether Keynes stuck to his earlier definition of probability in his later writings is somewhat moot. The risk-uncertainty distinction, however, was repeatedly stressed by him as of absolutely fundamental importance to economics. As Keynes himself put it, in summarising the *General Theory*:

> "The sense in which I am using the term is that in which the prospect of European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever." (Keynes 1937)

Moreover, the critical intellectual development from the *Treatise* to the *General Theory* is the movement from an asocial, logical view of probability and decision-making, to the treatment of decision-making under uncertainty as *institutionally* defined: the conditions under which decisions can be made in an uncertain world are, by the General Theory, bound by a series of social structures – in particular, that of money, his definition of which acted as the anchor for the whole system. Irreducible uncertainty exists and is only weakly captured by money's separate functions.

Keynes, in Davis' interpretation, viewed uncertainty as both "epistemological and ontological" (Davis 2010: 37). The presence of ontological uncertainty produces a nonergodic economy – one that, as a first approximation, is not pulled back towards an equilibrium point, and whose observables will be nonstationary over a sufficiently long period of time. It is one that allows the space for the creation of radically new, unforeseen possibilities, in which "…the innovator creates new opportunities and new state of the world." (Dequech 2003) Investment is a process that in conditions of indeterminacy.

The "marginal efficiency of capital"

Keynes' own description of the critical determinant of investment, the "marginal efficiency of capital" (MEC) schedule, however, therefore contained a fundamental flaw. As against

what he took to be the prevailing "classical" view of investment demand, which viewed the efficiency of capital as the single-period rate of return to an asset, Keynes wished to show that the MEC was defined as the *expected* return for a given asset, for all future time periods: it is "equal to that rate of discount which would make the present value of the series of annuities given by the returns expected from the capital-asset during its life just equal to the marginal supply price" (Keynes 1936: 135). MEC, in other words, like the rest of his system, depended on a particular view of future returns, formed by entrepreneurs' expectations.

However, if we allow, as Keynes insists upon, that expectations are about a necessarily uncertain future, and that there is no strictly *rational* basis to the formation of those expectations, then the distribution of expectations, for any given set of entrepreneurs will not be clear. Broadly similar information about the future will be interpreted in broadly similar ways, and the mean of these distributions will shift in a manner consistent with changes in public information. In the presence of private information and – decisively – no rational means to apprehend an unknowable future, the distribution around that mean is unknown. Factors outside of an economic analysis – whether institutional biases or entrepreneurs' psychologies – will determine the location of any individual set of expectations within the whole distribution.

But if the distribution is unknown, the mean cannot be taken as an indicator of the course of investment *in the aggregate*. An aggregate MEC schedule drawn on the basis of this mean could very well not reflect true conditions for investment – either as the objective circumstances facing entrepreneurs, or their subjective anticipations of the future. Individual MEC schedules could vary substantially. Keynes therefore proposes, instead, that the "greatest of these marginal efficiencies can then be regarded as the marginal efficiency of capital in general" (1936: 135-136).

This removes the problem of the uncertain *distribution* of the MEC schedules for different assets by throwing out the distribution itself. On this basis, a single schedule can be presented for the economy as a whole. This is, however, unsatisfactory on two counts: first, the "greatest of these marginal efficiencies" could be a clear outlier relative to the rest, and determined by little more (in Keynes' heavily psychologistic theory) than the whim of a single entrepreneur; second, more fundamentally, it is the *distribution* of the expected returns that matter if entrepreneurs can construct investment portfolios with more than

one asset, since it is the relative, not absolute, rates of return that matter in creating such portfolio (Markowitz 1952). Keynes' attempted resolution is unsatisfactory.

Keynes and psychologism

Its failure stems from Keynes' original error in attempting to find a psychological grounding for behaviour in conditions of uncertainty of a fundamental character. It is this that, later in the *General Theory*, leads him to focus on entrepreneurs' "animal spirits", on one side, and the three separate demands for money on the other. The macroeconomy resolves itself to a fine balance between the spiritedness and the cowardice of a few individuals; while arguably in keeping with Keynes' wider views of society and morality (Skidelsky 1983), these divinations are, of best, of a necessarily speculative character. Revisions to Keynes original system pushed the centrality of uncertainty to one side, instead choosing to present the macroeconomy as a system of basically stable structural parameters (Hicks 1937; Samuelson 1948) this, in turn, left the neoclassical synthesis models vulnerable to the criticisms of Lucas and others as their failings became apparent from the early 1970s onwards.

There is, nonetheless, within Keynes' system a critical insight into economics in the presence of uncertainty. Where he errs is in attempting to present uncertainty as something like an unfortunate *individual affliction*, rather than a *social fact.* Keynes simply takes the institutions of developed capitalism as read, and then assumes back from them that the processes through which uncertainty is dealt with are principally the result of individual behaviour. Like later neoclassical economists, or the earlier "classical" school that the *General Theory* was intended to overthrow, Keynes is blind to the existence of capitalism as a society with its own history – even if he provides a more sophisticated account of its operations, and is alert to its recurrent problems.

His theoretical system depends on the management of behaviour by those deemed capable (if not willing) to make investments – the entrepreneurs. The problem of aggregate demand, although often (if erroneously) identified as Keynes' critical new insight, is of a second order, given its dependence on prior investment. Changes in the MEC schedule determine the dynamic of the system as a whole. Those changes are driven by entrepreneurs' expectations of returns, which in turn are mediated by the presence of money and finance, and depend on expectations of future demand. Government

intervention, then, is not simply about the management of that future demand, through taxation and spending decisions – important though this may be. It is, crucially, about the management of expectations, through its monetary and fiscal operations.

But by attempting to describe the operations of a capitalist economy without also providing an account of its specific institutional features, Keynes' analysis collapses too quickly into psychological explanations for its behaviour. Institutional blindness, and a deliberately ahistorical approach to the development of those institutions, leads to a psychologisation of economic issues. "Mass psychology", whose presumed processes are referred to on occasion by Keynes, is not an effective substitute for economic analysis.

This is De Brunhoff's "irreducible psychological element" within Keynes' *General Theory* reintroduced, similar to the problem of investment we discussed earlier. It casts a "shadow" (Brunhoff 1976: 41) over the whole, threatening the breakdown of the theoretical system – a point, at the heart of the structure, where economic analysis does not function. Marx, in this respect, is perhaps much stronger on the same question: although noting the possible psychological compulsions to hoard on the part of the hoarder – avarice or aesthetics – these motivations have "a single object and a single effect that completely exhaust them as psychological causes" (Brunhoff 1976: 41). The effective *function* of hoarding, in Marx, is to sustain the role of money as the universal equivalent. The effective function of liquidity preference in Keynes is to satisfy the urges of the hoarder. One is contained within the system under scrutiny. The other steps outside of analysis.

The underlying problem is two-fold. Keynes has correctly identified the uncertainty-hoarding relationship. But he has placed it outside of economic analysis: on one side, uncertainty is merely a natural feature of all societies, exhibiting no specific characteristics in any particular form of social organisation; on the other, responses to uncertainty depend, ultimately, on its psychological impacts. There is a hole in his theory where history and institutions should be, weakly substituted for in the form of entrepreneurs. Keynes, perhaps, identified some of the contradictions here, writing at the end of the *General Theory* of the need for a "socialisation of investment" as the means to ensure the autonomous supply of investment expenditure when "animal spirits" failed and the preference for liquidity overwhelmed all other considerations.

Keynesian and Schumpeterian entrepreneurship

The type of uncertainty Keynes holds as fundamental to economic activity was, as we have just seen, of a different order to that of the standard neoclassical world. It cannot be fitted into the standard neoclassical representation of an economy as a deterministic system (with a trend) subject to stochastic shocks. Instead, the economy emerges as a social process, with Keynes' description of entrepreneurs as effective *mediators* of this uncertainty, turning an unknowable future, by their decisions, into specific investments. This places him close to researchers in the Austrian tradition, most notably Joseph Schumpeter and Frank Knight. Schumpeter, akin to Keynes, posited the existence of a "circular flow" (Schumpeter and Opie 1934) that constituted the economy in its "pure" (essentially non-capitalist) form: the primary motivation of all activity is its ultimate consumption, and, with just two classes in society – workers and landlords – the whole economy is entirely stable, producing no surplus. What is consumed in one period flows (as money) into sustaining consumption in the next. This pre-capitalist conception of the economy allows Schumpeter to introduce the entrepreneur as the *disruptive* element within the otherwise stable flow, the entrepreneur functioning as the source of all dynamism and growth that marks capitalism out as a distinctive social system. Remove entrepreneurship - which was to be secured through a social, not economic, process - and capitalism decays back to a stable, even static, system (Schumpeter 1942). Schumpeter was more consistent in his treatment of entrepreneurship than Keynes; it was a social, ultimately non-economic process, and could not be so easily folded back into the economic analysis.

The problem here, as Paul Sweezy indicates in a brief review (Sweezy 1943), is that the stable circular flow is highly sensitive to initial conditions (Sweezy 1943: 95). In particular, the assumption that no distinct group has access to capital ensures that no surplus is produced and no drive to accumulate exists. Once a distinct group has a privileged access to and ownership of capital, the drive to accumulate is rapidly set in train, reinforced by social institutions conferring prestige and power on this group. By effectively writing capital (and capitalists) out of his economy, Schumpeter can comparatively easily show that it is entrepreneurs, as a disruptive element, that drive innovation and therefore the accumulation of a surplus, rather than (as Sweezy contends) accumulation that creates the need for innovation: innovation helps secure the accumulated surplus; provides an advantage to the original innovator, in competitive conditions, in the form of an increased surplus; and the capitalist who does *not* innovate will, conversely, be driven out of business. (Sweezy 1943: 95-6)

A “circular flow” of some form, then, is unavoidable given a monetary economy, for the fundamental insight (often associated with Keynes) that every sale implies a purchase, ex post – if not ex ante, as Say’s Law asserted but never properly demonstrated (Marx 1973: 201). Keynes added to this the identity, ex post, that sales must equate to investment. Where disagreements emerge is over how this circular flows moves from a stable, balanced economy to one (like the one we live in) that exhibits dynamism: the movement, in Marx’s useful designation, from simple reproduction to *expanded* reproduction. Marx certainly conceded that in pure consumption economy (with no accumulation), aggregate supply would equate aggregate demand: “Of the part of the revenue in one branch of production (which produces consumable commodities) which is consumed in the revenue of another branch of production, it can be said that the demand is equal to its own supply (in so far as production is kept in the right proportion). It is the same as if each branch itself consumed that part of its revenue.” (Marx 1969: 233) This is the equivalent to Schumpeter’s circular flow (Bellamy Foster 1983: 327).

Disruptions occur once growth is introduced, and it is the conditions under which this process of growth and development of a capitalist economy can occur that bring us closer to a theoretical understanding of capitalism as a whole. Understanding the process by which accumulation occurs is therefore necessary to understanding the dynamic of capitalism as such. Schumpeter provides one answer: that growth, ultimately, is a process that occurs beyond the boundaries of the economy as such, with investment determined by the actions of entrepreneurs who, in a fundamental sense, are a class apart from – indeed, often a class in opposition to – the conventional operations of the economy. Sweezy, basing his argument on Marx, argues the opposite case: that accumulation is a *social* process that compels innovation, as a side-effect of accumulation, rather than its necessary condition. The pace of accumulation in general would set the pace of innovation in particular – not, as in Schumpeter, the other way round. Schumpeter treats, as defining feature of capitalism, the presence of “equal access to bank capital”; whereas it is a defining feature of Marx’s analysis that capitalism is most manifest in the structure of its *unequal* access to resources.

This clear distinction, however, is never quite adduced by Keynes. His entrepreneurs matter to the system, providing the autonomous element of investment that is capable – given the possibility of permanent stagnation in a monetary economy – of restarting the process of accumulation and moving the economy back towards full employment. But this autonomy

is provided solely by their "animal spirits". By holding that all uncertainty is of a general character, inherent in all human societies, Keynes never provides the link back to the specific, capitalist function of entrepreneurs.

Knightian entrepreneurs

A more precise consideration of the function of entrepreneurship takes us back to the Austrian School. Both Schumpeter and Keynes offered descriptions of entrepreneurs as something like guardians of economic dynamism: carving new paths for development in a world that otherwise crawls into the future, beset by ignorance. In Schumpeter's telling, the activity of entrepreneurship, and the innovation undertaken by entrepreneurs, acquires a virtuous, even heroic quality; but it is Frank Knight's more sober account that is of interest here.

Knight (1921) proposed that the principle act of entrepreneurship was to act as the conduit by which an *uncertain* future acquired the rational characteristics of a *risky* future. The former is fundamentally unknowable, and beyond the immediate reach of rational forecast; the latter consists of future states of the world whose probabilities of occurring are, at least in principle, knowable and insurable. It is a movement from an outcome that *cannot* be priced, to one that merely *is not* and it is entrepreneurs who enable this operation to take place. They bear the initial burdens of uncertainty, taking on risks that cannot be rational hedged or insured against, and, by creating new markets, allow those risks to take on distinct, rational prices.

Knight distinguishes between three different forms of decision-making under uncertainty: a priori probability, in which probabilities can be known with certainty beforehand, as in rolling a fair dice; statistical probability, in which probabilities can be reasonably inferred from prior observation; and "estimates" – the radical uncertainty of unique events (Knight 1921: 224-5). The first two are quantifiable – one by definition, the other by inference. The third is beyond the reach of mathematics. Knight argues that if an individual cannot repeat an experiment indefinitely often, probabilities, defined as long-run frequency ratios, are essentially irrelevant to decision-making. There is no rational basis to assign probabilities to possible events.

The existence of Knightian "uncertainty" depends on a feature of conventional statistical inference, rather than a more fundamental feature of reality itself. This opens the way to

link both risk and uncertainty through the market process. A central argument in *Risk, Uncertainty and Profit* is to justify the existence of profit by reference to the ability of agents to bear uncertainty:

> "It is this true uncertainty which… gives the characteristic form of 'enterprise' to economic organization as a whole and accounts for the peculiar income of the entrepreneur" (Knight 1921: 232)

That is, risk can be found "objectively", by reference to the tools needed to apprehend an external reality – whether induction or inference, but essentially as if a repeatable experiment was being performed. It is therefore *insurable.* Uncertainty emerges as that category of risk that cannot be insured, and so is borne by entrepreneurs (LeRoy and Singell 1987). This implies a continuum from risk into uncertainty, mediated by the market:

> "Indeed, since, as we have noticed, entirely homogeneous classification of instances is practically never possible in dealing with statistical probability, it is clear that the divergence from it of this third type [estimates] where all classification is excluded is a matter of degree only. There are all gradations from a perfectly homogeneous group of life or fire hazards at one extreme to an absolutely unique exercise of judgment at the other…" (Knight 1921: 225-226)

Knight himself makes clear his essential indifference between whether a risk *cannot* be priced, or whether it merely *is not* (Foldes 1958: 250). Should the technical means become available to either improve our computational abilities, or to improve our knowledge of existing situations, then the distinction can be shaded away through the market process. The steady development of both the theoretical tools needed to price risks of various sorts, and the appearance of the computing power needed to do so on a very wide-scale, seemed to offer precisely the means to do this. Derivatives are held to break the (in practice weak) distinction between "risk" and "uncertainty", rendering the previously intractable and unforeseen in clear shades of cost and volatility (Wigan 2009).

But in Knight's framing of the problem the risk-uncertainty distinction is then left theoretically "redundant" (Foldes 1958). A sufficiently advanced market system would remove in practice an unnecessary theoretical distinction; in the meantime, the actions of entrepreneurs will deal with uncertainty. Probability, as such, is subjective: or, at the very least, agents will behave as if it is, adopting subjective rankings of outcomes by intuited likelihood.

It is in this sense that Mas-Colell et al., in a standard postgraduate textbook, claim the Knightian distinction between risk and uncertainty is "nullified" by subjective expected

utility theory (Mas-Colell, Whinston et al. 1995). The two approaches seem to end up in the same place. As Bewley suggests, "From the point of view of Bayesian theory, Knight's decision theory has no interesting consequences. According to Bayeisan theory, decision-makers act so as to maximise the expected value of their gain, irrespective of whether the fluctuations faced are risk or uncertain." (Bewley 2003: 80) Moreover, the progressivist implications of Knight's definition of uncertainty are strikingly similar to the assumption of the neoclassical school that refinement of their tools will lead to a greater ability to manage risks. It is no wonder that Knight's risk-uncertainty distinction has become "deeply ingrained" (Runde 1998: 539) within conventional economics: it does not challenge the neoclassical account so much as extend its reach.

Knight, unlike Keynes, does not attempt to analyse the motivations of the entrepreneurs. They merely have a function within the system; and, to the extent that this avoids the "psychological element" Keynes introduces, it is a stronger account. In particular, it draws attention to the existence not merely of a psychological motivation to challenge uncertainty, but to the existence of agents within the economy as conduits for the process by which uncertainty is tamed.

This is critical. What sits, in Keynes' account of entrepreneurship, as essentially a kind of psychological speculation becomes in Knight's account a functional relationship between different elements of the economy. Entrepreneurs exist as agents that transform uncertainty into risk, through the creation of prices and thence markets. To put this process back into the terms of the *General Theory*, Knightian entrepreneurs solve the problem posed by Keynes' marginal efficiency of capital curve, in that they take an uncertain future and by their own actions create a stable, known distribution of prices.

Entrepreneurs versus the hoards

It remains, however, in relation to a *monetary* economy, a flawed conception of the role of the entrepreneur. Within the flow of money through the economy, the crucial mediator for uncertainty is not the *positive* action of the entrepreneur in creating new paths of accumulation: rather, it is the *negative* presence of the monetary hoards. Uncertainty is inherent to a monetary economy based on competitive accumulation; the mechanism by which this uncertainty is dealt with is through the appearance of monetary hoards over time, held in multiple places and forms by a multiplicity of agents. There is no one

particular agency that exists with a unique ability to mediate and translate uncertainty into certain – to generate the investment decisions that turn an unknowable future into a known present – but rather any agent capable of acting with money inside a monetary economy must act against uncertainty.

We have introduced elements of this *negative* specification before, in the discussion of Keynes' "financial motive". Each individual decision to invest, as Keynes conceded in debates subsequent to the publication of the *General Theory*, requires a *prior* mobilisation of monetary resources, since the funding for investment must logically be made available before the investment is paid for. In the neoclassical description of the macoroeconomy, this presents no great difficulty: the funding emerges simply from the presence of prior savings, allowing Say's Law to once again hold and for $S=I$ to appear ex ante. Keynes never conceded this much, sticking – correctly – to the ex post redefinition of the savings-investment identity. But this leaves open the question of where these prior money holdings emerge from: how can would-be entrepreneurs mobilise the resources needed to invest, ahead of the additional savings derived from investment being made available?

The answer lies precisely in the prior mobilisation of *monetary*, rather than *real* resources. The neoclassical paradigm misses this, or at least confuses a strictly monetary problem for a problem of real resources. But we can see here that money is principally mobilised in the form of its hoarding – that is to say, it is the *demobilisation* of money as a circulating element that then provides the basis for the mobilisation of real resources. The original form of the hoards, existing prior to the act of accumulation, provides the monetary resources for accumulation. But this is exactly to deprive the entrepreneur of their (Schumpeterian) agency: it is not the action of the heroic individual (or, perhaps, organisation, in his later formulations (Schumpeter 1942)), but the presence of the prior hoards that needs to be explained. Entrepreneurs are epiphenomenal: they are agents within a process, not causal factors of accumulation themselves.

This is a vital point, since it indicates one of the points in which Keynes' argument about money hoarding and its relationship to the fundamental savings-investment equation is at its shakiest. The problems he had in overcoming these weaknesses were brought in debates subsequent to the publication of the General Theory. They were not (as the next section seeks to show) adequately resolved by him at the time, and nor by those in writing in a post-Keynesian tradition afterwards. Resolving these conceptual problems requires us

to deepen our understanding of money itself, the circuits of monetary flows, and their relationship to uncertainty.

II. THE FINANCIAL DEMAND FOR MONEY

The stock of money and the financial motive

Keynes' attempts to resolve the contradictions noted above started by assuming in the *General Theory* that the stock of money is set exogenously, effectively under the control of the central bank. This removed from his model the need to describe the creation of money, and therefore also the need to provide a description of the formation of interest rates. Money simply existed, and the money interest rate fell "naturally" from this supply, in relation to the demand for liquidity given rates of return elsewhere.

The weakness in the whole conception, however, was soon set upon by his critics shortly after publication. Ohlin and Robertson, writing in the *Economics Journal*, defended the then-prevailing, orthodox theory of interest as the reward for abstinence from present consumption – that is, as the result of savings behaviour only. Equilibrium interest rates would appear where this propensity to save was balanced by the productivity of capital needed to reward savings. Keynes, contrary to this, held that savings were created from investment, the two being identical ex post and with income and the multiplier effects supplying the necessary adjustment from one to other. Interest rates fell out of liquidity preference, not time preference, and liquidity preference, as above, had a particular structure.

His more orthodox critics countered that, first, Keynes had overplayed the relationship between savings and investment, which existed merely as an accounting identity rather than a behavioural relationship, and, second, that he had unnecessarily confused matters by drawing a distinction between money holdings and savings where no such distinction could be shown to exit. (Ohlin 1937a: 435) proposed that a distinction could be drawn between net and gross credit supply and demand, with credit demand determined by the desire to invest and the supply of gross credit including claims other than money holdings alone. Both would have the same result: that savings and investment would be closely related to the demand for interest, and that "the rate of interest is simply the price of credit." (Ohlin 1937a: 221)

But this was a flawed model. The *stock* of money was to be entered here, in the gross supply of credit, alongside the *flow* of demand and supply of new credit for investment. Keynes had opened the door to the Ohlin critique precisely because he had committed the same category error, introducing an exogenous stock of money into a system that rested on flows of credit demand and supply over time without specifying the mechanism by which one was transformed into the other. The money stock was elided, through Ohlin, into an apparent flow of funds, when Kenyes had originally (and quite correctly) attempted to draw an analytical distinction between the two. In his 1937 reply to Ohlin and Robertson, he (partially) corrected himself. Accepting Ohlin's point that planned investment could affect interest rates, he instead offered an alternative mechanism that made explicit the relationship between the stock and the flow. Keynes suggested that planned investment required the mobilisation of money to spend ahead of the investment being completed and producing a monetary return. This mobilisation of funding was withdrawn from the stock of money balances and then used for investment expenditure. A demand for investment could give rise to a demand for cash, and therefore to changes in the rate of interest via the financial system which mobilised the necessary funds.

> "Planned investment – ie investment *ex ante* - may have to secure its 'financial provision' *before* the investment takes place; that is to say, before the corresponding saving has taken place… There has, therefore, to be a technique to bridge this gap between the time when the *decision* to invest is taken and the time when the correlative investment and saving actually occurs." (Keynes 1937a: 246)

Money is required ex ante for planned investment, ahead of the actual mobilisation of funds for investment, and this requirement can exist without any necessary link back to savings. Note that this is a more complex point than it may first appear: given Keynes' twin arguments, presented above, that interest rates determine the volume of investment in the future, and that interest rates are themselves determined by the volume of loanable funds available, a significant breach may have been opened here. If funds are mobilised prior to planned investment occurring, at what rate of interest should they be offered? Keynes introduced the "financial motive" as a challenge to the neoclassical theory of interest where the rate of interest is determined by "the supply of new *credit* due to ex-ante saving and the demand for it arising out of ex-ante investment." (Keynes 1937b: 663, with emphasis added) The financial motive reverses this, positing an ex ante demand for funds for investment ahead of the ex post existence of savings needed to finance them. It is a demand for money that is quite distinct from savings as such.

Keynes introduced the financial motive as an answer to those of his critics who suggested that the distinction he wished to draw between loanable funds and liquidity preference essentially did not matter for the determination of interest rates, and that the demand and supply of *credit* alone would determine the interest rate. Markets would clear to balance savings and investment, ex ante, leaving money with no meaningful role in the determination of interest rates, which would instead be settled by the supply of credit and the demand for investment funding in the form of loanable funds. Keynes, as challenged by Ohlin (1937a) and Robertson (1937), was logically inconsistent in his original treatment of interest. Were the demand for investment to increase, Keynes suggests that it would affect the interest rate only ex post and only indirectly through a resulting increase in income, which would in turn lead to increased demand for money balances. The criticism of this position noted that, if true, this would leave ex ante desired investment and savings unequal, and therefore the rate of interest indeterminate. The neoclassical theory determines the system by allowing interest rates to move in response to increased demand for investment, ex ante, rather than income moving, ex post.

Keynes' rejoinder, an extension of his general critique of Say's Law, introduces a distinction in the funding of investment between the ex ante demand for funds, taking place prior to its commencement, and the ex post arrival of those funds as savings that equate to investments once investment has taken place. By introducing this additional source of demand for money, the difficulty of interest rate indeterminacy is resolved – the financial motive uses up the slack in the system, as it were, sucking in otherwise idle funds and therefore leaving the interest rate unchanged. Shifts in the propensity to invest would still result, in the first instance, in ex post shifts in income, leaving ex ante rates unchanged.

The financial motive challenged

This financial motive was subsequently largely neglected by researchers. The IS-LM framework that became standard post-war had little need for it, translating Keynes' work into a static environment and treating interest rates and income as determined simultaneously. One of the few economists to pick up on Keynes' notes, (Davidson 1965), fits the financial motive into a standard IS-LM diagram of the macroeconomy, claiming that this comparative static approach allows the reconciliation of liquidity preference and loanable funds theories of the interest rate. The two, distinct, claims about the demand for

money (and hence the formation of the rate of interest) can be brought together by the financial motive since it implies that, if subject to an autonomous shock, both IS and LM curves will move together. An autonomous increase in planned investment expenditure, in the conventional IS-LM case, causes the IS curve to shift outwards. In Davidson's interpretation of the financial motive, however, this autonomous shift in planned investment also induces an increase in the demand for money, since investing firms need cash advanced before they can invest. The resultant shift in the LM curve causes interest rates to fall back down again, with the entire effect dependent on the relative elasticities of the two curves.

This interpretation has, however, been sharply criticised by Bibow (1995). Bibow argues, convincingly, that Davidson mistakes the disequilibrium concept of the financial motive for an equilibrium addition to the demand for money. Rather than creating a permanent additional demand for money at any given level of output, it is clear in Keynes' description that the financial motive is only a *temporary* additional demand, present due to the temporary absence of immediately available cash for planned investment. In equilibrium, with planned investment equating to realised expenditure, as applies in the IS-LM system, this additional financing demand for money cannot exist.

Bibow's alternative is, however, not more convincing. He argues that the financial motivation should, at best, be considered merely a subset of the more familiar transactions demand for money. The transactions motive for holding money balances arises, in Keynes' *General Theory* description, from the failure of synchronisation between receipts and expenditure. Money is needed to bridge the gap between the two across time, which is asserted to be brief in any case. In his earlier *Treatise on Money*, he had provided more detail, noting the presence of money held in different forms, holding different velocities, for different kinds of transactions. There is, on the *Treatise* basis, a distinction between the aggregate income-velocity of money, and the velocities of circulation for money in particular uses. Drawing on this distinction, Bibow argues that the financial demand for money, as presented by Keynes in his 1937 note, is merely an extension of the *Treatise* distinction between money demands in different transactions, rather than a distinctive element in his whole system.

Asimakopolus (1983) claims further that Keynes' description of the financial motive and the "revolving fund of finance" is in error, since it does not account for the multiplier effects of investment occurring over an extended time period the investment has been made. By

implicitly assuming (Asimakopolus claims) that multiplier effects are immediate, Keynes can maintain that savings and investments are ex ante independent of each other. Funds mobilised for investment are returned immediately in the form of returns from the investment, with the economy achieving an equilibrium position in the short-run at which planned investment and savings coincide ex post. The initial liquidity position is restored. However, if in reality these returns from investment are only realised over a longer time period, it should be clear that savings and investments can differ ex post, with Asimakopolus supplying a number of plausible examples (228); and that, moreover, the ability of firms to finance investment ex ante could be constrained by the availability of savings ex ante, since the funds may not then be available to make return the financing made available. In both cases, Keynes would be mistaken to both reject the identity of ex ante savings and investments, and to insist upon their ex post equality.

Keynes' error here was to assume that while investment is staggered over time, financial returns to investment arrive in very short order: at the end of a production period, in both cases. This leads to (as Asimakopolus suggests) a mistaken, if largely implicit, conclusion that the term structure of interest rates are unchanged by investment decisions (Asimakopolus 1983: 226). Keynes, clarifying his original 1937 article, holds that the rate of interest for ex ante investment is determined by the "*current* stock of money and the *current* state of liquidity preferences", leaving long-term rates (also deemed relevant by Keynes to investment decisions) undetermined and implicitly unchanged by ex ante investment. (Keynes 1937c: 665)

Asimakopolus (1991:110) further holds Keynes' failure at this point in the argument to be another example of the wider confusion in the *General Theory* between an identity between savings and investment, and an equilibrium relationship between the two. Keynes wishes to show that savings and investment are identity only, with the balance between the two holding at any rate of interest, and therefore with interest rates determined only indirectly from the savings-investment relationship.

Financial motive and uncertainty

The apparent error can, however, be corrected if we make use of the earlier discussion concerning the role of uncertainty in Keynes' *General Theory* system. Keynes clearly intended the financial motive to act as something akin to the transactions motive, since

both are necessary positive balances of money being held to meet payments due, as Bibow (1995) also suggests. But Bibow underplays the distinction between the two, which is pronounced once we allow for the presence of uncertain returns over time. The transactions motive is an equilibrium concept, and will be stable when the economy is in equilibrium. The financial motive, on the other hand, applies only to *disequilibrium* situations, away from a presumed stable point, and it appears only temporarily as the planned expenditure of firms and entrepreneurs on investment outstrips their immediately available cash balances. The financial motive can only appear immediately related to the transactions motive if we err, as Keynes did in his original presentation, in assuming that money returns from investment are available more or less immediately.

If, more realistically, we allow these returns to appear only over time, the distinction between financial and transactions demands becomes sharper still; in addition, it becomes obvious that some relationship to the term structure of interest rates will appear. It is precisely because returns from past investment will arrive at different intervals, and with some uncertainty attached, that cash balances held at different points in time cannot be considered perfect substitutes for each other over time, quite apart from any time preferences the investor may hold. The presence of "lumpy" returns to investments, each having different prior requirements, places a premium on those returns arriving soon with high certainty relative to those arriving further away with greater uncertainty. That much is reflected, in the usual fashion, in their risk-weighted net present value of their future returns.

But since each anticipated return requires a prior mobilisation of finance to meet payments, there is an implied relative price that exists for the cash demanded for each future return at each point in time previously. Cash held at any given point in time prior to the investment being made and producing a return cannot be perfectly substituted for cash held at any other point, even with unhindered access to a perfect credit market, since the returns the particular cash balance is needed for in the future are uncertain. Real cash balances must be held at any given point in time to cope with this, creating a demand for money of a type distinct from the others.

The presence of uncertainty of returns therefore pushes the financial motive for holding money away from something akin to the transactions motive – in which money balances can be perfectly substituted for any particular transaction - to something far closer to the

speculative demand for money, in which the presence of future uncertainty has a direct impact on the need for balances held today.

Alternatively, we can consider the case in which uncertainty over timings and returns does not exist, and all income streams from all investments are known with certainty into the future. In this case, there would be little need for investors to demand cash to meet immediate payments for investment: they could, for example, write their own promissory notes, which would (under certainty) be virtually as good as cash and offer the prospect of a rate of interest to soak up the limited remaining principal-agent risks, such as malfeasance by the investor. It is uncertainty that makes those selling products to the investor demand cash, rather than credit, and hence create the demand for money balances that Keynes introduced.

The relevance of the financial demand for money, as developed by later researchers in the post-Keynesian tradition, is that it attempts to reconcile the presence of money as an autonomous feature of economic life – specifically, here, as something which can form hoards – and the savings-investment relationship. The decisive element is in the relationship, as Asimikopolus and others have suggested, between uncertainty, and time. The presence of time creates a properly dynamic economy, in which the sequencing of actions matters; the presence of uncertainty creates the distinction between real savings and monetary hoards. The financial motive is Keynes' (only partially successful) attempt to coherently reconcile all three.

Circuitists and the financial motive

This alternative approach, introducing sequencing to the broadly post-Keynesian approach taken above, in which the financial motive, ultimately, can be thought of as a form of monetary demand brings us close to the circuitist school. Graziani (1998) and Rochon (1997) are amongst those arguing that the financial motive is fundamentally incompatible with Keynes' liquidity preference theory (Tymoigne 2004: 1). Critically, once the sequencing of investment is properly introduced to the model, the standard post-Keynesian interpretation, in which the financial motive is a subset of the transactions motive that appears only when the economy is growing (Chick 1983: 199), is not correct: the financial motive appears under *all* conditions in which investments must be financed, even when the economy is, in the aggregate, not growing. Graziani and others argue that the advance of

funds is not automatic, and may be constrained by the financial system; the existence of Keynes' "revolving fund of finance" is not sufficient to ensure that firms are independent of the financial system, since the credit received by investing firms from banks must be used to repay these initial loans. That means, then, that the revolving fund of finance laid aside to fund investment requires continual topping up from the credit system, irrespective of the rate of economic growth in the aggregate (Graziani 1985; Tymoigne 2004). Since income is generated by the spending of finance, including this initial injection of finance required to start the cycle of accumulation, it is finance that generates the income that sustains savings – and not the other way round. Investment is not constrained by savings, but may be constrained by access to finance, and the financial motive has very little to do with the transactions motive, since it features as an independent element within the system. The finance motive therefore does not only determine the rate of interest. It also acts to determine the distribution of income, since it relates directly to the provision of financing for sustained investment. A clear, conceptual distinction is introduced (where it is only, at most, implicit, in standard SFC models) between the market for *money* as the initial financing needed for investment, and the market for *finance* as the method to clear balances at the end of the period.

It is on this basis that circuitists argue that the financial motive removes the basis for Keynes' liquidity preference theory, implying a horizontal supply of money (Moore 1988) and that policy alone sets interest rates. Because the financial motive ensures that investment creates future savings, it cannot be the case (they argue) that the demand for money has an impact on the supply-price of loanable funds – the interest rate. Combined with Keynes' post-*General Theory* statements on the role of overdrafts in meeting the demand for funds, an entirely endogenous money supply is posited (Wray 2006: 8).

This, however, can only hold if the timing (rather than the sequencing) of the moments in the circuit are themselves fixed. As we have argued, the sequencing of the transitional points within the circuit is definitional: given the existence of ownership of assets, and the existence of money, it is necessarily the case that the process of production follows the sequencing indicated. But the precise intervals of these sequences are not fixed relative to wider time, and nor is the decision to initiate – or, crucially, fail to initiate – a sequence at any given point in time.

Circular flows and the paradox of profits

Stock flow consistent modelling embodies this principle directly. In the textbook example, "It is a very important part of our story that firms initiate production, that the production process takes time, and therefore that firms need finance in advance of receiving anything from sales." (Godley and Lavoie 2007: 251). This generates a "systemic need" (Godley 2004b: 127) for finance, and it is finance that appears at the start of the circuit, initiating the sequence. Firms are then assumed to be price-makers, setting production levels in the expectation that with an appropriate price they will make some target profit level. Working backwards, this means that firms' expectations of profits feed directly back into their demands for initial finance. It is banks that are assumed to supply that initial finance in its entirety, in the form of loans of credit money.

Production is modelled as the production period during which loans are acquired by firms, production occurs, resulting in an increase in stocks held by firms, and then sales are made, resulting the reduction of stocks by firms. Inventories, stocks of unsold goods, will be held over time to the extent that forecasting errors are made by firms: of expectations of greater demand than, in fact, existed. The economy, instead of being an equilibrium mechanism in which time is a matter of indifference (or a mere source of stochastic, additive error against the underlying mechanisms), is being treated as regular, sequential process during which economic activity takes place, each part of that activity forming a necessary connection with the others.

This conception of the economy as a *circuit* is not new, of course. François Quesnay was arguably the first researcher to adopt this approach in his *Tableau Economique* of 1758, but the classical school was in general well aware of the issues involved (Ricardo 1821; Marx and Engels 1967; Gnos 2006) It was with the "marginalist revolution" of the 1860s onwards that such concerns were buried behind the techniques of marginal analysis and equilibrium theorising upon comparative statics.

Nonetheless, this subterranean tradition has been brought back to the surface in recent years. Deriving from the "underground" (Graziani (1982) quoted in Realfonzo (2006)) of scholars like Wicksell, Schumpeter and Keynes, the "circuitists" have attempted to lay bare the sequence by which an abstract, but recognisably capitalist, can produce and stably reproduce itself. Their starting point, like the three named, has been to identify the provision of financing to firms as the necessary catalyst for activity in a monetary economy

where production takes place over time and in competitive conditions, implying uncertainty of outcomes (Renaud 2000: 286-7). Once finance is provided, the key task of the theorist is to consistently trace its circulation through the economy, this circulation providing the basis of the analysis – in pronounced contrast to the equilibrium theorising of the neoclassicists.

Graziani, a leading light in the Italian circuitist school, has perhaps best articulated the logic behind this choice of starting point. He argues, convincingly, that in an economy with pure credit money,

> "…any monetary payment must therefore be a triangular transaction, involving at least three agents, the payer, the payee, and the bank... Since in a monetary economy money payments go necessarily through a third agent, the third agent being one that specialises in the activity of producing means of payment (in modern times a bank), banks and firms must be considered as two distinct kinds of agents." (Graziani 1995: 518–519)

Of course, this would only apply in an economy with *solely* a credit form of money. It is the credit form of money, coming into existence inside the banking system with its loan mirror-image, that ensures both its circular path through the economy, and the necessity of a "third agent" (usual a bank) that can settle payments for agents elsewhere. Money is wholly endogenous, in this, world: it cannot come into existence except through its creation in banks,[11] and production is, in this sense, a process of debt creation (Seccarecia 1988: 51), and money is credit-driven and demand-determined (Moore 1988).

We will return to the applicability, or otherwise, of this particular conception of money. For now, we will simply note that if a credit theory of money is accepted, banks must exist and money must flow ultimately in a circular path: from its source, through the economy from account to account, and then back to its source in the banking system, clearing the loan that was created alongside it. The length of this circuit is indeterminate, given a planless, competitive economy; it must, nonetheless, exist if money takes this form – and, for the circuitists as for others in a broadly post-Keynesian analytical frame, it only ever takes this form in modern times.

[11] This differentiates the circuitist treatment of endogenous money from the neo-chartalists, but for our immediate purposes the difference between an endogenous money created to fund investment, and an endogenous money created to fund taxes is immaterial. For more on comparisons between the two, see Lavoie, M. (2011). The monetary and fiscal nexus of neo-chartalism: A friendly critical look. Ottawa, University of Ottawa.

Having the established the necessity of an intermediary agent (usually a bank), the general form of the circuitist model is to argue that firms approach the bank for a loan. Firms initially are assumed to have no monetary resources with which to make payments for employment, as a direct consequence of money existing as a property of the system of credit. They therefore have no choice but to turn to the bank (or banks) for a loan. This loan is invested, with payments made for the necessary means of production. Production commences, and the loan is repaid, with interest, to its originating bank, thus destroying both the loan and the money. The investment is made (in the simplest model) in labour, which receives payments in the form of wages. A sharp distinction is therefore made, drawn from Keynes, between initial financing of production (Keynes' financial motive for holding money) and the final financing of output (Graziani 1987). The ability of the firms (having obtained the loan) to command the means of payment allows them to determine the scale of their operations, thus determining employment, on the basis of expected demand, and to determine their scope – whether investment flows to capital or consumption goods. Households then determine the volume of their saving, out of the income received, but, since the volume of goods available is determined by the decisions of the firm, this decision will affect purely the price of commodities (and therefore the real wage) only. Both consumption expenditure, and the decision to save through the purchase of securities entail the return of money back to firms, enabling them to repay their debts.

This is where the initial versus final finance distinction matters: while initial finance is obtained with certainty by firms, who approach banks and receive credit money from them to fund their investments, final finance returns to firms dependent on decisions made by households, independently of the firms' wishes. If households save in firm financing (bonds or equity), this money returns to the firms; if, however, they hold their savings as deposits, a gap will appear between initial and final financing, with this gap dependent on the households' liquidity preference. There is thus a distinction to be drawn between the "money market", supplying initial finance from banks to firms, and the "financial market", supplying finance from households back to firms.

The singular difficulty identified by many, however, is that it is unclear how, given this set up, it is possible for positive profits to be earned. All units in the economy earn only what was paid to them. Labour, receiving wages, can spend only what it has to hand. But since firms must repay the original loaned money with interest, it is not clear how they can earn positive profits in a credit money economy – or, as Rochon put it, using Marx's terminology,

"How can M be transformed into M+?" (Rochon 2005: 125). Zazzaro framed this "paradox of profits" succinctly:

> "…if in an economic system (closed to external exchange) the only money existing is what the banks create in financing production, the amount of money that firms may hope to recover by selling their products is at the most equal to the amount by which they have been financed by banks. Therefore, once the principal has been repaid to banks, the possibility that firms as a whole can realise their profits in money terms or can pay interest owed to banks in money terms is ruled out" (Zazzaro 2003: 233)

Even if households have no net savings, spending all their income on consumption goods, and thus ensuring initial finance and final finance equate, firms will still need to pay interest. The money advanced, however, to cover production in a whole period is only sufficient to cover production in that period – temporary forms of credit, like trade credit, are advanced only *within* the period and are not relevant to the problem of where profits arise from (Nell 2002: 519). It is, as Schumpeter (1934: 189) noted, "impossible with a given sum of money to obtain a greater money sum".

Solutions to the paradox within the circuitist literature have been proposed at various points. But as (Nell 2002: 520) suggests too many of these rely on "outside assistance": that is, rather than showing how a solution can be found within the circuit itself, at the highest level of abstraction, additional factors are brought in to play. Breaching the banks' assumed monopoly on money creation, for instance, allows the circulation of fiat money, created directly by government (Renaud 2000: 291), but this imposes a dubious reliance of the systems' liquidity on the benign, interventionist presence of government. Even if this were *theoretically* accepted, as is well-known from assorted monetarist experiments in the 1980s, the actual capacity of government to intervene successfully in this way is limited in the extreme. Running a surplus on the current account, in an open economy model, would perform a similar trick; as long as some sector, other than that of the firms, runs a net financial deficit, the problem of profits can be solved.

The "external funding" solution is an old one: Rosa Luxemburg's classic *Accumulation of Capital*, and particularly her later *Anti-Critique* (Luxemburg, Tarbuck et al. 1973; Luxemburg 2003), develops a theory of general capitalist decline based precisely on the need for external financing to ensure profits can be earned by those holding capital, which she identified with non-capitalist areas of accumulation. The problem, in all cases, is that the resolution to the issue of financing depends on external intervention, which, in

Luxemburg's case, "proved" the eventual breakdown and descent of capitalism into crisis, as non-capitalist zones disappeared; leaving such speculation aside, the solution to the problem is unsatisfactory at the level of theory precisely because the supposed generality of the theory, in positing the circuit of capital as a general theory of capitalist accumulation, is destroyed.

Alternatively, "overlapping" periods of production could exist. Messori and Zazzaro (2005) propose a model in which economic growth determines that some firms expire, failing to repay their debts on bankruptcy, while others, just starting, make no positive profits in their first years. This has the consequence of making the circuit solvable only through the creation of *additional* circuits: it cannot be sustained by itself. All of these proposed solutions, however, have the character of "resolving" the paradox caused by the monetary circuit only by introducing elements basically extraneous to that circuit. Like the neoclassical "solutions" to the Cambridge critique, they resolve the problem only by stepping away from it, introducing additional assumptions and breaching the presumed generality of the model.

The "paradox of profits" is not resolved by the introduction of a capital goods sector alone, producing capital goods through some combination of labour and capital, with its outputs also used in the consumer sector. In this case, profits in the consumer goods sector do not present a problem, since this sector also receives the payments from workers in the capital goods sector. There is a direct flow from the capital goods sector back to the consumer goods sector which ensures the monetisation of profits made there. However, if profits made in the consumer goods sector are used to purchase capital goods, those in the capital goods sector can (at most) only recover their costs. The payments for capital goods from the consumer goods sector are not fully monetised by payments then made to workers in the capital goods sector, since the capital goods sector must also consume capital goods from the flows of payments it receives. Firms in the capital goods sector will make (at most) zero profits, an unsatisfactory conclusion.

Allowing credit creation to completely fund capital goods expenditure (Rochon 2005) does not properly resolve the dilemma, since the extent of the credit financing implied is excessive. With the (credit) money supply as M, total wages as W and investment spending (entirely determined by firms) as I, we have:

$$\Delta M = W + I = C + I$$

This will hold without complications for as long as households either do not save, or save entirely through the purchase of firms' securities (bonds and equities). Should households have any positive liquidity preference, however, they will hold some of their savings as deposits in the banking system, implying that, with consumption C less than the total amount received by households, W:

$$\Delta M = W + I > C + I$$

In other words, the implication is that the creation of money is greater than nominal income. Once again we discover an "excess" of money creation, relative to demands for means of payment.

Moreover, as Nell (2002: 526) indicates, there is an inconsistency implied in the logic. With loans received by all firms, and spent on either wages (to households) or capital goods (to the capital goods sector), at least some of the firms spending loans will be capital goods producers themselves, consuming the product of their own sector alongside spending money on wages, W. If that is the case, the realisation of some profits by the capital goods sector will depend on revenues received from within the capital goods sector – a circuit of realisation that is distinct from the rest of the model, when cross-sectoral earnings allow the realisation of profits. This implies, in turn, that as production commences and sales are made, firms in the consumer goods sector will have earnings on hand to purchase capital goods, whilst those in the capital goods sector will not need to borrow money to finance their own purchases: revenues, both from the consumer goods and from the capital goods sectors, will be arriving to enable finance. But then, as Nell asks, "Loans, however, are expensive and revenue is coming in anyway. Why borrow and pay interest on loans that are not needed?" (ibid.: 526) The paradox is seemingly resolved only at the expense of internal consistency and economic logic.

The paradox in SFC and the issue of uncertainty

The decisive point throughout all this is the necessary presence of initial financing. By construction, this initial financing must be enough to finance the *whole* of the subsequent circuit. But it needs also to be sufficient as to provide for a level of profits capable of sustaining levels of interest and debt repayments, given the assumption of loan financing. The paradox, then, concerns the status of the circuit of production at the *start* of its period; SFC, as we have discussed, is concerned in particular with the status of the circuit at its *end*. The two approaches can be reconciled, as suggested by (Jespersen 2009).

Zezza (2012) has proposed the use of an SFC-type framework to allow the resolution of the paradox through the explicit identification of interest payments and loan repayments as profits to the banking sector, which then *spends* these incomes received, enabling further realisation of profits elsewhere in the economy to take place. This appears to be a realistic solution to the problem, and one that does not depend on shifting the parameters of the problem too greatly. It is clearly inconsistent to treat interest payments, made in money, as being distinct from the generality of the circular flow of money; it is not the case that interest payments made to a banking sector by the non-financial sector simply disappear: in a market economy, with banks can be presumed to wish to maximise profits, interest payments received would constitute the immediate form of revenue; there would be little reason, otherwise, for banks to wish to offer loans, if not in anticipation of receiving the loan, plus interest, in return. Banks place a "bet", through firms' investments, on the levels of effective demand that will prevail at the end of the period, given events at the start.

This is, however, precisely where the difficulty emerges: the bet placed by the banks at the start of the period, in expectation of the eventual return, is dependent on both the *production* of commodities (even if these take the form of services, rather than physical goods) and the *realisation* of their value in sale. These are distinct operations, against which the bank must adjudge both to come good. The entrepreneur seeking the investment must make a similar calculation; in both cases the presence of uncertainty mediates the decision. The investment, if made, presupposes a movement from an uncertain future, into a certain present, containing the products of the investment at the end of the period. There is, then, a relationship between the initial financing and the final financial status that is mediated by uncertainty: the link is exactly the movement from a certain stock of funding towards an uncertain return. It is the firm that, as an institution, mediates this uncertainty: the transition is only possible, in a production economy, because

the firm has committed some value of funding to the investment, producing commodities, and then offering them for sale.

We have encountered this mediation before, in the form of the Godley-Lavoie treatment of inventories. But we noted that this was an unsuccessful attempt at mediation precisely because it abstracted from the full conditions of uncertainty that confront any entrepreneur, acting through a firm, ahead of any investment. This introduced an asymmetry in the treatment of inventories, since they appeared as a legacy of past failure, but were also held as the means of hedging against future uncertainty. They were, in other words, acting something like an inadequate substitute for holdings of money, with firms (in the Godley-Lavoie model) holding no positive money balances themselves: merely a stock of acquired loans and continual flows of financing. Clearly, inventories will be held by firms for precisely the reason Godley and Lavoie describe; but to correctly understand their role in decisionmaking by entrepreneurs, we must think about them in properly monetary (that is, current value) terms as one of several hedges against the future that a firm can maintain: the other being, of course, its own holdings of money. As we have shown in previous chapters, the desire of firms to maintain any hedge against the future in the form of inventories, or to maintain a positive level of capital investment implies the requirement for total financing ahead of the current demand for financing.

This is, of course, exactly the "financial motive" that the circuitist school focus on, and that has been under discussion in this chapter. The point we wish to stress, however, is that the finance is not just that required for initial financing: any scale of operations beyond the pure employment of labour (with any positive level of inventories, or any amount of capital invested) will lead to a surplus requirement for monetary financing at the start of the circuit, as a direct result of uncertainty prevailing throughout the whole circuit and the firms' rational response to it. Firms, in this sense, mediate the uncertainty of investment by also maintaining holdings of money. The propensity to hoard, and to withdraw money from the circulation through which otherwise flow, exists for firms.

Banks, as providers of the initial credit, expect to receive a monetary return on the credit money offered, M'>M. But this return will be affected by the uncertainty that prevails: they may judge any given proposal for a loan more or less risky, and choose to make the loan on that basis by their own standards; but from the point of view of the circuit, given – if the

funding is provided – that a circuit *must*, as a consequence, come into existence, it is the *firm* that takes direct responsibility for the uncertainty that prevails *within* the circuit. There are two different categories of decision being made: one is to commence a circuit, and if banks provide initial finance this must reside with them; the other is to hedge against uncertainty once a circuit has begun by holding money back from circulation. Money is held back precisely because it is, as we have discussed, the ideal social form in which the uncertainty that prevails a competitive, unplanned economy can be dealt with. The provision of financing by banks, then, will in general *exceed* the returns that might be immediately anticipated by the banks, given the scale of realisation.

The whole economy, in this sense, will need to be "over-monetised" by banks seeking to compensate, as the originators of the credit-money, for the desire of firms to withdraw money from circulation, as their own hedge against the future; and if money is withdrawn from circulation, it will not be realised in any sense. The bank will not earn a return on this portion of the money that is offered. It is in this sense that banks must have an incentive to attempt to *over-fund* firms, relative to an expected return; and, furthermore, to seek more efficient means by which they can earn any given level of return. This over-financing would, of course, ensure that the paradox of profits did not exist: if banks continually provide an *excess* of financing, relative to that which is required in *actuality* to realise sales and a monetary surplus, they will both account for this in making their initial loans; and, furthermore, can expect some positive return because the additional financing required has (subject to uncertainty and the successful completion of the circuit financed) already provided not just the finance needed to meet this, but a further element needed to meet the firms' own desire to hedge and to hoard money during the circuit itself. The implication of over-financing, of course, is the expectation that at least some of the excess finance will not be returned, as investments fail, and therefore interest rates will be elevated in general; and it is here that banks have both an incentive to monitor and attempt to manage risks, and, at the same time, push those in the real economy towards an increasing financialisation of their activities, using the banking and finance sector in preference to real production.

Failing overfunding, they can demand a non-monetary repayment of loans, through the acquisition of financial assets. This may, however, point to a further resolution to the apparent paradox, if we allow that indebted firms, receiving demands for repayment (with

interest) from the banks, can repay in real terms through the disposal of their financial assets. The implication, explored in (Bossone 2001), is that firms will be forced to meet interest payments not in money but in the disposal of financial assets. In the absence of firms' asset growth, the net wealth of the whole economy will gradually shift towards the banks until all financial assets are owned by them, matching the growing preference of households to hold increasingly liquid assets. The path of the economy, over time, is determined by the balance between firm growth, bank lending, and household demand for money. Febrero (2008) has, by providing an explicit account of a four-sector production model (consumption goods, capital goods, and two circulating capital goods producers) along with the extension of funding into short- and long-term loans, offered a means to reconcile the presence positive monetary profits with the circuitist theory. The realisation of profits, however, appears to be a little sensitive to the precise linkages between the different elements of the circuit link and align themselves: it is not clear different configurations would produce the same neat results.

This indicates, again, the issue of uncertainty as prevailing not just on the movements of financial assets but as the direct and necessary consequence of production occurring as a sequence of events over time. The crucial relationship here is between the role of money as both the initiator of the circuit and the means through which its separate elements are brought together, but *also* its presence as the ultimate means to hedge against the uncertainty that prevails at every stage within that circuit, including its completion in a sale and realisation of monetary profits. With banks providing funding there is, then, a direct relationship established between the credit system and the productive economy that hinges, in particular, on the existence of uncertainty.

Conclusion

This chapter started with an examination of the role of uncertainty as it affected entrepreneurship, here defined as the capacity to *initiate* a circuit of capital, without necessarily holding the financial means to do so. This provided the basis for a discussion of the "financial motive" in Keynes, showing that Keynes' (and others) were unable to satisfactorily include the financial motive for the provision of funding within an atemporal general equilibrium framework: the financial motive is certainly a demand for funding, but

it depends on the existence of uncertainty that necessarily prevails within a sequence of economic activities, from initial financing to the (hoped-for) receipt of monetary profits.

This led to a discussion of the circuitist school, who have most closely focused on the role of initial (as against final) financing, and in describing precisely the sequence of events needed to enable production to occur. The problem was raised, however, of the raising of financing from bank credit implied that insufficient funds would be available to meet repayments with interest – the "paradox of profits". We suggested a number of possible resolutions to this, eventually indicating that, in the presence of uncertainty, and with firms operating as the mediating element between a known present and an unknown future, there was a permanent incentive both for firms to hoard and for banks to oversupply initial credit. This would allow the paradox to be resolved.

CHAPTER SEVEN

RISK, UNCERTAINTY AND MONEY: HOARDS AND LEAKS FROM THE CIRCUIT

Introduction

The chapter is divided into three main parts. We open up a discussion of uncertainty, hoarding and money through an examination of the central writings of Keynes and the post-Keynesians. The second section examines Keynes' theory of demand for money and liquidity preference in the light of his *General Theory* and subsequent debates. We note the centrality of uncertainty to Keynes' and post-Keynesian thought, and indicate that is best understood as an issue in the social organisation of the economy, rather than as an abstraction from the economy, as in neoclassical systems.

This consideration of the relationship between uncertainty and money leads us into developing an account of *hoarding* as a "leak" of money from the circuit, and as the presence of private, decentralised responses to a generalised condition of social uncertainty. Following Marx and subsequent researchers, we show that the circuit of capital implies a high degree of uncertainty and a desire (indeed a necessity) to hoard given the presence of that uncertainty. These private motivations to hoard assume a social character with the formation of the credit system, and with economic growth, this social uncertainty spreads across all of economic life.

We discuss the implications of this theory of hoarding for our approaches to money, nothing in particular that the conventional quantity theory has significant difficulties in accounting for behaviour of this sort. That then leads us back to SFC, with the claim that the usual presentation of SFC cannot properly account for hoarding and "leaks" from the circuit. We note that a theory of credit-money alone, as SFC models rely upon, is not sufficient to account for the appearance of features such as world money, and that the circular path of credit-money cannot be assumed for all money forms in the presence of hoarding. The chapter concludes by introducing some of the issues to be considered in the final chapter, on the shadow banking system as a manifestation of the hoard.

For clarity and consistency, uncertainty throughout refers to the real uncertainty, that is, the necessarily unknowable future as seen from the present. Occasionally "uncertainty" refers to the natural, ontological uncertainty that arises from the unidirectionality and

irreversibility of time, and when this is the case it will be made clear by reference to "fundamental uncertainty". More usually it is used in reference to the specific form of uncertainty that arises in a capitalist monetary economy consisting of competing capitals. Sometimes this aspect will be stressed by reference to "capitalist uncertainty". Risk, by way of contrast, refers only to *understandings* of uncertainty. It is epistemological, relating to how we might come to understand uncertainty.

I. SOCIAL UNCERTAINTY, PRIVATE HOARDS

Uncertainty and money in Keynes

Probability and uncertainty were critical to the work of John Maynard Keynes throughout his life (Skidelsky 1983), but they have been peculiarly neglected in the standard treatments of his work – which, as Hyman Minsky put it, is like staging "Hamlet without a Prince" (Minsky 1975: 57). This chapter attempts to develop some of the insights from Keynes and the post-Keynesians concerning the role of uncertainty in economic life, developing a preliminary theory of the demand for money in a capitalist economy on the basis of it. This provides the basis for a subsequent discussion of money itself and the operations of the credit system.

It is the centrality of uncertainty to Keynes' own writings, at least in the post-Keynesian interpretation, that motivates the interest here. In contrast to the dominant tradition in macroeconomics, at least since the 1940s, Keynes treated uncertainty as a feature of macroeconomic life, not as problem for microeconomics to resolve. However, this may have been treated later in building essentially determinist "Keynesian" systems (and then, later, in stochastic models in which uncertainty was of an additive, error-term, character), the clear link Keynes wished to establish between the uncertainty that afflicts all economic activity and the development of money and credit systems.

Keynes, famously, provided three different motivations for the holding of money balances, given the zero (or near-zero) interest rate it would pay. In the first instance, the transactions motive described the holdings needed to complete payments demanded. Next, a precautionary motive, "the desire for security as to the future cash equivalent of a certain proportion of total resources". Finally, the speculative motive that could emerge when those holding money balances choose to speculate on future potential movements in interest rates (Keynes 1936: 170-174).

Some subsequent discussion has centred on the legitimacy, or otherwise, of these distinctions: Kahn (1954: 81) proposed that the divide between transactions and precautionary motivations had little relevance in practice, with both being simply the money balances needed at any point in time to meet demands for payment – the only difference being the length of time over which the payments might arrive. However, this misses Keynes' critical reference point in uncertainty, which the distinction in timings between transactions and precautionary motives introduces: positive money balances are required at all because of the presence of uncertainty – either as a hedge against losses or unexpected payments in the precautionary motive, or as a bet on future interest rate movements in the speculative motive. Shackle (1967: 205) proposed that the precautionary motive ceased to exist when the transactions and speculative motives were "properly described", on the basis of this hard distinction between a direct payments use for money, and its role in managing uncertainty.

This does not seem quite accurate: while both precautionary and speculative motives concern the presence of uncertainty, the former can exist under any circumstances in which money payments might be needed in the future, but the latter can only appear in the presence of uncertain future interest rates. The key difference between the two is the complexity with which that uncertainty is handled. While the precautionary motive could plausibly exist in a world with zero interest rates – or, more precisely, completely fixed real rates into the future – the speculative motive only arises because of the institutions that are developed precisely to handle the presence of uncertainty – the financial system itself. It is, to that extent, reflexive: it deals with the uncertainty present in economic life at a higher level of abstraction from the precautionary motive. We will return to this distinction later.

Keynes, then, presents hoarding not as simply the analogue of a decision to save – or, equivalently, a decision to forego consumption – but as something that, in a monetary economy, is necessarily distinctive:

> "The concept of *Hoarding* may be regarded as a first approximation to the concept of *Liquidity-preference*. Indeed if we were to substitute 'propensity to hoard' for 'hoarding', it would come to substantially the same thing. But if we mean by 'hoarding' an actual increase in cash-holding, it is an incomplete idea—and seriously misleading if it causes us to think of 'hoarding' and 'not-hoarding' as simple alternatives. For the decision to hoard is not taken absolutely or without regard to the advantages offered for parting with liquidity;—it results from a balancing of advantages, and we have, therefore, to know what lies in the other scale. Moreover it is impossible for the actual amount of hoarding to change as a result of decisions

> on the part of the public, so long as we mean by 'hoarding' the actual holding of cash. For the amount of hoarding must be equal to the quantity of money (or—on some definitions—to the quantity of money *minus* what is required to satisfy the transactions-motive); and the quantity of money is not determined by the public. All that the propensity of the public towards hoarding can achieve is to determine the rate of interest at which the aggregate desire to hoard becomes equal to the available cash. The habit of overlooking the relation of the rate of interest to hoarding may be a part of the explanation why interest has been usually regarded as the reward of not-spending, whereas in fact it is the reward of not-hoarding." (Keynes 1936: 174)

It is precisely the fact that, in a monetary economy, the operations of saving, hoarding and investment are distinct that allows Keynes to claim that it is "essentially one in which changing views about the future [as they impact on changing propensities to save, hoard, and invest] are capable of altering the *quantity* of employment, and not merely its direction." (Keynes 1936: vii) In Keynes' system, money can act as a store of wealth over time (despite its generally zero, or near-zero, interest rate) because contracts are written in money terms, meaning that obligations to pay will be delivered and must be met through money. This creates an uncertainty about future liabilities, in which payments are demanded in money terms and for which other assets cannot easily substitute. There is therefore an incentive to hold positive amounts of money in the form of hoards, irrespective of their opportunity costs in interest foregone (Asimakopolus 1991: ch.5). Crudely, the decision to save is governed by time preference; liquidity preference by choice of assets. Unlike the "classical" (in Keynes' terminology) system, the real and monetary side can be distinguished; and this distinction emerges, critically, in the creation of money *hoards* as distinct from real *savings*.

Note, however, that in Keynes' case the possibility of using money as a hoard depends not *directly* on its characteristics as money, but rather on the presence of both positive rates of return elsewhere, and the inability of other assets to act as ready substitutes for it. Money is here not directly a store of value, but even if it were only money of account it could still function as an effective hoard, given the presence of uncertainty about future rates of interest. If there was no positive rate of interest anywhere, there would be no incentive to differentiate between different forms of assets, and money hoards and savings would be equivalent. If other assets could be easily substituted for money, on the other hand, there would be little sense in holding stocks of money back from circulation, even where future payments were demanded directly in money form – other assets could be readily exchanged for money and payments met.

But there are two distinct problems with this view of hoarding behaviour. The first is its conventional character. Money itself, in this system, does not invite hoarding: it is only because of its characteristics in relation to other assets that it can function as such. The boundary, then, between money and other assets is weak: but if the boundary is weak, and potentially porous, there is good reason to think that a profit-motivated private sector will seek to undermine money's unique status. If nothing else, arbitrage opportunities should exist. But this opens Keynes' theory up to the challenge of Friedrich von Hayek's own theorisation of the credit cycle, in which greater and greater quantities of money-like assets are produced in the course of a credit boom, approaching forms of private money, answering the demand of private capital for greater quantities of liquid assets. This then in turn leads to a dislocation of productive investment that only a thoroughgoing bust can reconfigure (Hayek 1931). If the private sector can create new forms of moneylike assets, with nothing other than pure convention to restrain it, there is no reason to identify – as Keynes does – the uniquely disruptive role of the money-rate of interest in "setting the pace" and therefore "hold[ing] back investment" (Keynes 1936: 235) due to its uniquely desirable properties, since the money-rate of interest no longer need function as "the" rate of interest regulating the system as a whole. The private sector itself will happily create money-like substitutes that address the need for assets that have some of the desirable features of money – principally liquidity- while also maintaining their own rates of interest. Keynes' system – and its policy conclusions, regarding the desirability of government intervention to drive down long-term rates of interest – lies potentially exposed.

Second, and more fundamental, is that Keynes' definition assumes that which it needs to demonstrate. Because money hoards exist by reference to other, interest-bearing assets, there must be a rate of interest which exists *prior to* the formation of these money hoards – or else there would be no need to establish such hoards, except perhaps on some personal whim. It is against movements in both the rates of return generally, and the money-rate of interest in particular, that Keynes believes hoards can become established, since – given the unpredictability of such movements over the long term, at least – there is a permanent need to hold at least some funds against (or in favour of) such movements. It is from the rate of interest that he reads backwards into the propensity to hoard. But if the propensity to hoard, by establishing the preference for liquidity, also helps establish the interest rate, it would appear we have run into a circular argument.

Uncertainty, and the desire for hoards

As we suggested in the previous chapter, the Knightian description of entrepreneurs as the agents that translate uncertainty into certain outcomes is not quite accurate. It is the "entrepreneurs'" ability to systematically *remove* money from circulation, rather than introduce it *into* circulation, that is their distinctive ability. Keynes, in the post-Keynesian view, presented a view of the economy that was entirely at odds to what Keynes called the "classical" system, or what we would more usually identify as neoclassical. The key elements in the prevailing neoclassical view, following the marginalist revolution of the latter nineteenth century, were the existence of linked series of free markets that, left to their own devices, would clear effectively through time. Marshall, one of the great economic system-builders, described a world in which stability in asset markets was secured by the presence of long-term "fundamentals". Speculation and short-run volatility had only transitory effects, with the economy, reverting to a settled equilibrium through time where agents' beliefs would match economic reality. Keynes challenged this profoundly, presenting "an inversion of Marshall's thinking", in which long-term expectations are often "disappointed" and where the short-run is dominated by "animal spirits" (Davis 2010: 43). The economy, and long-run expectations, could only be stabilised by the use of government intervention: the replacement of public intervention for Marshall's private virtues.

He offered instead "a monetary economy guided by individuals' expectations about the future. There is no permanent state of rest in a monetary world, and the equilibria that emerge are temporary and transient" (Davis 2010). Keynes further, in the *General Theory*, purported to show how decisions made through time in an uncertain world were formed through a series of social and institutional factors, the most important of which was money, acting as a medium of exchange, a store of value, and facilitator for speculation. This multi-purpose money was both necessary for the continued existence of capitalism and economic growth, but the contradictions between its different roles could, in a system with decentralised investment decisions, lead to breakdown.

This reclamation of Keynes' probability theories, and the placing of uncertainty at the centre of his *General Theory* system prevents post-Keynesianism from relying on the (essentially unexplained) psychological and personal factors that drive liquidity preference in the conventional Keynesian system (Brunhoff 1976: 41). What it points to is the presence of hoarding as a *necessary* complement to money, in the presence of uncertainty. Money

cannot exist without the prospect of it existing as a hoard; even the most transitory moment where it is not in flow – that is, where it is not being used in exchange – can form a hoard of some sort. As part of its functioning, it can move directly from stock to flow and back again, determined entirely by the behaviour and actions of individuals, not subject to any wider control. This is precisely what makes money so conceptually difficult, particularly if the conceptual tools we are bringing to bear emphasise exactly the division between stocks and flows. But this presence of money as both a general medium of exchange, *and*, since it can act as a store of value, a barrier *against* the act of exchange – a barrier that can be erected by individuals given the presence of systemic uncertainty – is essential.

Hoarding, and breaks in the flow

This still does not, however, get us to a completely satisfactory theory of hoarding. It works as a description of its function within the whole capitalist system at the highest level of abstraction, that of capital in general. It is less satisfactory as a description at a lower of level of abstraction, that of particular capitals. Keynes' "animal spirits", as the motivating force for entrepreneurs facing uncertainty, by pushing the analytical frame down to the individual entrepreneur at least offers a means to understand why hoarding occurs – even if this is at the expense of economic analysis. What is required is a conceptual bridge from the generality of hoarding, to the particular behaviour of individual units of capital – preferably without falling into psychologism of a Keynesian or neoclassical variety.

There are bridges offered in the development of a systemic conception of hoarding, as developed by economists writing in the tradition of Marxist political economy. Following Itoh and Lapavitsas (1999: ch.3), we claim hoarding develops from the *necessarily* temporal and unplanned nature of capitalism existing as particular capitals within the circuit of capital in general. That circuit, separated as it into competing capitals, is subject to breakdown. Suppliers go bankrupt. Markets collapse. Delays of every sort can emerge as capital flows through its circuit. Capitalists, in response to the necessary uncertainty surrounding accumulation in their own system, hoard funds. In doing so they are hedging against uncertainty.

It is the contradiction between the finite available quantity of money, and its infinity of alternate uses that establishes the possibility of hoarding behaviour. Money has a permanent opportunity cost: its expenditure in one form always rules out its use in any

other, its value as a general commodity being exchanged for a value of a particular commodity. To use money in exchange is to destroy the generality of its value. This, then, can establish the need for a hoard, as a barrier against the destruction of its general value in particular commodity forms. The link between this general possibility, and the actual appearance of hoarding, is found in the particular experiences of social uncertainty under capitalism.

Uncertainty, as in Keynes, is the vital element here. But the point to note is that this Keynesian uncertainty is uncertainty of a kind that necessarily prevails in *any* social system. Yet it has been used to justify the existence of *particular* behaviour in a *given* social system – that of a capitalist monetary economy. For general, social uncertainty of this kind to have *particular* effects – in this case, that of hoarding behaviour – it has to be mediated through particular institutions, and this is precisely the role of the credit system in Keynes. This takes us back, however, to assuming that which needs to be demonstrated. The credit system arrives logically prior, in this scheme, to the uncertainty that it is intended to deal with. But in Marx, unless we take his colourful, psychological descriptions of the "greed" for gold literally, no such economic rationale exists for the *particular* units of capital (Marx 1867: ch.3).[12] For the system, the purpose of hoarding is clearly described. For the individual unit of the system, the details still need filling in.

The strength of the alternative offered by Itoh and Lapavitsas, building on Marx, is that it provides specificity to uncertainty. Uncertainty, of the kind that promotes the specific behaviour of hoarding under capitalism, emerges as a result of capitalist social relations. Although general uncertainty, of the kind that Keynes described affecting *any* society, clearly still exists, it is the definite relationships that develop between competing capitals that give uncertainty a particular expression under capitalism. That, in turn, creates the definite behaviour of hoarding. There is a clear, analytically defined link from the social relations being described, to the practice being analysed.

Hoarding and the appearance of the credit system

There are some difficulties, however, concerning the relationship of the phases of the circuit of capital to "leaks" of value in the form of money hoards. Following the

[12] The analysis throughout volume 1 of Capital is conducted at the level of capital in general. It is only by the third volume that particular units of capital are introduced.

presentation used earlier, the whole circuit can be represented schematically, at the highest level of abstraction, as the combination of three processes:

M-C…P…C'-M'

The first phase (M-C) describes the advance of money and the purchase of commodities. These commodities, including materials, means of production and (crucially) labour power, then enter the phase of production, …P…. In doing so, they are transformed by this process into further commodities, which then re-enter the market and are sold for an increased volume of money (C'-M'). Condensed, the entire circuit forms only M-M', but Marx was at great pains to indicate the centrality of the productive process to the otherwise somewhat mysterious process by which money advanced now became a greater sum of money in the future.

At the stage of commodity purchase (M-C) during the circulation phase, a hoard of money is held against unforeseen payments and price fluctuations (Marx 1976: 165). This is replicated in the uncertainty that is, again, present in the disposal of commodities (C'-M'), where uncertainties in sale and price fluctuations mirror those at commodity purchase stage. In both instances it is the logic of competition in the market, and the separation of buyer and seller in a monetised economy that produces the fundamental uncertainty. Hoards occur as a response to both. It is the transition between stages that creates the zone of uncertainty.

However, Itoh and Lapavitsas (1999: 67) also detail two other instances of hoarding, where it can occur as a result of delays *within* stages, rather than uncertainties in the transition *between* stages. They note the possibility of delayed purchases and disposals, and – in particular – the need to maintain, and upgrade, stocks of fixed capital. Profits are accumulated and depreciation funds established to deal with both. The uncertainty here is not over the risk in failing to complete the transition across the phases of capital. It is over the presence of variable (and potentially unknown) time delays as capital moves within a single phase.

There is, then, a distinction to be made between different compulsions to hoard. Uncertainty over the completion of the circuit emerges *between* the phases of the circuit. Time delays impact only *within* phases of the circuit, and could be themselves subject to volatility, but they do not threaten the breakdown of the whole circuit. Both, however, are brought together by the entire circuit, resulting in hoards "associated with the turnover of

capital as a whole" (Itoh and Lapavitsas 1999: 67). But for the circuit to proceed "uninterruptedly", as it passes through alternating phases of production and circulation, it is necessary for only a part of the capital to actually be engaged in the process of production. "While one part is in the period of production, another must always be in the period of circulation. Or in other words, one part can perform the function of productive capital only on condition that another part is withdrawn from production proper in the form of commodity- or money-capital." (Marx 1976: ch.15)

Because the two stages are not necessarily of equal periods – indeed, as Marx notes, they will be so only as an "exception", capital will be periodically "set free" from the process in the form of money hoards. For total social capital, the "release of capital must be the rule" and "[a] very considerable portion of the social circulating capital, which is turned over several times a year, will therefore periodically exist in the form of released capital during the annual turnover cycle." (ibid.) Further, as the scale of production grows, so too must the scale of the released capital hoard, since the stages of the cycle become increasingly lengthened and unlikely to synchronise. The commencement of a new cycle by an investing capitalist will require an initial hoard greater than would be required in one production period, as we have suggested previously.

It is, therefore, the case that as we move from simple to expanded reproduction the necessity to develop larger hoards appears, beyond the scale that a single capitalist can plausibly maintain. The creation of hoards, therefore, and in particular their expansion beyond the immediate requirements of production, is what creates the "social foundation for the credit system". The credit system collects "'leaked' value, transforms it into interest-bearing capital, and channels it back to real accumulation." (Itoh and Lapavitsas 1999: 69) Interest is, then, a share of the mass of profit – but the interest rate, importantly, has no necessary relationship to the rate of profit, being formed from hoarding within the turnover of capital.

Uncertainty, not phase lengths, determines hoarding

This initially might appear as a simple case of timing differences: the separate phases cannot be guaranteed to align sequentially, and so hoards become necessary, just as they do when dealing with delays appearing within the individual phases. This is, however, to miss a critical nuance. Marx's own presentation of the turnover process, as Lapavitsas

elsewhere notes, is flawed (Lapavitsas 1997: 95). Marx assumed that although purchases occur at different times, the final output is sold "at one stroke" – an inherently implausible assumption, given the likelihood that final outputs are sold across different industries. However, on the basis of this assumption, Marx attempts to demonstrate that where disproportionalities occur between different phases of the circuit – as is very likely – money hoards will necessarily develop. His reasoning is that as sales revenue arrives in one pile, it necessarily appears after at least one production period has already lapsed, since prior production must have occurred for commodities to be sold.

However, following Lapavitsas (1997), this is incorrect. The accruing money capital from sales revenue is fluid and it can be spread over the present and future production periods. The cash lump sums from sales revenues, unevenly distributed over time, are necessary to maintain continuous production, even if (as Marx holds by construction in his presentation of simple reproduction) the value of final output in each period is equal to the value of capital necessary to run one production period, with no growth occurring. Sales revenue arrives, and is immediately needed to cover production costs for the future period. That is to say, a hoard is needed to maintain production *into the future*, rather than – as in Marx's presentation – to cover for costs already accrued.

Even under the restrictive assumptions Marx uses, the sequencing of the separate production and circulation phases therefore matters less than *uncertainty* over their future behaviour. The phasing that Marx highlights, therefore, as driving the appearance of hoards over the turnover of capital as a whole is in fact *mediated* by uncertainty. It is not phasing alone that creates hoards, as in his original presentation, but the uncertainty of future phasing that creates them.

Expanded reproduction generalises uncertainty

This uncertainty that is present in the transitions between phases in the cycle is here both partly subsumed under the wider turnover of capital, as the possibility of hoarding throughout the entire turnover cycle can act to mitigate those transition uncertainties. A hoard that can be set up on a permanent, or at least multi-cycle basis, offers the possibility that uncertainties within a complete circuit of capital can be continuously hedged against. Simultaneously, however, the creation of these more permanent hoards generalises the uncertainty. The actions of particular capitals against uncertainty at the phases of the cycle

transmutes into an uncertainty prevalent across the whole cycle, confronting capital-in-general. In particular, the appearance of expanded reproduction creates a generalised uncertainty, as it is unknown for capital-in-general if the newly-expanded volume of capital can, on completion of one circuit of capital, be successfully thrown back into and pulled through successive rounds of the circuit.

In other words, what could appear to be simply an uncertainty against the vagaries of the market at any given point in time – the unexpected collapse of an output price; the unanticipated shortage of an input – takes on a more fundamental character as we move into expanded reproduction. Mitigating the uncertainty present in the transition between phases in the cycle of capital through the creation of hoards by individual capitals leads to the reproduction of uncertainty in a more general form as capital expands. Moving from capital-in-general under simple reproduction to particular capitals under expanded reproduction *deepens* the uncertainties that are particular to capitalism. The hoards themselves, now erected on a permanent basis against particular capitals' uncertainties in phase transitions, become a source of permanent uncertainty for capital-in-general.

As capitalism develops, with increasing turnover times and greater concentrations of fixed capital, the uncertainties attached to the circuit necessarily also increase. The deepening of capital implies the lengthening of the phases, increasing the costs of mismatch and uncertainty. Extended cycles of reproduction mean extended periods in which capital is fixed in place, illiquid relative to the demand for its liquidation and realization in the money form. The credit system is the institution that emerges to manage hoards created from uncertainty under expanded reproduction.

It should be, further to this, apparent that the possibility of hoarding is one of the reasons that Marx himself, and later authors, were correct to draw a distinction between money as such, and *money-capital*. Money can, by its nature, be used for any number of different purposes: its status as the generalised equivalent guarantees this flexibility, and of course this liquidity of use is precisely what helps guarantee its status as money. But if introduced to the circuit of capital, it becomes quite a different creature. If money is hoarded, it is not necessarily functioning as money capital, since it is (virtually by definition) being held purely as the money form. To become money-capital, it must begin to circulate as part of the circuit of capital, and to this extent it must depend on the social institutions of credit that enable this to occur. As Marx put it:

> The numerous points at which money is withdrawn from circulation and accumulates in numerous individual hoards or potential money-capitals appear as so many obstacles to circulation, because they immobilise money and deprive it of its capacity to circulate for a given period of time. (Marx 1894: 493)

That implies, too, the expansion of the credit system as a means to manage the process, and provide an expanded repository for the hoards that emerge.[13] It is the *necessary* uncertainty of a capitalist economy functioning as many competing capitals that creates the necessity to hoard. If that particular uncertainty did not exist, capital would not be competing as many different capitals. And as the concentration and complexity of capital increases, the size of the credit system increases in parallel. It is formed from the process of accumulation, but is partly autonomous from it, exercising a dynamic that is constrained but directed by real accumulation. This is the dynamic by which the credit system creates *loanable money capital*: of the ability to offer, for wider circulation, money not just as money but as a distinct moment in the whole cycle of accumulation.

II. UNCERTAINTY AND MONEY

Uncertainty and the velocity of circulation

In the table below, we have shown each of the four motivations for holding money, their relationship to uncertainty, and whether a developed credit system is needed a priori to support them. “Intrinsic” uncertainty refers to the uncertainty that prevails over any expected sequence of future events in an unplanned, competitive economy. “Extrinsic” here refers to the uncertainty that can prevail in the structures intended, initially to help deal with that intrinsic uncertainty – the credit system itself. One is built into a capitalist economy, and is inescapable within that economy; the other emerges only as that economy develops and deepens its operations. Alongside the familiar three of standard macroeconomic theory (deriving more-or-less directly from Keynes) -–the transactions, precautionary, and speculative demands for money holdings – we have included the financial motivation for holding money, as analysed in the previous chapter. What our discussion above should indicate, however, is that these distinctions exist for the circulation of money in general, but do not hold for money in operation as particular forms

[13] Hayek makes a similar point in his *Prices and Production*, although he reverses the sequence on the basis of his individualist approach: greater piles of credit call into play greater concentrations of capital as a result of its lengthening turnover time. Hayek, F. A. (1931). Prices and Production. London, George Routledge and Sons.

of money. Notably, there is the distinction to be made between money-in-general, which may be hoarded, and then money-capital, brought to the circuit of capital, and then (finally) the presence of loanable money capital as the distinctive form of money provided by the credit system.

Table 7.1: Structure of demand for money and its relationship to uncertainty

Type of demand	Uncertainty	Credit system needed?
Transactions	None	No
Precautionary	Intrinsic	Desirable
Speculative	Extrinsic, dependent on credit system	Necessary
Financial	Intrinsic	No

These distinctions matter inasmuch as the transitions and phases within the circuit of capital matter. The closer we approach the circuit of capital, with – notably – its differentiation of phases along the lines indicated, the further we get from being able to treat money as an undifferentiated mass. Each specific motivation for holding money balances implies, in turn, a distinctive relationship to the supply of money – that is, a distinctive velocity of circulation applies to each one. While Keynes indicated this point in his *Treatise on Money*, by the time of the *General Theory* it had been somewhat lost in the shift back towards a simple quantity theory – that is, back towards money conceived *only* as an undifferentiated "stock" of generic buying power. SFC models suffer from a similar defect: there exists, within the matrix representation of the economy, only one form of money in existence (that of credit-money), precisely because the representation claims to be complete (and therefore cannot countenance hoards and leaks existing separately from credit-money hoards). Its credit theory of money presents money as an undifferentiated mass of generic purchasing power; it is, to this extent, necessary to counterpose a *money theory of credit*, to a *credit theory of money* if we are to avoid falling into a (Friedmanite: see Friedman 1956) variant of the quantity theory.

The quantity theory

Strictly, the quantity theory holds that the velocity of circulation is, in equilibrium (which is to say at full employment), fixed at a given rate. Prices, in contrast, are flexible and so therefore changes in the supply of money impact on the aggregate price level, the identity being maintained through a simple market logic: a greater supply of money, circulating at the same velocity, will cause prices to be bid up through market competition; the reverse applies if the quantity should be reduced. This system describes a relationship between velocity and money supply, and prices and real output in the equation of exchange:

$$MV=PY$$

This, under the assumptions of the quantity theory, shifts from being a statement of identity to a behavioural equation. There is a direct, proportionate relationship from money on the price level. Velocity itself is a function only of the level of income, which can under normal conditions be treated as a constant. Some variations can be made to this basic framework; a "Keynesian" twist would be to incorporate changes in the expected real interest into the velocity function, alongside income, corresponding to the precautionary and speculative demands for money holdings alongside the transactions demand, which varies in simple fashion with the level of aggregate income.

This implies, on the basis of the equation of exchange, that monetary policy can have some degree of impact on the level of output. This constituted the basis for the standard Keynesian critique of the quantity theory, as it became codified post-WW2. It is an interpretation that can follow from Keynes' presentation in the *General Theory*, largely because he himself accepted a version of the quantity theory in the book. But it misses out some important features of the macroeconomy.

These fall in two parts. First, it misinterprets the separate demands for money as we have detailed above. It is not the case that these demands for money can be treated either as derivatives from a transactions demand, or that they will have a relationship of simple causality from the interest rate. Instead, as presented above, each element forms out of a given relationship to uncertainty, with the exception of the transactions demand which has a direct relationship to income and can be treated as the most basic form of the demand for money. It is this relationship to structural uncertainty under capitalism, not its mediated appearance in the credit system, that gives the different character to each of the different forms of demand.

That being the case, each separate demand for money has only an indirect relationship, at best, to the rate of interest, with the speculative demand forming the most immediate links to the rate of interest and the credit system, and transactions demand the most distant. But in no case will the relationship be simple, because the real driver for the demand is the underlying capitalist uncertainty, not the subsequent mediations of that uncertainty through the credit system and term structures of different assets, important though these are. We would expect the real demand for money, on this basis, to be comparatively interest inelastic, as indeed it has been – and is increasingly so.

That is to say, the appearance of uncertainty within the system cannot simply be dealt with by monetary elements of the system. Interest rates as such will only partially account for the presence of uncertainty prevailing within the system as a whole. And because the system is properly dynamic, in the sense that the timing of events matters, uncertainty is irreducible.

Second, the standard Keynesian model misinterprets the velocity of circulation itself. There is no, single, velocity of circulation – something Keynes had stressed in the *Treatise on Money*. Instead, different demands for money impose different requirements on the role of money and create out of this the different speeds at which money will move. An "average" velocity circulation can be constructed, but is of limited analytical relevance: at any given point in time, depending on how demand for money itself shifts, the "average" velocity of circulation can (and will) vary significantly around any assumed average over time. These shifts in the observed, "average" velocity of circulation will, under most circumstances, be dominated by shifts in the structure of demand for money rather than, as the standard Keynesian system might suggest, changes in variables seemingly affecting the velocity of circulation. As above, the interest rate will have only a weak impact on the observed velocity because it is only, at best, a mediated version of the underlying uncertainty of a capitalist economy. After allowing for the transactions demand for money, directly linked to incomes, it is the form of the demand, and the hierarchy of the different demands for money, that come to dominate the observed velocity.

As we have indicated, the structure of that demand is fundamentally shaped by the uncertainty all agents in a competitive capitalist economy must face. But as noted earlier, that uncertainty is not directly observed or countable: a point detailed by Keynes himself, and placed centre-stage by the post-Keynesians. We cannot register uncertainty as simply

the variation of prices over time; rather, we see its effects by proxy in the shifts in the structure of demand for money over time.

This is central to one claim presented for the chapter: the observed velocity of circulation can be best understood not as a function of observed variables, such as income and rates of interest, but of unobserved, structural uncertainty. Keynes' attempts to describe the appearance of a "financial motive" in the demand for money has already opened up the possibility of a relationship between the monetary side (in hoarding) and the real side (in savings-investment) not wholly dependent on the behaviour of agents, but falling, instead, from the fundamental structure of a dynamic economy under uncertainty. But if the observed velocity of circulation is itself dependent on unobserved variables – rather than functioning, as in the standard quantity theory, as a directly *behavioural* relationship – we must ask what it is that determines these unobservables.

Quantity theory and anti-quantity theory

Attempting to answer that question takes us back to the equation of exchange, which shows (in the most fundamental form) the relationship between real and monetary sides of the economy. As an identity, it is necessarily true; but as a behavioural equation it is open to different interpretations. Taking income as read for now, we have attempted to show that in principle the velocity of circulation depends only as a second-order function on observed variables. We have left, however, both prices and the money supply itself undetermined.

In the strict quantity theory, prices are determined by the money supply, rising and falling with the available stock of money. Control of the money supply therefore allows control of prices – an insight developed by Milton Friedman and the monetarists in their 1960s restatement of the quantity theory. Monetarism as such is now discredited, both intellectually and, following unsuccessful attempts to manage the money supply in the early 1980s, as a practical policy suggestion. Its determination of the supply of money, as a crudely exogenous factor in the equation, has a venerable history, however, stretching through the Treasury View of the 1930s, through to Ricardo and the bullionist controversy of the 1840s, all the way back to David Hume's initial statement of the quantity theory in 1761.

It has always been challenged. The applicability of the quantity theory depended, critically, on the stability of the velocity of circulation. If it could be shown that this was unstable in some sense, at least over the short-term, the quantity theory would break down and the money supply could no longer straightforwardly determine prices. As we have attempted to show above, under conditions of uncertainty in a monetary economy, we would expect this breakdown to be the case, a priori.

In opposition to the quantity theory, a school of anti-quantity theorists has always stressed the instability of the velocity of circulation, depending on the nature of the demand for money at any given point in time. This, in turn, implied that the stock of money was not fixed exogenously to the system, but could fluctuate with the "ebbs and flows" of demand for money (Marx 1867: 134). This implied an effective differentiation in the *forms* of money, as opposed to the all-encompassing category of the quantity theorists, with different types of money circulating at different rates, in and out of the hoarded (non-circulating) cash, in response to changing demands.

Marx and the Banking and Currency Schools

The relationship between the credit system and the productive economy have, naturally, occupied a central position in economics since its foundation as a distinct discipline. But given both the nature of the development of economic thought since then (Rubin and Filtzer 1979), and given the deep complexity of the subject, it is useful to strip out a century or more of seeming development of this thought, and return to original variants. There is a clarity to the debates around the Bank Charter Act of 1844 that can be lacking in subsequent arguments. The Bank Charter Act enshrined, in law, the principle that all banknote issue by the Bank of England should be immediately backed by gold, issuing notes "pari passu" with changes in gold inflows and outflows: that is to say, while times of gold inflow the notes in circulation would expand, during outflow the Bank would be required to restrict the issuance and circulation of notes. The "currency principle", to which the Act's protagonists in the Currency School deferred, was intended to stem the flow of gold from a national economy, within an international commodity money system centred on gold. The Currency School argued that this clearly deflationary policy of the currency principle – restricting the issuance of means of payment exactly as the supply of alternate means of payment was also being restricted – was justified on the grounds that the interest rate

must be allowed to rise, reflecting the real scarcity of capital of which the drain on gold was merely a symptom. As rates rose, and prices fell, the price of domestic capital internationally would be bid upwards and gold would reverse its outflow. Monetary policy, then, was solely intended to passively regulate the movements of real flows of capital.

In contrast, the Banking School argued that the expansion of banknotes in times of gold drain would be sufficient to contain the rise in the rate of interest, since the drain in gold reflected a drain in means of payment and that, therefore, the monetary authorities had a duty to intervene to maintain stable credit conditions. With means of payment becoming scarce as a result of the gold drain, the real risk was deflation; further restrictions in note issue would reinforce that drain in means of payment, reinforcing the drive to deflation rather than (as the Currency School held) accelerating the resolution of the real factors driving the loss of gold. In microcosm, both sides of the dispute contain the elements of all future arguments over monetary policy: whether movements in nominal values reflect real movements; whether monetary policy can effect long-term changes in real values. The Currency side held to a strictly Quantity Theory of money; the Banking side was pronouncedly anti-Quantity Theory.

Marx, in opposing the Quantity Theory, sided with the Banking School, favouring the expansion of currency in the presence of a drain on means of payment. However, he criticised both schools as holding to a fundamentally mercantilist view of the economy, in which drains on gold (and therefore of changes in money balances) represented a real drain on the national wealth, with the aim of policy being (ultimately) to stanch the exit of gold from the economy. For Marx, "the forced transformation of the value of commodities into money", as occurred through the attempts to stem the gold drain by restricting (in effect) real economic activity, "represented a recession of commodity capital" (Ormazabal 2009: 5). This "transformation" represented the primacy of monetary values, within capitalism, over commodities, and the production of commodities. The contrary process – of the forcible conversion of money into commodities – on the other hand was never observed. This asymmetry meant that, in practice, the expansion of commodity production (and therefore ultimately of capitalism itself) experienced real barriers in the form of the monetary limits against which it would compress itself.

This is the key to understanding Marx's opposition to the Quantity Theory, and his development of the labour theory of value. It is, further, the indicator as to why the SFC representation is, ultimately, incomplete, since it presents not the expansion of commodity

production as limited by its monetary shadow, but the monetary shadow as limited by the production of mere commodities. The representation in the social accounting matrix, in this sense, although it purports to be complete, is in fact always suffering from a species of monetary excess, in which the potential expansion of the monetary values permanently exceeds the representation of stocks and flows of values – and their presence as assets and liabilities – within the matrix itself. The form this takes, for society as a whole, is the creation of individual hoards that ultimately render themselves as social hoards in the form of the credit system. To see this, we will need to look further at the concept of money, as it appears in the Quantity Theory and its inversion in the anti-Quantity Theory.

Different forms of money

The derivation of the different forms of money corresponds, in our view, more closely to the appearance of money in history. Rather than, as argued in Graeber (2011), an *opposition* between commodity and credit forms of money, the two (in Graeber's account) alternating through time, it suggests a *unity* of the different forms money has historically taken, and continues to exist as today. The quantity theory implies that, however different agents may behave over time, there emerges (through the presence of money itself) a homogeneity of the money form in its flows, which can be treated easily as a single flow allowing for a single, unitary, "average" velocity of its circulation. In the stronger form, such as early monetarism, this literally implied a single, stable velocity of circulation. In its weaker form, as in the "Keynesian" version of the quantity theory, it implied the formation of what was (in effect) a single velocity that, if not stable at any given point in time, at least held a stability of variance over time. It is the behaviour of agents that determines the direction of the system, with money driving prices, rather than the direction of the system that determines the behaviour of agents.

Instead, what we have suggested from the above is something closer to the presence of a heterogeneity of flows of money, and therefore of money as (in effect) different forms, that cannot be easily reduced to a single form of monetary flow throughout the whole circuit. Those flows are, because money is heterogeneous in this sense, not complete, closed circuits: they are necessarily subject to leaks as money alters its effective form throughout the complete flow. The quantity theory cannot allow for that, since if leaks from the circuit of money occur, the relationship it describes breaks down: it is not

necessarily the case that money (over whatever period of time) always determines prices, even if this determination – given, say, a low velocity of circulation – is slow. If an effective leak can occur – with some volume of money indefinitely suspended from the wider circuit - money cannot completely determine prices.

Leaks from the monetary system can occur. As we have suggested above, it is precisely the presence of irreducible uncertainty within a dynamic economy that creates the possibility of hoarding: of *systematic*, but variable, leaks from the system of flows. Those leaks are themselves directly related to the functioning of the system itself, and not reducible to a question of preferences or behaviour of agents within the system. The appearance of hoards is, critically, not derived directly from agents' preferences.

Hoarding and the "law of reflux"

The hoard itself represents a concentration of claims on the capacity of society to produce values. It has a necessarily social character: it cannot function except in relation to the value produced by society, since it is held as a barrier against the uncertainties and planlessness of social production conducted by private agents. A fully private hoard could not exist, just as a particular money, valuable only for one individual, cannot exist. The one is built out of the other. Both are held as a relation between agents in the economy, but both stand opposed to the rest of the economy.

It is the latter contradiction that, for the hoard, gives it a problematic character for the capitalist economy in general. Because it represents a continually abstracted stock of potential claims against value produced, it is always a threat to the production of those values. The presence of monetary hoards permanently threatens the circulation of value in general, since it can appear at any moment and blow apart that circulation by exercising its character as a store of claims against value. This alerts us to the more fundamental contradiction, which is that the strictly *social* character of the hoard must be expressed, in general, through the *private* actions of agents.

Likitkijsomboon (2005: 161) has raised this contradiction. If the hoarding mechanism is necessary to stabilise the monetary system, "what is the intermediate link from the state of monetary disequilibrium to individuals' hoarding decisions?" For quantity theorists, this is not a problem: the stock of money is strictly exogenous, and therefore prices formed in the market through private actions adjust to it. But for anti-quantity theorists, holding the

determination of money stocks to be driven by the price system, it is a serious problem. There is no clear mechanism by which those private agents seeking to hoard or dis-hoard money will operate in such a way that the money hoarded (or dis-hoarded) will clear the whole system. Marx, as Likitkijsomboon says, did not explain the mechanism (2005: 161). He cannot use the interest rate as the mechanism because it has not been introduced at this level of analysis.

There is, however, a route towards a solution. It lies in two parts. First is through the recognition that at least part of the money created for the hoard –in developed capitalism, the very major part – will be credit money, issued by the credit system, rather than money of any other type. This has a very particular role within capitalism, being issued by banks on the basis of demands for cash, and being held against deposits left with banks as liabilities. Although in principle this money need not enter circulation, in practice it is precisely because it is created in the process of credit creation that its owner will not, except in rare cases, seek to hold onto it; rather, it will flood into the rest of the system and make its way round back to the banks in due course, as means of payment. On returning to the banks it annuls its prior existence as liability for its holder, and balances with the deposit liabilities of the banks that offered it. It is of course possible for banks to offer an excess (or, less likely, an insufficiency) of credit money relative to that which can be readily absorbed by the demand for payments in the rest of the economy. As long as, however, the banking system itself is sufficiently liquid, with banks able to call on balances amongst themselves as needed to balance the flow of demands for credit money elsewhere, the system as a whole is not threatened with breakdown. The “law of reflux” for credit money operates as part of the very functioning of credit money. It is distinct, in this case, from the meandering course that other forms of money could take, with no *necessary* route back to their source. Commodity money, or money functioning as a commodity money, has this form: it is issued, from whatever source, but need not follow a route back to that source at any point.

This is why the financial demand for money is of critical importance. It is, as discussed, not simply a transactions demand for money, but one that is based on a particular relationship with uncertainty. It forms its distinct character precisely because it is, in some sense, forward-looking and therefore dependent on outcomes in the future that are necessarily not known with certainty at the time the demand is made. It also, however, is the direct means (as we have seen) by which Keynes hypothesised that the identity between savings and investment he asserted held ex post could come to realise itself ex ante. Or, to put it

another way, the financial demand for money could exist because returns from the investment it was mobilised for would start to flow, increasing incomes, and the increased income arising as a result of the multiplier effect could be used to cancel out the additional demands for payment the mobilisation of the cash would create. It is a version of the law of reflux, creeping into the *General Theory* system, which otherwise has no need of it.

But it is a law of reflux subject to the uncertainty of the rest of the system. This gives it a distinct character. Because the course of money's return cannot be guaranteed, if circulated as a result of the financial demand, it presents a source of instability for the system. The weaker the source of the returns needed to generate the money's circulatory reflux, ensuring the system balances, the more unstable the whole system becomes. Or rather, to be precise: the more *uncertain* the *future* returns appear to be, the more the stock of money needed *today* appears to present a challenge to the system as a whole. It will not necessarily regulate itself because this stock of funding, if mobilised, threatens to destabilise the rest of the system.

This is an important conclusion. It provides a means by which uncertainty over the course of future returns begins to affect the operations of the monetary system today, at a fundamental level. It implies that changes in the uncertainty prevailing within the system will start to impact as more or less smooth operations of the law of reflux and hence the balance of the entire monetary system. This is a manifestation of the fundamental contradiction between uncertainty, which exists as a result of social relations, at the level of society, and the private character of hoarding that takes place to deal with uncertainty. It is the private character of the hoard, together with the socially uncertain nature of the returns, that produces the instability across the whole system.

That uncertainty does not exist as a representation of reality: it is a fundamental constituent of the reality of a capitalist economy. It cannot be, in other words, reduced (as in the Arrow-Debreu system) to "contingent commodities", essentially equivalent to commodities existing without uncertainty. It forms the basis on which all economic activity must take place in a world of commodity production, generalised exchange, and autonomous production. Conversely, it also implies that the mechanisms by which this uncertainty is dealt with – identified here as hoarding in particular – cannot function as purely symbolic. They must, in a very direct sense, also be a real mechanism, or else the necessary symmetry between a real uncertainty and its real barrier would not hold. Hoards cannot be simply symbolic, or consist of an accumulation of symbols; they must act as a

real store of value. This has direct implications for the theory of money. Money must itself be able to function as a *real store of value* independent of its particular representation.

Symbolic money and the Quantity Theory

We must identify, against credit theorists, the presence of money not as a *symbol* of some other thing – some form of primordial debt (Théret 1999), say, or a representation of state power (Ingham 1999; Wray 2000) – but as the real form of social value in a decentralised, market economy in which commodity production has become generalised. The presence of money is unavoidable in the functioning of such a system: since equivalences exchange in trade (trade being a point of equivalence between different commodities) but since there exists a "third term" in monetary exchanges, this being the form of money, money must itself be a form of value (Lapavitsas 2003: ch.4).

The weakness in the versions of money theory that hold money to be a form of credit (rather than credit being a form of money, as we are claiming) is precisely that they cannot uniquely determine this relationship: if money is merely a symbol of value existing elsewhere, that money form can be replaced by any other symbol at any point. The analogue of this argument, within conventional, neoclassical economics, are variants on Cagan's model (Cagan 1956), with rational expectations, that point to the (near-)costless consequences of a quick and "credible" disinflation (Sargent 1982). If money is purely and simply a symbol, then removing one symbolic representation and replacing it with another is, naturally, of a very low cost. If, in reality, the costs of the operation turn out to be rather high (Romer and Romer 1989), so much the worse for reality. For the credit-money theorists, who avoid the more obvious weaknesses of the neoclassical case, a similar argument revolves around the possibility of printing money to create an expansion, or that (following a particular interpretation of the national income identity) it is necessary for a government deficit to exist, in a fiat-money system, for accumulation and therefore growth to continue. In both the neoclassical and the more heterodox case, the presumption of money as something closer to a pure symbol than itself being a valued commodity (of an admittedly unusual type) leads both into the error that only monetary operations are needed to correct manifestations of real economic failure.

The theoretical result of this, in the case of the post-Keynesian SFC representation, is a misreading of the direction of travel of the circuit of money. A "monetary theory of

production" locates the spur for accumulation as the acquisition of credit liabilities on the part of the accumulating agent (whether this, in practice, begins directly with firms, or indirectly with households, is irrelevant here), the need for repayment of which then motivates the drive to expand the circuit of money flows. In terms of the SFC representation, this requires that credit money is created within the banking system and flows to other units within the economy only as a *representation* of (presumed) underlying movements of value. The representation of the movement then forces the real movement into play, and on this basis the separate movements of the flows across the balance sheet result in a stable set of stocks, ex post, at the end of the modelled time period.

The movement of the (presumed) purely symbolic, in other words, heralds the movement of the real capital that, in turn, allows the symbolic representation to align with the real. There is a parallel here with the pure Quantity Theory case, in which, on the basis of the equation of exchange, a fixed velocity of circulation ensures that the movement of the monetary stock translates directly into a movement of prices, for a given output. For SFC and credit-money theorists, the relationship appears completely reversed: the movement of the money stock calls the real movement of output, underlying the representation, directly into existence. Yet for the system to be stable, ex post, given the real movement that underlies the purely symbolic representation at the level of the social accounting matrix. The circuit of the symbolic form of money – the credit-money here represented across the matrix – is always complete, by assumption: this is what the principle of double-entry accounting of stocks and flows means. But since this representation is, in reality, dependent on the *real* movement, the presumption has to be that the movement of the underlying real is entirely distinct from the movement of the symbolic. This is because, to close the system at the level of its symbolic representation - with all stocks completely representing the past history of all flows – the symbolic representation must itself be complete. If the real movements that the symbolic representation claims to represent intrude in this circuit, they have the potential (at least) to force serious disjunctures between the symbolic and the real.

In practice, SFC representations concede this point by holding that the ultimate movement of capital as such is determined outside the system represented by the social accounting matrix. The movement of capital appears as a residual element – as the "net worth" of the economy, a claim that is itself (as we have seen) slightly dubious – rather than the motive force of the movement of the system as a whole. And the expansion of that stock of capital,

like the neoclassical growth systems that SFC claims to be an alternative to, depends ultimately on the exogenous movements of the productivity of capital – something beyond the reach of the modelled system.

The SFC representation is more complete than the neoclassical alternatives. It allows a fuller description of the movements of value across the economy, since value and flows of value are treated as gross, rather than net. But the insistence on closure at the end of the modelled period forces it back into something akin to a Quantity Theory: real movements affect only real movements; nominal movements, in the end, affect only nominal movements, since the real they purport to represent is ultimately unaffected by their purely notional movements.

Quantity Theory, anti-Quantity Theory, and monetary crises

This reappearance of an ex post Quantity Theory is a weakness within the SFC representation, and one that flows directly from first, the presence of money as symbol within the system; second, the insistence that the accounts are complete, and balance; and third, following in the trail of these two, the actual disjuncture that emerges between the movement of value in the accounting matrix, and the real movement of value in the economy. To close the gap between the real movement and its nominal representation requires us to rethink the presence of money within the system; in particular, we need to return to the (necessary, but hidden in SFC) role of money as the presence of value within a system of exchange, rather than a mere representation of that value. In practice, this means a reconsideration of the *shape* that money describes in its flow, and our understanding of the causal relationship that therefore develops between this description of the monetary flow and the wider economy.

We can trace this path directly. “Marx holds that the value of money in capitalism is the interest rate, not its purchasing power. Money is not a *sign of value*.” (Ormazabal 2009: 9) This follows from his holding that what was known at the time as the Law of Reflux was in operation: that is, notes issued by the Bank of England (in the case of a gold drain) would not be inflationary because they do not represent an increase in the demand for commodities; rather, they represent an increase in the demand for means of payment, given its restriction otherwise. Excess issues would therefore return to the issuer, rather than remaining in circulation to bid up the prices of commodities. This latter point was the

Law of Reflux in operation; it implies both a capacity for hoarding that is independent of the real side of the economy, determined principally by monetary factors, and it implies that the measured velocity of circulation is variable, and highly sensitive to variations in monetary conditions.

We have encountered something very similar to the Law of Reflux already, in describing the circular route that credit money takes, on its issuance, through the banking system. Because it is issued alongside a loan, credit money automatically has a "shadow" within the financial system that drags it back towards its issuer: the money circulates across the real economy, driving real activity – or at least potentially driving activity separate from the sphere of monetary circulation – but as it circulates from holder to holder, it must, in effect, return to its issuer as a payment for the loan advanced. Credit money, in this instance, follows a circular path, in contradistinction to commodity money which can follow an undetermined path through the economy: it has no "law of reflux", and can remain either in circulation or in a hoard essentially indefinitely. It can even exit the sphere of the currency's usual circulation, and be used as a store of value elsewhere in the world.

SFC representations, at least of the post-Keynesian type we are considering, contain only a credit version of money. They have no space for a commodity version of money; money always follows a circular path, remaining, as inside money, inside the system as represented in the social accounting matrix. Commodity money as such is an archaic form of money; we will, however, shortly suggest that the development of credit money institutions has given rise to money that can (on the basis of hoarding) act like commodity money of old, following no particular path back to its issuer.

For now, in the case of the gold drain considered by the Currency School, the argument was that since the drain was motivated by a real mispricing, the extra issuance of currency by the Bank of England could only have an inflationary effect (at least over anything other than the shortest of time periods) since it would immediately be forced into circulation and bid up the prices of commodities. This was opposed by both the Banking School and Marx, who argued that the attempt to restrict the reissuance of notes returned to the Bank of England simply artificially restricted the supply of means of payment in circulation, relative to demand, and therefore simply bid up the price of money.

Where Marx differed from the Banking School was in his insistence that the solution to a crisis of money and banking could not be solved purely through monetary means alone.

The crisis and its monetary expression were distinct. “An expansion of money-capital, which arises out of the fact that, in view of the expansion of banking… what was formerly a private hoard or coin reserve is always converted into loanable capital for a definite time, does not indicate a growth in productive capital any more than the increasing deposits with the London stock banks when the latter began to pay interest on deposits. As long as the scale of production remains the same, this expansion leads only to an abundance of loanable money-capital as compared with the productive.” (Marx 1894: ch.30) The price of “industrial” (productive) capital and loanable capital tend to move inversely to each other, as shown through the rate of interest, and most dramatically in the aftermath of a crisis during which time loanable capital is superabundant. The rate of interest on loan capital, and the return on productive capital match only coincidentally during the course of the business cycle.

So when a crisis emerges, principally (in Marx’s view) through the overproduction of commodities, the monetary appearance of a crisis is exactly that – only its appearance. As the overproduction becomes apparent, forcing a collapse in commodity values, the over-extension of credit becomes apparent. A shortage of means of payment emerges, as a “tremendous rush for means of payment” occurs, credit collapses, and only cash is acceptable as a means of settling bills. This, in turn, reveals the largely fictitious structure of much of the earlier overexpansion of credit. The underlying movement, however, is in the real prices of commodities and their circulation – including that of commodity capital – from which the circulation of credit and means of payment is an amplification, but not the cause. Insisting, in the face of a crisis that would itself have been worsened by the presence of the credit system, that the credit system alone can be used to resolve the crisis, in effect, pushing on a string. At most, the Banking School was correct in insisting that the actual production and circulation of commodities – on which rested real employment and incomes – should not be sacrificed for the good of apparently restoring notional harmony in the market for money. But it erred if, on the basis that the effects of a crisis should not be *worsened* by poor monetary policy, but that the crisis could itself be resolved or circumvented with monetary policy alone. Since the crisis, whatever its monetary appearance, was the presence of a real disorder amongst the circulation of commodities – and only secondarily a disorder in the circulation of money – it required the restoration of something approaching order amongst that sphere of commodity circulation ahead of order being restored in the sphere of monetary circulation.

Put differently, although the anti-Quantity Theory holds true for the circulation of monetary values, it holds an asymmetry: the line of causality from the prices determined by the real production, distribution and circulation of commodities towards the monetary system overdetermines the potential for money circulation to decide the structure of the commodity sphere, outside of the most immediate period of time. Monetary policy would be at its most effective in the teeth of a crisis, when the general disorder prevailing in the real economy could at least be stemmed by the correct application of monetary policy, but monetary policy alone could not provide the conditions by which circulation could be assured over the longer term.

SFC, to this extent, represents an actual retrogression from the Banking School in that it does not follow through on the anti-Quantity Theory. Similarly to Keynes himself, who by the *General Theory* had adopted an (at best) quasi-endogenous theory of money determination, maintaining a fixed stock of money around which portfolio decisions were then taken (rather than allowing, as in a genuinely endogenous system, the creation of money determining portfolio holding decisions), the post-Keynesian representation of money contained inside SFC reproduces elements of the Quantity Theory precisely by, as Lapavitsas suggests of Keynes, not "even consider[ing] the way in which money mediates the realisation of total output." (Lapavitsas 1992: 15) It is the presumption that a global *stability* prevails in the financial representations of the underlying (real) movements of value that forces SFC representations back into something that, in the aggregate, looks perilously like a Quantity Theory. While at the start of the modelling period, money appears to be endogenous – created as credit money within the banking system – at the *end* of the modelled period, once all flows have been netted off, it re-emerges as a seemingly exogenous element. It appears exogenous, in the sense of existing as a stock separate from the rest of the economy, because it must ensure the stability of all totals decreed, after the modelling period has closed, to be stable "stocks". This forces money to take on the appearance of an external factor: it is unaffected, outside of the modelling period and once, ex post, a balance exists across the social accounting matrix, by any elements within the model itself.

Double-entry accounting means zero net flows

This result is the direct outcome of the accounting approach SFC uses. It follows from the double-entry approach that is integral to SFC that the sum of flows within a given period, for the whole matrix, must equate to zero. It is only the stocks that shift, at the end of a period. Implicit beneath this appeal to the logic of accountancy is the need for money to represent a stable value within each period. If monetary value can vary *within* a period, it would be possible for flows to fail to equate over the period.

Partly the problem can be solved by assuming, as SFC generally does, that each period is complete and self-contained, for whatever length it exists. By definition, then, we can claim that the period starts and closes over period during which the monetary value of the flows is itself fixed. Yet if the monetary value can be plausibly seen to vary, the representation would break down.

This is where the contradiction between the strictly social representation of money and credit behaviour that the SFC representation assumes, and its manifestation as the product of distinct decisions is most obvious. With only general, social form of money created through the banks, the hoarding behaviour that can take place separately from the circuit of inside money – as breaks within that circuit – is overlooked. Capital-in-general, the social form of the circuit as represented in the social accounting matrix, cannot simply subsume the distinct forms of capital accumulation, and the distinct parts of the circuit, that exist in reality. Hoarding can, in practice, occur at any point along the circuit - and it will, precisely because of the issue of uncertainty.

And since, as discussed, this uncertainty exists *separately* to the issue of timing, the periodisation imposed on the circuit is not sufficient to overcome the presence of hoarding behaviour. Since uncertainty is a general feature of the existence of the circuit as such, it can occur, at the level of the individual elements (as a manifestation of capital-in-particular) at any point throughout the circuit, irrespective of the periodisation that is modelled. It therefore breaks with the periodisation imposed in the circuit: it is something quite distinct, and cannot be captured fully by the social accounting matrix approach of SFC.

Therefore the circuit is regularly subject to breakdowns. Instead of a stable monetary form and value, that stably constitutes the medium of the flows that are assumed to occur within each period, the flows themselves may break in erratic and unplanned ways, unobserved in the social accounting matrix. Indeed, since uncertainty prevails the circuit, and is separate from the issue of timing and periodisation within the circuit, these breaks

will occur in an a priori undetermined fashion; they are a further manifestation of the contradiction between capital-in-general, existing at the level of the circuit, and the particular forms that capital takes as we move away from this most abstract representation.

Money, within the circuit, is a necessarily social creation: it cannot exist as truly private or autonomous money, but must appear as its social function if it is to exist at all. Central to its functioning, however, is its capacity to be used autonomously by private agents: no part of any amount of money is predetermined in its use, and it is this very generality of use that defines it as money. It is this contradictory aspect of money – that its generality implies its private, undetermined use – that SFC has the most significant problems with. Time periods cannot be defined completely within the circuit because, at any point, the circuit may be broken by the removal of money from its circulation – by its disappearance from the flow and translation into a hoarded stock, over however brief a period of time. The presence of uncertainty, as the conditioning feature of money held as a hoard, will determine that this occurs; it is the presence of uncertainty, then, that means time periods within the circuit of *money* cannot be defined a priori, although of course the pure technical conditions of production may define the useful turnover time of capital more generally. By starting with money, however, the circuit and the periodisation becomes indeterminate, since the presence of uncertainty, as mediated by money, now dominates the activity of those using money.

This means that the standard Quantity Theory of the determination of prices by reference to a stock of money does not function. Given the presence of uncertainty within the circulation of money and capital, and given the use of money as barrier against that social uncertainty as privately experienced, generating hoards, the stable "velocity of circulation" that the Quantity Theory depends upon cannot hold (Friedman 1956; Friedman and Schwartz 1963). The evidence, particularly since the 1970s – coinciding precisely with the period during which Friedman's restatement of the Theory gained ground – suggests that the relationship is not at all stable, observed velocity tending to decline and the "extrinsic econometric relationships" tending to "breakdown" (Goodhart 1989). But this is a deeper problem than simply that the velocity of circulation may itself be subject to change over time, a factor generally identified by even the more crude Keynesian models (Werner 2005: ch.7). The relationship between what we observe as the "stock" of money, and financial balances more generally, and what we derive as the "velocity" of that money stock is in fact

a far more porous and indeterminate relationship than even allowing a variable velocity can model for.

Moreover, because we assume that at the end of the modelling period the stocks of money and the observed financial balances are all net of within-period flows, we in fact end up with something very similar to a Say's Law version of equilibrium: because we have insisted that the balance sheet does, in fact, match up to the reality of economic decisions underneath it, and because we insist that the stocks observed at the end of the period are, in fact, stable stocks of value, we implicitly allow a variant of Say's Law, in which net excess demands are zero, to come into being. It is only the presence, ex ante, of the creation of credit money that drives the dynamic of the system; ex post, at the end of the modelling period, the system is closed and stable.

III. THE EXCESS OF MONEY

The monetary "excess"

This collision between the presumed stability of the monetary forms at the end of the period, and their actual instability within and without the period - to the point of breaking the periodisation imposed – produces a distinct outcome within the operation of the model. We have suggested already that the presence of capital as a residual element within the system is one form of this, and that this forced exit of the real movement of capital from the modelled system represents a failure of the representation as such. But this representation of capital as a residual disguises the other real manifestation of the breakdown of the SFC representation, which is the necessary presence of a monetary "excess", given the flow of money across the circuit.

SFC, being a monetary theory of production, assumes that the presence of (symbolic, credit) money is sufficient to call into existence the presence of real processes of capital accumulation. This money appears, and is assumed to be sufficient to inspire the process of accumulation that generates the necessary balancing at the other end of the time-period: with all gross flows netted off, the stocks remaining are assumed to contain both the necessary and the sufficient representation of holdings of wealth within the economy. As we have seen, in practice this simply leaves the real process of accumulation as a residual upon the flows that SFC purports to capture; but in addition, as the discussion of Keynes' financial motive indicated, we cannot (given the presence of uncertainty) be sure that

mobilised holdings of money will be sufficient to call into existence the real capital and productive forces necessary to actually secure the balance of flows and value that the SFC system purports to represent.

In other words, the SFC representation assumes that which needs to be demonstrated: that the movement of the total output can be realised – returned back to the circuit of capital – ahead of its reinvestment within the cycle. This has to be demonstrated precisely because of the existence of the *necessary* monetary excess: that the presence of money as such, in a form that is amenable to be hoarded at the discretion of individual agents (which is to say, all plausible forms of money that exist), *necessarily* creates an excess of the quantity of the money form ahead of the amount that would actually be needed to meet the demands of realisation. This necessary excess is not fully realised in the post-Keynesian version of monetary circulation precisely because it obscures the distinction between capital-in-general and capital at the level of individual capitals. It aggregates, but it presumes a smooth aggregation in which the layers of mediation between the circulation of money and the realities of production can be flattened out into a simple representation of financial flows. It therefore misses the necessarily particularised decisions to hoard – whether momentary or of a longer duration – by focusing only on the ultimate social form of the hoard, the banking and credit system itself, and then further assuming that this description of the movement of money actually captures every possible movement of money within the system.

In a similar fashion, it is this presence of the necessary monetary excess that undermines the arguments, repeated from an earlier period of pronounced crisis, concerning the possibility of imposing full-reserve banking of a modern monetary economy (Dyson, Greenham et al. 2010). The confusion here is between the presentation of the money system as complete, and the reality of its incompleteness, relative to the actuality of hoarding and money that is otherwise abstracted and frozen out of the complete circuit. Full-reserve banking presumes that the excess is unnecessary: that all money produced can be simply matched to existing deposits, rather than allowing that the banking and monetary system produces a necessary excess precisely because the circuit of capital (at the level of capital-in-general) and individual behaviour (at the level of capital-in-particular) contradict: there is no point, within the circuit, at which the “correct” stock of money can be reliably posited, as indeed the earlier monetarists discovered. Similarly, proposals to restrict the production of money, via credit creation, to that which is necessarily

"productive" (however defined; Werner (2005) suggests tying directly investments productive of GDP) suffer from the same problem.

Keynes himself, as we have seen in the discussion of the financial motive, recognised something of this after the publication of the *General Theory*. But the debates here were inconclusive, and failed to identify the extent to which the necessary presence of the monetary excess in fact undermined the *General Theory* system. This excess is a genuine surplus to the immediate requirements of investment and the realisation of investments: it is not, for instance, equivalent to the necessary *ex ante* use of money holdings in order to bring forward investment, as identified by Keynes (and latterly indicated by Steve Keen in his well-publicised debate with Paul Krugman (Campiglio and Bernardo 2012)). Instead, this is an *ex post* monetary excess: it exists *after* the fact, given the presence of uncertainty within the circuit of capital and the ability of individual elements within that circuit to cope with uncertainty through their hoarding decisions.

The "paradox of profit" reconsidered

Were it to be *only* an *ex ante* problem, the monetary excess – that element of the total stock of money needed ahead of the planned investment – would not present an insurmountable difficulty. The "paradox of profit", considered earlier, in which, for a credit economy, firm revenues can at most equal the initial financing of production costs, is a manifestation of this *initial* excess (Bellofiore, Davanzati et al. 2000). Steve Keen, amongst others, has demonstrated that the paradox can be resolved, by allowing for variations in the turnover time during which "same money can be spent several times in one year" because the initial loan of money generates flows of variable lengths that, in turn, can be spent and respent during the production period (Keen 2009: 6).

The presence of an ex ante "excess", then, can be reconciled with the presence of both positive profits for capitalists and with the more general claims of post-Keynesian SFC treatments to represent a complete macroeconomy, with all stocks and flows at all times accounted for. It cannot, however, be reconciled with the presence of an ex post excess of money, since this ex post *stock* exists (in effect) outside of the realm of flows that the SFC representation purports to contain. Its presence is a tribute to the capacity of particular elements of the system (principally those concerned directly with the capital accumulation)

to withhold money from wider circulation, *in addition to* those stocks withheld as a necessary part of the accumulation process, ex ante.

We have encountered something like this before, in noting, back in chapter 3, that the existence of outside money in DSGE models cannot be reconciled with the claim that debts held by the "representative agent" cannot accelerate forever: outside money always imposes itself as the necessary means by which debts could, in theory, eventually be repaid. Here, we have a determinedly *inside* money system that suffers from a parallel problem, precisely because (in a certain sense) the existence of hoarding activity in excess of that captured within the banking system – as must necessarily exist, given the presence of social uncertainty but individual procedures to deal with this uncertainty – a form of "outside" money is permanently being created and re-created through the actions of hoarding and dishoarding.

We have, of course, moved a very long way from the days of commodity money, when the formation of an "outside" money was inherent to the creation of money as such. Virtually all money created now, within a national economy – within, that is, the sphere of representation that SFC claims to account for – is a form of inside money, created by and within the banking system and returning, as is typical for credit money, back into the banking system after it has traversed the wider economy. Credit money, as we have noted, observes a circular path: created by banks, it provokes and motivates wider economic activity for as long as it does not return to its creator, and can follow a course across multiple deposit accounts and between multiple hands before it does so. But because it is created, overwhelmingly, in parallel to the creation of a loan demanding repayment, it will – outside of those periods of deep crisis – in the generality always return to its source.

The exception to this, however, is where a form of national credit (or semi-credit) money has taken on the characteristics of *world money* (Marx 1867: ch.3). World money, created as essentially credit money within a national economy, can take on characteristics more commonly associated with commodity money when it moves outside of the immediate banking system of its creation. The ubiquitous presence of dollar bills, for example, across much of the world, functions as precisely a form of commodity money as far as the non-dollar economies are concerned: a reliable store of value that can exist quite independently of its banking system, with no requirement, at any point for the bills to return to their source. They can, therefore, constitute a form "outside money" relative to the national

monetary system, precisely because they represent the most developed form of money relative to the less developed national money form in operation in any particular economy.

Financialisation, outside money, and the monetary excess

This presence of a world money, developed as a national means of payment but then operating, in effect, as a form of outside (commodity-equivalent) money outside of its national economy birthplace, is essential to understanding the progress of financialisaiton over the last three decades. The development of an excess, and of hoards that exist outside of the conventional banking system, have been central to the development and expansion of the financial system, centred on the US dollar, from at least the point at which the US essentially abandoned its own attempts to regulate and control the use and circulation of dollars within the global system: that is, from at least Nixon's abandonment of the Bretton Woods agreements in 1971, although of course the appearance on non-US circulations of dollar holdings substantially pre-date that, most notably in the creation of the Eurodollar markets in the 1950s.

But it was the acceleration of non-bank, external hoardings that was decisive, allied to the much-noted acceleration of "financial innovation" throughout the decades since the 1970s. We want, however, to turn attention away from the supply-side issues that occupied enormous theoretical and policymaking attention since the financial crash of 2007-8, not least in ongoing debates about the appropriate forms and degrees of regulation to be applied to financial markets. Instead, we will draw on the conclusions in this chapter regarding the appearance of private hoards and the necessary monetary excess this entails to consider, in the next, the appearance and growth of an immense (and immensely complex) set of quasi-banking institutions that constitute the principal form that this monetary excess has taken.

For SFC representations of the economy, and for post-Keynesianism more generally, the appearance of the so-called "shadow banking system" makes manifest the more theoretical of the necessary monetary excess. If under the classic period of "Keynesian" regulation, and in particular the relatively controlled circulation of global money forms that Bretton Woods imposed, this excess was (in practice) managed and regulated, it has now far outstripped the boundaries within which a national economy can plausibly attempt to

regulate its movements. The world has become increasingly less “Keynesian”, both in practice and at the level of theory.

Leaks and the contradictions of the circuit

This chapter has looked at Keynes’ attempts to resolve some of the problems opened up by the *General Theory*’s core discussion of the balance between savings-investment and the demand for money. The discussion both in the book and immediately afterwards is fundamental to the subsequent development of macroeconomic theory but, as we have attempted to show, it opens up some irreconcilable differences between some of Keynes’ insights – partially developed by him and others – and the standard approach to macroeconomics, dependent on a quantity theory of money and with an “irreducible psychological dimension” (Brunhoff 1976: 41) motivating the flows of money around the circuit. In particular, we attempt to show that Keynes’ own attempts to overcome the contradictions of the *General Theory* through the financial demand for money demonstrate the incompatibility of money seen as a *flow* around a circuit, and money as a *stock* that determines prices. Leaks from the system can occur, in the form of hoarding, driven by the uncertainty and sequencing of processes that inherent to a genuinely dynamic capitalist economy.

These leaks, in turn, undermine any presentation of the economy as only a *single* set of flow relationships. Once the monetary circuit is open-ended and indeterminate, as we suggest above, it cannot be reliably presented as a single system. Stock-flow consistent models, by the nature, attempt to present the entire economy as just that: a single system of stocks and flows mediated by money. But once the forms of money become unstable, as they do when leaks of indeterminate duration appear in the system, the stock-flow representation can no longer be said to be consistent: it will balance only under exceptional circumstances, reducing it from a general representation of a “monetary production economy” to one that functions only in the particular case where uncertainty a priori has no impact on the flow of the money circuit. Since, however, this at least implies an economy without money, and probably one in which perfect planning is possible, SFC is weakened as a convincing modelling strategy.

CHAPTER EIGHT

BANKS, SHADOW BANKS, AND INCONSISTENCIES

Introduction

The preceding chapters have introduced the SFC presentation of the world, and attempted to tease out some of the anomalies this causes. Two have been outstanding: the first is the need to identify production as a sequence of events known ex ante, as in the circuitist literature, rather than as the ex post financial presentation that SFC relies on; the second is the presence of uncertainty and the consequences this has for the functioning of money within the circuit of capital.

The SFC representation we have discussed so far makes some strong institutional claims about the role of banks and financial institutions within the macroeconomy. In stark contrast to orthodox, neoclassical treatments, SFC (at least as in the main strand that has developed, post-Tobin) draws on a longstanding literature within post-Keynesianism to present banks as not the passive intermediaries of an exogenous money supply, but active agents in the creation and supply of money. Banks then take on an absolutely core function within the wider economy, supplying the necessary funding without which (in SFC representations) wider activity cannot take place.

But this strong claim about the role and function of banks can be challenged. While few would seriously dispute the centrality of banking – even if conventional macro models tend to exclude a meaningful role for them – it is not necessarily the case that banks are *the* critical driver of capital accumulation and the wider circuits of money and capital. In particular, financialisation over the last thirty or so years has tended to drive banking functions *away* from the representation presumed as central in conventional SFC accounts. And the underlying theory of money needed to sustain the SFC representation can, in turn, be challenged.

As the third chapter suggested, neoclassical economics has a specific understandings of uncertainty and money that lead to derive clear theoretical conclusions: the intermediary role of banks, the passive role of money, and the separability of uncertainty from institutions chief amongst them. SFC models, in their standard form, have much to say on money; much to say on banks; but little directly on uncertainty. We have attempted to

resolve some of that, with a presentation of banks as endogenous money creators (as in SFC); uncertainty as prevalent in any plausible monetary circuit of production; and of the excess of financing, relative to assumed needs, that recurs repeatedly once uncertainty is introduced as a feature of the circuit as such, and of firms' decisionmaking in particular. This, in turn, has led, following those theories of credit influenced by Marx, into a consideration of the anti-Quantity Theory of money as the best means to reconcile the separate elements in a clear and consistent fashion. The appearance of a "monetary excess" – of money in existence over and above its apparent need to finance production – has been stressed throughout.

At present, the analysis has been conducted at high level of abstraction. We have not looked in more detail at the forms of the institutions that have developed to handle these different elements within the economy. This chapter attempts to provide a "thicker" description of the appearance of this "monetary excess" in its modern form: of the hoarding that has occurred over the last decade or so, taking a very particular form that presents a direct challenge (we argue) to simple SFC presentations. We introduce a few new elements to the outline to help explain this, returning to some of the themes about social norms and wider social institutions introduced at the start of the thesis.

This chapter first examines briefly neoclassical theories of banking, and how these fail to stand up to the observed institutional and functional changes that the financial system has undergone over the last few decades. We explore here, in particular, the suggested role banks play in the management of risk, and how neoclassical theories of risk have failed to account for the transformation of banking. The chapter looks in detail at the functioning of the so-called "shadow banking system", proposing that financialisation has led to the development of a non-depository banking function. This banking function conflicts with the representation claimed for banks inside conventional SFC models, and we develop a brief account of how an SFC representation cannot adequately capture shadow banking behaviour. We conclude with a brief summary of the theory of credit money underlying the post-Keynesian SFC model, and indicate ways in which this can be improved – to be considered more fully in the subsequent chapter.

I. BANKS, UNCERTAINTY, AND INSTITUTIONS

Banks' risk management functions

A strong prediction of the neoclassical theory of banking, where banks essentially appear only to overcome information asymmetries amongst agents, is that the proliferation of information technologies and their falling cost should act to reduce the need for banks as institutions. Yet recent history directly contradicts this prediction, as Allen and Santomero (2001) indicate. The costs of acquiring and processing information have dropped sharply as a result of improvements in information technology. But this has occurred at the same time as financial intermediaries have massively expanded – exactly the opposite of the prediction. Some alternative explanation is needed, if the core neoclassical system is to be kept in place. Allen and Santomero (1998, 2001) have proposed that we broaden the neoclassical theory consider financial intermediaries as institutions that specialise in the management of risk. They claim (Allen and Santomero 1998) that a "functional perspective" (Merton 1989) of the financial system, analysing its activities by considering the functions it performs, provides a better way to understand its transformation over the last few years than the "institutional perspective" provided by the information-theoretic approach. Institutions change substantially, in ways not related to the economics of information, but functions are far more stable. (Allen and Santomero 1998: 1465-1466). This focus on functions, rather than institutions, helps account for the changing balance of banking activities in the period of globalisation – away, Allen and Santomero argue, from traditional information-management favoured by neoclassical theory, and towards risk management.

Scholtens and van Wensveen (2000) argue to the contrary that banks have *always* been the management of risk, citing "merchant bankers in the Italian Renaissance", the first "true investment bankers" of the Dutch Republic, and "even the seemingly dull business of savings and loan associations and credit unions in the US in the 1950s" as examples of financial intermediaries deeply concerned with the management of risk. In a similar vein, (Haug and Taleb 2008) propose that the Black-Scholes-Merton option pricing formula, developed in the 1970s as supposedly a new means to manage risk, is merely a scholastic rewriting of longstanding practice amongst option traders – and that this and other academic formulae are largely irrelevant to the actual business of trading. Options were actively traded in the pre-modern financial world and, moreover, attempts to formalise the practices – what Haug and Taleb refer to as the *techne* of trading – simply introduced unnecessary tail risks and fragilities.

Much of this seems true, and obviously so. Financial institutions have always had to deal with risk to some extent. Derivatives existed for many years before their academic pricing models. However, the argument that there exists nothing new under the financial sun cannot account for the similarly obvious shift in banks' activities, as seen in their balance sheets, over the decades since the 1970s. For most of banks' existence, they did *not* earn the majority of their accounting profits on the basis of fees income and off-balance sheet activities. Similarly, the majority of transactions by major banks were *not* between other major banks, as approximately 70 per cent of banking transactions now are. Under these circumstances, the *character* of major banks themselves has changed.

Allen and Santamero propose a cross-section test for what they argue is a "fundamental" importance of risk-management in explaining differences in banking systems across economies. Banks in Japan, Germany and France are under less pressure from financial markets than those in the US and UK. As a result, they have been able to manage risk through intertemporal smoothing, building up reserves of safe, low yielding assets when returns are high to be drawn upon when returns elsewhere are low. US and UK banks, by contrast, can no longer rely on intertemporal smoothing as competition amongst assets leads to a high level of withdrawals from their reserves by households. They cannot use reserves to manage risk, and so rely on derivatives and similar techniques (Allen and Santomero 2001). The pace of financial innovation is faster in the Anglo-Saxon economies. Supporting evidence is provided by Tsai, Chang et al. (2011), who find a correlation between the quality of private credit reporting systems in a country, and the entry of foreign banks. Banks are more likely to enter countries where credit reporting is robust. Tsai et al., sticking to the standard neoclassical frame, attribute this to information asymmetries for new entrant banks – akin to their bias towards own-language economies when entering new markets (Buch 2000).

Risk management challenged

Lapavitsas and dos Santos (2008) dismiss Allen and Santomero's focus on risk, claiming that since bank's risk management functions were demonstrably inadequate during the 2007-9 financial crisis, the theory does not hold up. Risks that developed particularly around housing loans were hopelessly mispriced and badly managed, and so "[t]here seems to be little mileage in an analytical framework founded on the presumed ability of financial

intermediaries to manage risk." (34) But this is a weak objection. The fact that an institution apparently performs its tasks badly does not mean that those tasks are not part of its functions. dos Santos elsewhere notes banks' risk-management activities are an adjunct to their more fundamental purpose of credit creation, perhaps underplaying the overwhelming importance of non-standard activities to banks' functioning (Dos Santos 2011).

Where they are on stronger grounds is noting the theoretical deficiencies of Allen and Santomero's analysis, which they view as inferior even to the information-theoretic approach. Allen and Santomero do not define closely their meaning of risk, relying heavily on empirical evidence in both the papers under discussion (1998; 2001); but as we have argued earlier, a failure to theoretically apprehend risk is at the heart of the failure of the neoclassical approach to understand the development of financial markets and institutions over the last twenty years or more. Simply noting a change is not good enough, and theoretical hole at the centre of Allen and Santomero's work leaves them open to the charge presented by Lapavitsas and dos Santos.

The two approaches directly contradict. Information is the opposite of trust, since if it was possible to have complete information – including information about all future states of the world, based on future actions – trust would be unnecessary. This is, at heart, Hayek's insight into the functioning of a market society: collective organisation, of any sort – from trade unions to the nation-state – were a throwback to a pre-modern social order. The market order had to be constructed against collectivism, offering a rational means to organise an increasingly complex society that did not depend upon – indeed, was explicitly destructive of – collectivities and trust.

Information, in this world, is not just opposed to trust: it is the enemy of trust. Trust matters only where information cannot be properly organised; and information is only properly organised through the "extended order" of market relations against the collectivism of our distant past (Hayek 1991). A guard is necessary against these collective urges, for which a state is required, but a limited state that seeks to preserve property relations and break up trusts and combines where these threaten the functioning of the law (Hayek 1960). A well-organised market society would have no need for trust, as conceived here. Market relations and enforced property rights would suffice.

Yet the presence of trust points directly to the presence of the necessarily social and historically determined character of banking: just as Allen and Santomero, adapting a broadly neoclassical frame, fail to develop a notion of risk or uncertainty beyond empirical observation, in a similar fashion the Hayekian theory of social development fails to develop a notion of trust as anything other than the property of individual relationships. But it is money's character as the pre-eminent form of social relationships within the economy – its necessary role as the *universal equivalent*, against which all other relationships are judged, measured, and valued – that demands foundations of social trust. Money is not, and to function as money *cannot*, be solely a relationship between privately-contracting individuals. It must come with society attached. The failure of information-based theories of banking and bank development is exactly that this necessary property of money as such is lost.

Trust and banking

Lapavitsas is correct to indicate the importance of the development of trust amongst banks. Where he errs somewhat is in claiming that this trust emerges only spontaneously, as part of the general transactions that banks perform amongst themselves. Banks, as he notes, are distinct from other capitalist enterprises: the division of labour amongst industrial capitalists gives a material basis for the development of trust, as firms occupy different locations within the production process and so come to rely on each other for materials and markets. Commercial credit, offered on a "buy now, pay later" basis, therefore has a solid material footing.

Banks, on the other hand, do not use and exploit labour in the same way. Their strength or fragility depends not their success in mobilizing and organizing their capital and labour, but on their own balance sheets. Trust matters insofar as those balance sheets can be respected. Banks loaning to industrial capital can attempt to assess the creditworthiness of individual enterprises, using their own knowledge of the concern or the industry, or through the development of credit-scoring techniques. In all cases the aim is to mitigate the uncertainty that necessarily attaches itself to credit relations extended through time.

Depositors into banks, in comparison, operate in a dense fog of uncertainty. Knowledge of a banks' balance sheet at any given point in time, given the complexity of any bank's relationship to its creditors and debtors, may not be a reliable guide to its true stability. As

Lapavitsas says, the "truly remarkable aspect of financial intermediation is not the lending of money by banks; rather it is the action of capitalists to deposit idle money with banks on the basis of mere promises to pay." (Lapavitsas 2003: 82) The inherent instability of fractional reserve banking, with the ever-present threat of bank runs, is due to this heavy dependence on trust. A certain suspension of disbelief is required for the system to function at all. It is precisely on this basis that the regulation of bank deposits began to emerge, first through the appearance of lenders of last resort, and later through legal means such as the provision of deposit insurance. The deposit and loan functions of banks, in relation to wider society, came to enjoy a comparatively secure foundation on the state.

Once again, we are brought back to the convoluted relationship between state debt, and private credit. The state was present at the birth of the modern credit system and if it acted more as midwife than mother, *pace* chartalism, it has taken a keen interest in the child ever since. It was the expansion of state expenditure, most obviously for war, that compelled the initial creation of a monopoly central bank capable of managing the state's burgeoning finances – first, unsuccessfully in the Dutch Republic in 1609, and then later, more dramatically, through the formation of the Swedish Riksbank in 1664 and the Bank of England in 1694. The state, with its immense ideological reserves and – more pertinently – its powers of taxation provides the necessary basis of trust – even faith – in the functioning of financial markets that competitive private capital, alone, cannot engender. "Public credit becomes the *credo* of capital. And with the rise of national debt-making, want of faith in the national debt takes the place of the blasphemy against the Holy Ghost, which may not be forgiven." (Marx 1976: vol 1., ch.31)

Lapavitsas then ascribes the same process to the development of interbank money markets, with private institutions founded on trust inducing state support. Bank reserves require management, as the timing of deposits and withdrawals for any one institution is uncertain. They therefore look to manage their reserves through trade with other banks. Banks continually assess each others' own abilities to pay through the institution of the money market, upon which an interest rate, applicable to the whole of society, can emerge. It standardizes and makes "homogenous" the private uncertainties present on individual banks balance sheets, and in doing so makes a social property of the systems' perceived stability (Lapavitsas 2003: 83). But the appearance of this stability is not dependent on the banking system itself: it is a property of the wider credit system and, in particular, the capacity of the lender of last resort, the central bank, to mobilise its own powers through

the provision of a discount window and other short-term credit facilities, priced at a discount rate that remains (largely) under its own control. The sequencing of this is important: modern interbank markets began to operate only after the state had secured a central bank as an effective lender of last resort.

On one side, the state appears *after* private banks' own initiative in becoming modern deposit-taking, loan-making institutions reliant on fractional reserves. On the other, it appears *before* the creation of the interbank market that banks, now expanded enormously, rely upon to manage their own reserves. The relationship is, in neither case, purely in one direction – states leading banks, or banks leading states; it is dependent on the nature of the specific function being performed.

The asymmetry here is crucial to the state-bank relationship, and in particular to the ability of the banks (collectively) to act as a general repository for capital. SFC models highlight the ability of banks to provide a "buffer" for capital accumulation more generally, their balance sheets acting as the "flexible component" on which other accumulating sectors can rely to overcome the uncertainties inherent to the process of capital accumulation (Godley 2004a: 6). The buffer itself is a combination of both the banks' great flexibility in being able to provide credit, essentially as demanded, and the overwhelming need to maintain social trust in themselves as providers of that credit. Maintaining this delicate balance between two, clearly conflicting, interests has been treated as the pre-eminent role of the state, and of regulation, within the banking system. It is precisely because this relationship cannot be a priori determined that active *regulation* as such, rather than merely passive *rules* and private contracts (as Hayek's theory would suggest), have been so essential to banking. Although disguised somewhat during the so-called Great Moderation, this essential feature of a capitalist banking system has reasserted itself with a vengeance since, as debates around macro-prudential regulation, post-crash, attest (Clement 2010).

Regulation as the mediator for uncertainty

Regulation is the counterpoint to the uneasy dance between state and private capital. It is the capacity to apply norms, distinct from binding laws, that delineates the relationship as it has evolved in the development of capitalism. Different national capitalisms have adopted different balances between formal law and informal regulations: from the purportedly "gentlemanly capitalism" of the Victorian City of London (Cain and Hopkins

1993), to the subordinate role of private banks to state credit creation in Wilhelmine Germany (Gerschenkron 1962) or twentieth century Japan (Johnson 1982). This broad-brush picture obviously obscures much of the detail; but it is not controversial to arrange national capitalisms, throughout their development, on a regulatory spectrum of credit systems, from law-bound and state-controlled to more laissez-faire.

The period since the 1970s has seen deep changes in the structures of financial markets, relationships between financial institutions and the real economy, and relationships between states and financial institutions. Collectively, these sets of transformations are often referred to as "financialisation": the widening and the deepening of financial activities across economy and society, assisted by a process of state-led transformation of financial relationships (Helleiner 1994) and the dramatic internationalisation of finance.

A popular view holds that the period since the collapse of the Bretton Woods system, and the dominance of neoliberal policymaking, is one solely (or very largely) by deregulation alone – by the steady removal of state and regulatory controls over how finance operates (Eatwell and Taylor 2000). While this captures an important element of the truth, it is more accurate to indicate the ways in which state and regulators have shaped the development of finance over time: that, far from withdrawing and allowing a completely autonomous process of "financial innovation" to occur, the presence of states and regulators have helped determine the shape of financial processes and institutions. Even if negatively, through a process of "regulatory arbitrage", it is the presence of regulations that determined outcomes.

For the so-called "shadow banking system", consisting of an immense range of off-balance sheet financial processes, regulatory arbitrage has been an important (arguably the most important determinant) in their development (FSB 2011: 5). The presence, for instance, of limited insurance for conventional deposits helped drive demand for non-bank deposits (Gorton and Metrick 2010). And it has been suggested that reactions to the US Dodd-Frank act (alongside Basel III) have helped sustain demand for non-bank banking processes (Poszar and Singh 2011: 15). But regulations have impacted on these activities in a positive sense: the provisions of the Basel II agreement on capital adequacy ratios helped drive demand in banks for (allegedly) sophisticated risk management. Nor does regulation have to be driven by states, or agreements between states: the credit rating agencies performed an effective regulatory function, in providing credit assurances for complex new financial products, despite the major CRAs being wholly private concerns.

II. THE SHADOW BANKING SYSTEM

New institutions and the shadow banking system

The set of institutions and relationships that collectively are known as the shadow banking system requires careful attention. But the system itself somewhat ill-defined, at least at the level of determining its component parts. Gorton and Metrick (2010) attempt to delineate the term in their discussion of banking regulation following the financial crisis. They provide a rather mixed bag of off-balance sheet, non-traditional banking activities: the growth of money market mutual funds, securitization, repo agreements, and a rising demand for collateral. It is not, unfortunately, clear what would link all these elements, beyond the obvious case that they are all activities now undertaken by banks. There is no analytical case made to regard this (or any other) list as a definitive description, or anything like it. And the list of options can vary, often depending on the preferred focus of the observer: BIS' Financial Stability Board have defined shadow banking as a "system of credit intermediation" that, typically for a regulator, "raises concerns" (FSB 2011); from Harvard Law School's "Forum on Corporate Governance", we find that shadow banking is "maturity transformation… outside the terms of the banking social contract" (Ricks 2010). All of this is true, in its own terms, but does not get us much closer to answering the question.

The "bucket" approach to definition has been correctly described as an obstacle to clarity (Schwarz 2012: 620). Deloitte's more recent estimates for the size of the sector have attempted to impose a little more clarity, defining what they claim is a consensus on activities that encompass credit intermediation using market – not bank – mechanisms; funds raised without state guarantees; and no privileged access to a central bank in the event of liquidity problems (Kocjan, Ogilvie et al. 2012: 5). They exclude from the list both leverage, noting that it is not necessary to shadow bank-like activities, and, interestingly, whether a procedure or institution is off or on the formal balance sheet – the result of regulatory changes, as "[w]ith new accounting treatments issued in 2009, many such entities are now consolidated" (Kocjan, Ogilvie et al. 2012: 5). This last point will prove to be important to stock-flow representations of financial flows, as we will see shortly.

Yet clearly the question of definition matters: off-balance sheet activities, on some estimates for recent years, have dominated banks' total, conventional assets, and clearly

remain both enormously large – and potentially dangerous. By any reasonable measure, the mixture of non-depository activities and institutions that are generally held to make up the shadow banking system have grown exponentially over the last decade. It is likely that off-balance sheet activities by banks, and non-depository credit creation, are now at least as large as the traditional deposit-based banking system (Turner 2011). One estimate placed the total value of assets under management in US shadow banks at $10.5tr in early 2007, or slightly larger than the conventional banking system at the time (Geithner 2008). It has shrunk significantly since then, with Deloitte estimating around $9.5tr assets under management in the US by the last quarter of 2012 (Kocjan, Ogilvie et al. 2012).

Defining what these activities are, why they are undertaken, and how they relate to the more conventional financial and monetary system is of importance. The period of financialisation has created an innovative new form of credit-creation that, by itself, poses a challenge to conventional understandings of that process. The neoclassical theorisation we have briefly dealt with, and largely found wanting; but while we have noted the post-Keynesian SFC alternative, as we attempt to show below it cannot properly understand the operations of what is by now a crucial part of the financial system globally – and one that, moreover, played an obvious and immediate role in the crash of 2007-8.

The demand for shadow banking

In practice, the best route to understanding the appearance and role of the shadow banking system is less through attempts to pull apart the intricacies of its operations.[14] Rather, it is in understanding the drivers of demand for shadow banking operations, and how this (in turn) shaped the context in which shadow banking emerged. The supply-side matters here, of course, with the wider processes of deregulation and computerisation (allied to a growing sophistication of technique) allowing shadow banking operations to emerge. But it was demand for these operations that pulled the individual elements of the system into a truly *systemic* shape.

Demand for its operations arose as a result of what is sometimes labelled a "global savings glut" (Bernanke 2005) but which can more accurately be thought of as the product of financialisation itself in creating immense concentrations of wealth, like corporate cash

[14] One particularly ambitious example of this is the extraordinarily intricate schematic "map" of the shadow banking system presented in Pozsar, Z., T. Adrian, et al. (2010). Shadow banking. Staff reports. New York, Federal Reserve Bank of New York.

holdings, searching for a safe home (Borio and Disyata 2011). Financialisation, by both promoting a turn towards financial operations amongst corporations alongside a secular decline in tangible investment, and by driving an dramatic increase in inequality, created huge pools of wealth held in private hands (Poszar 2011: 5). These pools generally had little to do with traditional household savings, which remained broadly flat (and, in net terms, turned sharply negative in the heavily financialised Anglo-Saxon economies). Instead, corporations and asset managers dominated the demand for the more exotic forms of asset – with the crucial proviso that these new instruments were both safe, and liquid (Caballero 2010; Poszar 2011). Indeed, Caballero argues convincingly that the well-known international imbalances between surplus and deficit economies (often reduced to just US vs. China) had little to do with the crisis of 2007-8, when it arrived: far from the "sudden stop" that the "global savings glut" would predict, when the system crashed net inflows to the US had a "stabilising character". The biggest element of weakness in the system turned out not to be the public accumulation of reserves, driven by the imbalances and deliberate sterilisation policy (with China as the particular villain), as the privately-generated demand pressure for assets that were both seemingly safe and liquid. Once the system shook, these synthetic, seemingly safe assets disintegrated rapidly, fuelling further collapse and a rush towards safety – facilitated ultimately by government-led bailouts (Caballero 2010).

This particular asset demand relates directly to financialisation. Corporate savings, on one side, grew globally from $50bn in 1990, to $750bn immediately before the crash, in 2007. They have continued to rise, albeit at a slower rate, topping $1.2tr by the close of 2010 (Poszar 2011). As in the earlier expansion of the bond market (Warburton 1999: 13) over the 1980s and 1990s, requirements from government for borrowing – especially in the US – helped mop up some of the demand for safe, but comparatively liquid, assets. As has received wide attention, much of the demand for these US government assets was soaked up by the reserve requirements of surplus countries, with longer-term T-bills and other government bonds being particularly favoured by reserve managers. But there remained huge potential reserves of demand for *short-term* safe assets, driven by the pools of private, non-government wealth now extant. Securitisation provided an apparently reliable means to create assets that could be used in this way.

In other words, the expansion of finance and the processes of financialisation itself – particularly if considered in the context of diminishing investment opportunities elsewhere in the economy – helped create the market for the shadow banking system, pulling it into

shape over the 2000s. Alongside this, as wealth became increasingly concentrated towards the top end of income distribution – reversing a previous, post-war trend, at least in the West, towards greater equality – the new concentrations of private wealth imposed their own asset management problems. By creating assets that were seemingly as liquid (or nearly as liquid) as cash holdings, but that offered comparatively high, secure rates of return, securitisation helped in turn sustain the plentiful creation of credit back into the real economy. Barwell and Burrows (2011), provide a stylised example of the process by which global imbalances could translate, indirectly through the choices of the financial system – rather than directly, in real terms, through supposedly neutral intermediaries - into the expansion of assets and liabilities in the wider economy. Once the technical capacities were in place to generate synthetic, seemingly safe and definitively liquid assets, it required the mobilisation of demand for financing of this kind that financialisaiton had generated to pull the shadow banking system into operation.

Shadow banking operations described

A singular feature of the shadow banking system is precisely its complexity. A great mass of functions, otherwise relatively tractably executed inside conventional banking institutions, are combined across institutional boundaries to enable the process of non-depository credit creation to function. Pozsar, Adrian et al. (2010) have attempted to completely "map" the separate elements of the system, describing both the units involved and the relationships between them: the resulting diagram is of startling complexity, and functions best when blown up to wall-poster size (Tett 2010). Nonetheless, at a suitably high level of abstraction, it is possible to derive four main elements, the specific sequencing of which defines the whole system. Securitisation, and the development and extension of securitisation techniques, allowed the formation of an "intermediation chain", with assets passed from process to process in response to demand for credit (Pozsar, Adrian et al. 2010: 1). Securitisation allowed the conversion, at its most abstract, of income streams into financial assets that could, in turn, be traded, used as collateral, or accumulated. The shadow banking system is a privately-organised network, quite distinct from – and indeed often in simple opposition to – the tightly-regulated official banking system. Each element within the network has its own requirements for profitability, and none of the separate elements, taken by itself, constitutes the entire system: it is only their appearance within the system that forms them as part of the shadow banking system.

This last point is germane. While the conventional banks had, in effect, a very strong integration of intermediation processes, centralising within themselves the process of credit creation and subject to immediate regulation by the state, the shadow banking system operates to a wholly different principle: it is its very separatedness that allows it to operate, since every distinct part of the system can function independently of the system as a whole; yet the operation of each element, privately-determined and pursuing its own goals of maximising revenues, creates the system as a whole. These are market-led, not institution-led, processes. We take, in other words, a *functional* approach to understanding the shadow banking system: it is best understood precisely as a *system*, containing defined functions, than as a complex set of institutions.

The core elements within this system are securitisation of income streams arising from credit elsewhere in the economy – typically, but not necessarily, housing loans; and the development of repurchase agreements as the distinctive form of non-depository credit creation, dependent on the use of securitised assets (Claessens, Pozsar et al. 2012). Given the presence of securitisation, and the ability to manufacture, essentially on demand – at least during the years of the boom – assets capable of acting as collateral within loan transaction, the potential was in place to allow the enormous expansion of forms of credit creation that did not rely, at any point, on either the presence or the creation of deposits as such. Conventional banking theory, of course, stresses the need for *prior* deposits to allow the creation of further credit, under the presumption of the money multiplier and fractional reserve banking. The endogenous money systems we have considered so far in relation to SFC modelling *create* deposits as a result of the making of loans.

The need for collateral is substantial because, unlike the traditional depository banking system, the shadow banking system has no form of deposit insurance. Collateral is instead offered as a means to provide additional security against the failure of loans. But once the means to generate cheap and (apparently) robust collateral was delivered, as through the process of securitisation (of home loans especially), the system could expand immensely. With credit ratings agencies as the overseers of the process, and notoriously willing to grant top ratings to fundamentally dubious synthetic financial instruments, this expansion could appear entirely robust until it was overtaken by the debacle of 2007-8.

Securitisation mimics conventional banking procedures insofar as it involves maturity transformation. However, whereas conventional banks seek to transform long-term assets (loans) into short-term liabilities (deposits) – a process that *creates* credit risk when new

deposits are made – the shadow banking system seeks instead to manage and spread the risk of an already-existing income stream. This is done through the tranching of flows of income into streams arranged by risk, using a first, off-balance sheet, special purpose vehicle (SPV) allowing the risks attached to be (theoretically) managed, and a new, long-term security to be created. Tranching allowed the creation of a developed hierarchy of cash flow, with those holding subordinate (junior) tranches of the security not entitled to repayments until the more senior holders had been paid in full. This more complex structure of repayment, suitably risk-managed, allowed the creation of more complex forms of structured financial assets.

This security is then sold off-balance sheet into a second SPV, acting as a repository for the assets, that can, in turn, issue *short-term*, seemingly safe, assets off the back of the *long-term* security. By (seemingly) managing risks, and through creating separate structures capable of issuing securities, income streams and assets can be transformed. These short-term assets can then be made liquid through either the banks' guarantees for the underlying asset values, or through the use of an MMMF holding these assets and seeking to maintain its own book value and issuing shares as needed (Claessens, Pozsar et al. 2012: 6). Typically, these newly-created assets would be either very short-term (and relatively less sophisticated) Asset-Backed Commercial Paper (ABCP), or, somewhat longer-term, tranched assets like Collateralised Debt Obligations (CDOs) based on complex combinations of risk-adjusted streams of future income. And, notoriously, in the belief that tranching and risk-managed rendered securitised assets more safe than conventional financial products, these newly-created synthetic securities could, in turn, be fed back through the procedure, creating such exotic products as CDO-squared or even (briefly) CDO-cubed and higher powers.

These could reach achieve a quite staggering complexity: Haldane (2009) suggests that a typical CDO-squared prospectus would run to 300 pages, containing 125 CDOs. Each CDO would typically 150 Residential Mortgage-Backed Securities (RMBS), and each RMBS itself held 5,000 mortgages. Since the fundamental principle of pricing and adjusting for risk requires an understanding of the correlations in estimated probabilities of joint default, and since each of these mortgages' joint-default probabilities would need to be estimated for every other mortgage, the sheer size of the computational task ideally required here should be obvious: in practice, it cannot be plausibly performed on a suitable time-scale, and so short-cuts of various kinds (notoriously, the Gaussian copula function implying

correlations can be reduced a simple normal distribution) would be used instead (Li 2000). The presence of this complexity, and the deeply reductionist assumptions needed to skirt round it, has been frequently criticized as a contributory factor in the crash.

Of course, complexity did not help; but this complexity was itself only the by-product of the expansion of credit in the first place. It was the plasiticity of the deregulated shadow-banking environment that allowed such complexity to be produced, but it was the expansion of credit that drove the demand for this level of complexity. "Systemic risk" is not systemic because systems are complex and poorly-understood by their users; a true systemic risk emerges when the procedures of the system as such are at fault.

Once (seemingly) safe, short-term, and liquid assets where available for collateral, the second part of the core shadow banking operations can come in. Where a traditional bank would take deposits from and make loans to its customers, utilising its ability to expand its balance sheet to generate credit, the shadow banking system operates under a quite different principle for the generation of credit. Typically, an institution (say a large investment bank) would generate additional financing by selling a collateral asset to an institutional investor (typically a money market mutual fund, MMMF) in return for a promise to buy back the asset at a future date, for a higher price. This would create a form of loan, typically very short term, and significant demand for collateral was created. What, in conventional credit relationships (and particularly those of the banking system) was a process of liability and asset creation unified within a single institution were now separated: on the *liability* side, shadow banks provided (seemingly) safe claims through securitisation; on the *asset* side, it provided credit to borrowers. The two were mutually dependent, just as their equivalents in the more conventional bank credit creation process (Claessens, Pozsar et al. 2012: 6).

This entire process would take place away from traditional balance sheets, and would generate credit in a wholly new, non-traditional form. To function, a high degree of (non-regulatory) trust was required: in the mathematical models underlying the synthetic assets; in the ability of the credit rating agencies to truly rate credit; and in the ability of the "debtor" side of the repo transactions to make good their promises to repurchase.

Repurchase agreements and non-deposit credit creation

Integral, then, to the shadow banking system is its ability to mobilise off-balance sheet credit in novel new forms. The development of repo agreements is perhaps most striking. In its simplest form, a repo agreement is a contract under which one party sells a security to another, with an agreement to repurchase the security at a higher price later. The buying party, in effect, acts as a lender, with the higher repurchase price acting like interest on a loan. Governments and corporations began using them seriously in the 1960s and 1970s, but it was standardisation of contracts in the late 1980s that helped pave the way for their astronomical private sector expansion over the last few decades (Garbade 2006). The global repo market is estimated to have grown by 19 per cent per annum from 2001 to 2007 (Gorton and Metrick 2010: 15), while the US market alone was estimated to cover $10tr of assets annually at its peak (Hördahl and King 2008). The IMF estimate that by November 2007, it accounted for about half of the activity of the shadow banking system. While the US (in theory) limits rehypothecation to 140 per cent of a clients' debit balance, the UK places no restrictions on the size of rehypothecated assets. Assets were 'churned' – reused in parallel trades – four times over, on average. Accounting for rehypothecation increases the total size of the shadow banking system, measured by assets under management, by at least 50 per cent. The financial crisis has made banks substantially more cautious about its use, but over $2tr remained rehypothecated as of mid-2010 (Singh and Aitken 2010). And given its evident, easy money appeal, it is likely to expand once more.

It is important to note that this is a process of credit creation that is quite distinct from the norm. There is no need for a deposit account to exist from which credit can be created; there is no immediate need for any reserves at all, since the entire operation depends on the provision of suitable collateral in the form of the exchanged security. Gorton and Mettrick describe repo on this basis as "a form of privately created money" (2010: 21). The Federal Reserve previously counted it as part of its M3 measure of the money supply, prior to M3's discontinuation in 2006. However, it is a form of private money that is peculiar to certain institutions: Hordahl and King (2008: 39) note that the top US investment banks funded roughly half their assets using repo markets, compared to very little use by the (tightly regulated) commercial banks. It is the pre-eminent form of credit money creation *inside* the shadow banking system.

The critical feature here is the way in which the repo market can allow the creation of credit money on the basis of securitisation. And the process of securitisation is one of the

principle ways in which the risk commodity is created and distributed. But the reliance on fictitious values in the specific form (securitisation) of a fictitious general commodity is itself dangerously unstable. The crisis demonstrated the rapidity with which securities could disintegrate, leaving banks clutching essentially valueless assets. With the repo market both central to investment banks operations, and absolutely dependent on rapid securitisation, the slump in values was catastrophic for the banks. New issuance of asset-backed securities in the US collapsed, on a month-on-month basis, from $300bn peak in November 2006 to essentially zero by October 2008 (Adrian and Shin 2009). Rapid government intervention was required to prevent the disintegration of the shadow banking system – forcible replacing fictitious values the real value of simple cash.

All this is important for our analytical frame as follows. It hinges, in particular, on two critical sets of relationships in the circuit of capital: that between money and commodity exchange, described by C-M-C, and that between money-capital and expanded money-capital, M-M', with M' representing (as ever) the expansion of value in money form. The credit creation process is conventionally represented by the self-expansion of value, M-M', in which the creation of increased values in the production process itself is hidden: money-capital is advanced, and then returned later in time with additional value. This can appear conventionally in the form of interest-bearing capital, in which money takes on the direct appearance of self-expansion through the interest rate. Or it can, as we have indicated, appear unconventionally in the repo market, through the repurchasing of commodities.

It is this repurchase of commodities that provides the link into commodity circulation in general. Commodity exchange, C-M-C, is necessarily the exchange of equal values; as a simple statement of fact, without formally equal exchange, mediated in this instance by money, no exchange would occur: there is no direct compulsion to exchange, and so equality prevails in the action of exchange. Yet this is the *simulated* transfer of values: in practice, it is merely a species of convention that defines the transfer as one of commodities. The commodities are, in a very specific sense, "fictitious": at best, they are representations of value, dependent on accounting conventions, that may be flowing elsewhere within the system.

It is this fictitious quality that makes the apparent exchange of commodities, in turn mobilising the apparent expansion of monetary values, so readily subject to disruption. This instability in measured value the direct result of the commodity's fictitious nature – it can be duplicated and reproduced, in identical form, without a costly production process. This

can be seen most obviously in the process of rehypothecation, in which the same security could be used repeatedly for different repo agreements. There is no real exchange of value here, since this would imply single, sequential trades, with the collateral security moving from agent to agent; instead, the fictitious nature of the commodity is exploited to provide apparently stable collateral in parallel trades. This is a distinct operation from using the same asset as collateral for a conventional loan arrangement, since the asset is in fact *exchanged* to engender the repo agreement and unlock the credit. Rehypothecation involves the parallel use of the same asset in multiple trades.

The effect, however, is to allow the creation of greater and greater volumes of private credit money. This duplication is quite distinct from the usual circulation of commodities, which do not have the feature of being open for use in parallel transactions: they have to be used, by definition, sequentially, exchanged from agent to agent. However, we should note that the standard rule of commodity exchange – that it is value-preserving – remains in place under securitisation. Trading and re-trading the same security does not create new value: the same value embodied, underneath the layers of complexity that securitisation creates, is traded. There is no reason to grant this new exchange mysterious new properties. That, in turn, implies that the relationship between the creation of credit and the underlying asset values, expressed in money, must become increasingly tenuous. And there is very clearly a Ponzi element to the process, since no new value is entering the exchange. The fragility of the arrangement should be clear, as in Minsky's (1993) description of financial fragility.

Note that this process is itself dependent on the *representation of the process*, and on the trust in that representation, rather than on anything approaching a genuine exchange of equal values. It is this dependency on representation and on convention that makes shadow banking – and key processes like securitisation and rehypothecation in particular – so difficult for SFC models to handle. They, too, depend on an accounting convention for their consistency: that of the double-entry book-keeping principle, expanded (under SFC conditions) to quadruple-entry. Assets and liabilities must balance because that is how a balance sheet functions. Yet we have in the shadow banking system the expansion of (apparent) value and the creation of credit money in a process that subverts the formal rules of accounting that SFC depends upon to function.

It is precisely this attempt to circumvent what are otherwise the well-defined procedures of public trust, and state-led regulation, through the creation and use of an artificial

commodity, that opens the shadow banking system up to such gross instability. The trade of commodities, ideally, does not depend on public intervention: there is no necessary third force that intervenes in any individual exchange, and his much is key to the principle of the exchange of equal values: the exchanged is not forced, is freely entered into, and is decentralised in a fundamental sense.

This does not, however, apply to banking. Banking is pre-eminently, as we have discussed, a creature of both trust and therefore of regulation. The closest it has got historically to a form of privatised, decentralised credit relation is in the periods of relatively free banking, prior to the creation of a (state recognised) central-bank: in the US, this period was closed with the creation of the Federal Reserve in 1912, and then ended definitively with the appearance of deposit protection. It is precisely because banks cannot, in practice, decentralise the procedures of trust necessary to sustain their own operations that they end u, again in practice, reliant on the state or at least some external form of regulator. This helps explain the absolute centrality of government's own lending to the rest of the system: a state's borrowing can appear as the stable, zero-risk point for the rest of the structure of credit transactions.

It is precisely because there is *no* immediate exchange of equivalents that credit transactions contain this riskiness. At the same time, it is fundamental to credit transactions that this exchange of equivalents should not exist: or else the transaction would not be a true credit transaction, since there would be no gain of value by the debtor. Yet this fundamental principle is seemingly violated by the operations of the shadow banking system: there is, in a repo transaction, an exchange of (seemingly) equivalents. Collateral is offered in exchange for a payment; the same collateral is then repurchased, by prior agreement, creating what appears to be (in effect) a rate of interest. This apparent rate of interest can be shown as the difference between the initial purchase price (*Y*), and the repurchase price (*X*), expressed as a ratio to the initial price: *(Y-X)/X*. This "repo rate" approximates the operation of the rate of interest in the more conventional bond markets.

It is not, however, the same. Whereas a conventional credit transaction contains no exchange of equivalents, a repo transaction seemingly contains a trade: a valuable asset is exchanged in return for cash. The twist here is the offer of a repurchase agreement – an offer to (usually very rapidly) trade the asset back at a somewhat increased rate. For this to function, it is necessary for the asset to be sold (and repurchased) only at less than its market value; if this is not done, there is no incentive for the creditor to repurchase.

Similarly, given the risk of a default (failure to repurchase), the haircut represents a hedge for the debtor. This "haircut", expressing the difference between the initial sale price of the asset and its mark-to-market value, then, is absolutely critical to the operation of the procedure.

The haircut expresses the instability of the whole procedure. In the first instance this arises because it is required to perform two, distinct, tasks: to both ensure the purchase-repurchase trade will occur; and to safeguard the initial purchaser against risk. The first is determined by the willingness of counterparties to trade, and can be dependent on supply-side factors; the second depends, more directly, on perceptions of risk. While it can clearly by seen that, in situations of market distress, haircuts demanded rise precipitously (as occurred over 2007-8), in more stable times it is not clear which element will dominate. In practice, there are no commonly accepted frameworks for pricing haircuts, and there has been a proliferation of different techniques. Dang and Holmstrom (2011) find that haircuts for the same type of collateral will vary depending on the counterparty, although elsewhere ratings agency Fitch has discovered no correlation (Fitch 2012).

But the instability runs deeper than this problem at the level of knowledge; that is, the epistemological issue that arises when confronting an unknown future, and, therefore, the difficulties in rationally pricing it. Repo embodies a deeper form of instability since to function as a credit transaction it depends, at its heart, on the creation of an absence: on the appearance of a "gap" between what the market actually will bear for a commodity, and what the putative borrower will be willing to accept for the privilege of being able to generate the credit. This differs from secured, collateralised lending more generally – whether on small-scale, as in pawnbroking, or in very large property transactions – since the collateral itself *must* be traded for the credit to exist – rather than, as is more usually the case, the collateral to be traded *only* when the loan fails. But the trade cannot occur as an exchange of equals, because the inequality in the exchange (stretched over time) generates the credit. Because there is no equality of exchange, and because the trade occurs with a necessary absence – enforced by those trading, in effect, agreeing to suspend the usual rules of trade – repo must always present a form of risk to the system as a whole. Securitised, fictitious assets were hugely useful to this process: since they embodied a market value that was itself *constructed by institutional procedures*, rather than through the process of exchange directly, their very plasticity made them very desirable for the processes of exchange as such.

This construction took place through private procedures, operating in broadly competitive conditions. It was not, and is not, the more conventional mode in which prices can be artificially restricted or altered by cartel, monopoly, or government decree: no third agent intervened. Financialisation has thrown up any number of examples of rigged and manipulated markets and prices, from individual frauds to institutional failures like LIBOR-rigging. Stenfors (2012) provides a valuable discussion of the latter. But the subversion of the exchange-determined price entailed in the process of repo credit is different to these essentially contingent factors; it was essential to the process of price-formation, not the obvious undermining of the procedure. And it could come into existence precisely because of the *absence* of more conventional regulatory forms that determine the structure of markets for interest rates: from government lending, particularly of T-bills, to establish the "risk-free" rate, to the specific forms of regulation created in an attempt to stabilise conventional banking. Shadow banking relies on both: it requires the plastic form of credit money, operating elsewhere in the system, to enable the generation of new forms of credit; and it requires the operation of interest rates elsewhere in the system to act as its own reference point. It does not, however, directly rely on either.

For this operation to succeed, although the form of it was entirely private and taking place in sphere quite distinct from the conventional, regulated, on-balance sheet financial, it demanded a level of functioning trust between institutions. The risk of malfeasance, in the absence of trust, was too great otherwise: the shadow banking system, as a system, could not come into operation without some stability of its component parts. That stability is precisely why the shadow banking system could not create purely its own, new, form of money: it demanded the presence of an existing form of money as precisely the stable mechanism that could, in turn, take its own (inherently unstable) procedures and turn them into a stable, systemic set of functions. Shadow banking, then, operates *against* the fundamental principles of credit creation as is conventionally understood, and *with* those procedures through its reliance on the general form that credit money takes for its operations. It is exactly because of this necessary basis of privatised (non-state, non-regulated) trust, as manifested in money, that makes world money so suitable for the operation of the shadow banking system. The dollar is the favoured instrument precisely because it can operate as something approaching a universal equivalent, globally – with the pound and the euro very much secondary. Shadow banking was both the product of concentrations of cash holdings, built up during the period of financialisation, and could best operate where those cash holdings were held in the form of the global currency, as a

manifestation of the systemic confidence in that currency's continued operation as a store of value. In other words, those two features made it a form of global hoard, but of an unusual kind.

The usual M-M' process, central (at the highest level of abstraction) to all credit markets, is therefore doubly undermined by shadow banking. First, it is not just the creation of what is sometimes labelled "fictitious capital": the capacity of developed credit market to be able to supply a Net Present Value (NPV) to a flow of future incomes. Rather, it uses the creation of a wholly fictitious commodity form, via securitisation, to form a rate of interest: the procedure is reversed. Second, the generation of these flows of new credit are not just *potentially* disassociated from the circuit of capital and the generation of an eventual return via (ultimately) the production of value: they are *necessarily* disassociated from them, and can stand in direct opposition to them, to the extent that they represent a pure financial claim within the financial system that can even stand *prior* to claims made elsewhere. The potential for instability, as has been previously indicated, is not just a contingent risk that might become realised: unlike conventional "systemic" risk, this is not risk appearing as a result of the system's complexity or scale relative to the scale of the wider economy. This is a *genuinely* systemic risk in the sense that it is a necessary part of the system's direct functioning.

No shadow banking run

This form of systemic risk has manifested itself in a very specific form. Elsewhere, the 2007-8 crisis has been described as a run on the shadow banking system (Gorton 2010; Gorton and Metrick 2010). While an appealing comparison, we are clearly not talking about the standard, self-sustaining run on a bank that are a recurring feature of fractional reserve banking, and which have been modelled in the neoclassical tradition by Diamond and Dybvig (1983). It is difficult to describe the run as the product of collapsing depositor confidence when there were no deposits to speak of. The fundamental confusion emerges in that a conventional bank run is, as the Diamond-Dybvig model illustrates, inherent to the functioning of deposit banking: it is impossible to run a fractional reserve banking system, creating credit on the basis of limited deposits, without also creating the possibility of a run. The combination of liquid liabilities (deposits) and illiquid assets (loans) is always at risk. Policies have developed, certainly since the 1930s, on the basis of maintaining confidence

in the banking system: for instance through deposit insurance, introduced in the US in 1934, or capital adequacy ratios and minimum reserve requirements. In all cases it is the maintenance of trust and confidence about the system that, in turn, allows the system to function. Should that depositor confidence disappear – for any reason, even the most spurious – a run always remains a possibility.

The shadow banking system specifically does *not* use deposits, relying instead on market-based mechanisms to create credit. It *cannot*, therefore, lead to a run as conventionally described. Confidence about the *institution* does not matter, in the first instance; confidence in the *market,* however, may do. This distinction matters, since it better describes the process observed inside the before and during the financial crisis of 2007-9. It began as a crisis of the markets, most obviously in the initial 'credit crunch' from mid-2007 onwards, when liquidity began drying up in the interbank markets. At least one genuine, old-fashioned bank run began, as minor British bank Northern Rock, heavily dependent on the interbank loan market, was forced to request government assistance. Crowds of depositors queued to remove their deposits: an authentic crisis of confidence, in this case driven by the act of appealing for assistance – rather than the bank's fundamentals. But otherwise major financial institutions, while beginning to report large losses and value write-offs often associated with their holdings of sub-prime mortgages, apparently retained investor confidence. It was their *market* financing operations, not *deposit* financing operations that were in trouble. As the market-based, securitised assets driving credit creation collapsed in value, banks suffered mounting losses. Bear Stearns, faced with bankruptcy in early 2008, was forced into a merger with Bank of America; and of course Lehman Bros filed for bankruptcy in September 2008. None of this, however, involved a run: banks' *assets*, not their *liabilities*, were the source of the problem. It was a genuine crisis of solvency, brought on by falling asset values, not a crisis of confidence in the institution. Similarly, in the wider shadow banking system, encompassing insurance companies and hedge funds, no run occurred – and nor could it. Clearly, the rising fear of counterparty risk spread the crisis, but this is counterparty risk, not risk associated with the institution itself.

In other words, distinct from the stock-flow balance-sheet representation of banking institutions, and from the neoclassical representation of a bank run as fundamentally the product confidence *within* institutions, we have here a process largely determined and driven by the markets themselves; and, in particular, the sets of relationships developed

around the management of money within the market – a crisis between rather than within institutions, at least in the first instance.

Plastic accounts

As we have seen earlier, there is a substantial slipperiness in defining the shadow banking system if we consider it as a matter of on- or off-balance sheet activity. This is over and above the difficulties in ascertaining the scale of "shadow" operations, which can be of an immense complexity. It is a fundamental feature of the shadow system itself: not just that it operates off-balance sheet, but that large sections of it can (in practice) migrate on- and off-balance sheet. The Deloitte redefinition of the shadow system, after the 2008 US government protection was offered to MMMFs, shows exactly the problem: a change in the regulatory regime produced an apparently immediate shift in the size and scope of the US shadow banking operation.

Obviously, the introduction of the government protection changed the nature of the assets and liabilities involved, with a corresponding change in the balance sheet position of the sectors – the government, in effect, taking on substantial new contingent liabilities. But the fact that this shift could be completed so easily points to a deeper issue than simply one of definition. It is fundamental to the operation of the shadow banking system that its component elements maintain a "plastic", malleable relationship with other balance sheets.

It is this feature that undermines the SFC claim to provide a *complete* representation of the macroeconomy at the level of finance. It is essential to the coherence of SFC that every stock, or flow, must be accounted for within the frame; for a closed national economy, this means that every stock or flow of the national unit of account must be accounted for; for an open economy, this can expand to include transfers to and from abroad; for multiple national economies, the balance of financial transfers must equate across both; and, finally, if we could imagine a modelling of the entire world of national economies, this would necessarily balance – the world is itself a complete economy against which no external balances can be held.[15] There is a logic to this that, as a first pass representation of the functioning of an economy (or set of linked economies) is appealing, and follows naturally from the definitions of both double-entry bookkeeping and the national income accounts.

[15] Although see Krugman, P. (1978). The theory of interplanetary trade, Yale University. for one challenge to this conventional wisdom.

Shadow banking challenges this. It operates in *opposition* to the functioning of the balance sheet: it is precisely because it is *not* on the balance sheet that it can function at all. It therefore constitutes a "leak" of a fairly grand order from the presentation made under SFC conditions. It further indicates the institutional limitations of SFC: what SFC presents as a *general* representation of a capitalist economy is, in fact, one strictly delimited by its institutional claims. Far from being "general", in the sense of presenting the reality that would obtain in any conceivable capitalist economy considered at the necessary level of abstraction, what we have under SFC is something closely bound to the description of that economy offered by *convention* – in particular, the convention of the national income accounts – and not that offered by analysis or history. For the SBS, this gap between the claim of generality and the specific failing is especially pronounced; what SFC presents is, in fact, a representation of the macroeconomy that is tightly bound to the conventions established in successive revisions of the national income accounting procedures. These conventions, in turn, draw on a strongly (if "hydraulic") "Keynesian" conception of the national economy: that institutions are stable and best considered precisely at the level of the national. Yet the world does not any longer (if it did ever) function like that: the circuits of national monetary flows that SFC purports to contain cannot exist solely at the level of nation and official monetary policy. Financialisation has produced the means by which this "Keynesianism" cannot any longer function, either in practice or in theory.

Shadow banking and stock-flow consistency

The presence of the shadow banking system as a (largely) off-balance sheet repository for financial assets and liabilities is of increasing importance to the wider circulation of capital, particularly when there are issues in the both the production and realisation of value within the circuit of production. It is because it is off balance-sheet that the issues of risk and risk management have taken on such an acute form: the processes of risk management, securitisation and related efforts to conceptualise risk provide the means by which the relationship between shadow banking (as non-bank hoard) and the wider banking and credit system can be managed.

This presumed management of risk, in turn, allows a greater flexibility of accounting and representation within the circuit of capital. It is because the various component parts of the shadow banking system can act in the space created by the absence of regulation, and

within a circuit of money capital that is not immediately dependent on either a commodity base or state control, that it creates such a challenge for SFC representations of the economy. The whole system forms a siphon out of the accounting framework that SFC attempts to provide. It is because its functioning is so slippery, relative to formal accounting, that it cannot be adequately captured within an SFC representation of the world.

It is exactly because these activities are occurring off-balance sheet, as a vast "leak" from the balance sheet that stock-flow consistent modelling cannot be treated as a general representation of a modern, money-based and capitalist economy. The presence of the shadow banking system, particularly on this vast scale, presents a direct challenge to representations of the economy as solely determined by monetary flows *within* sets of balance sheets. In fact, it is the potential for flows *away* from balance sheets, and outside of the circuits that the balance sheets contain that causes most difficulties for the SFC representation of financial flows. Fundamentally, the otherwise hard distinction between definite stocks, and definite flows, begins to break down here.

Endogenous money creation of a special kind

SFC representations, particularly those rooted within a broadly post-Keynesian understanding of money creation, place the creation and circulation of inside money at the centre of their analysis. They present a "monetary theory of production", in which the initial mobilisation of money in turn generates the financial activity. This generation of money could, in principle, be provided by the state (a point stressed by the latter-day school of Chartalists: see Wray (2000) for a prominent example), or (as is more typically assumed) through the private banking system. The process of money creation is, in either case, endogenous to economic activity, rather than presumed (fundamentally) exogenous to the same activity.

This is not, as we have seen, the same as the process of endogenous credit creation that occurs inside the shadow banking system, dependent on the trading and re-trading of constructed financial commodities. It cannot be plausibly represent this process because, in the end, it expects each stock and each flow it represents to have only *one* plausible interpretation: every asset is assigned correctly, every liability likewise, and every movement between the identified sectors can be specified uniquely. What the shadow

banking system does is to undermine the uniqueness of that specification, by setting mechanisms of credit generation that depend precisely on *non-uniqueness* to function: the same transaction, in effect, is reproduced over and over again in a way that is not easily captured by the balance sheet representation proposed.

A stylised SFC representation of shadow banking activity

Attempts have been made to attempt to capture at least of the shadow banks' functioning, however. A recent paper by Barwell and Burrows (2011) presented a "balance sheet perspective on the Great Moderation" in the UK, and included a substantial appendix on the stylised representation of securitisation through a series of linked balance-sheet changes. The paper as a whole has the immense advantage, as is typical of SFC representations, of drawing attention to gross rather than net financial flows, and of displaying both assets and liabilities within the complete macroeconomy. It therefore indicates, broadly correctly, that the development of immense holdings of financial assets during the so-called "Great Moderation" of the 2000s contained, in reality, the seeds of its own destruction in the Great Financial Crash of 2007-8. The discussions of the acceleration in household lending, the effects of corporate restructuring, and the concomitant expansion of bank balances, in particular, are invaluable.

Where the authors are less successful, however, is in their efforts to display the relationship between this expansion of balance sheets and the development of a securitised and non-depository shadow banking sector. Although never as a large, either in absolute or proportional terms, as in the US, securitised lending to UK households accounted for over 20% of all loans made by the time of the crash (Barwell and Burrows 2011: 29). There stylised presentation of securitisation only involves the creation of a new UK mortgage that is, in turn, funded through a UK-based SPV lending to a European pension fund, shown as a system of (graphical) balance sheets. The fundamental problem, of course, is that once the new asset has been created and sold by the SPV, it does not simply reside in the purchasers' balance sheet; it could, for instance, be used multiple times to generate still further credit, elsewhere within the shadow-banking system, through rehypothecation. A balance sheet representation alone does not adequately capture this problem of multiplicity, inherent to the shadow banking systems' operations, since it presents each stock and each flow as representing a single, joint operation: the movement

of assets (on one side) and liabilities (on the other). Financial products failing to correspond to this clear delineation fall outside of what can be plausibly represented; this can be seen, already, at the level of the national accounts. The UK's own accounting framework rightly identifies derivatives products as an important part of the financial system, but then also – quite correctly – realises that contingent financial products with uncertain structures cannot easily be accounted for within the national accounting framework.[16]

The critical problem, then, is that although the SFC representation claims to be complete (to whatever degree of generality), it is, in fact, potentially otherwise. The presence of credit money, otherwise correctly identified within SFC, is precisely where it can end up misapplied. It exists in a world in which the rules of "Keynesianism" still exist; but financialisation, over the last few decades, has thrown up increasingly complex ways in which Keynesianism is challenged, both at the level of policy and at the level of theory. The shadow banking system is simply the most comprehensive edition of that challenge, and, as such, presents one of the biggest empirical obstacles for SFC representations to overcome.

Conclusion

This chapter has taken a more empirical approach than the preceding, and attempted to draw on a wider range of literature to develop the point that the presumed generality of the SFC presentation in fact does not hold: it represents a world that is, in a sense, too "Keynesian" relative to what we actually see, most particularly in the form of the shadow banking system. This challenge to pure accounting matrices, and the kind of claims SFC makes about the world, can be reconciled with an understanding of money as endogenous; of money as a form of hoard against uncertainty, therefore implying an anti-Quantity Theory, relative to prices; and of the social institutions needed to handle monetary operations as in fact central understanding how those operations are performed – rather than an afterthought.

The failure of SFC to properly encompass the types of new, and often wildly complex operations that we see in shadow banking, can be traced directly back to some of its theoretical failures. We have, throughout, stressed that the impact of structural uncertainty on SFC models produces a breakdown of the accounting and economic systems contained within its matrices. The zero-sum condition will no longer hold; the money

[16] See notes on the treatment of derivatives in Blue Book 2012, ch. four.

markets, assumed in balance by the (*n-1*) closure rule, in fact are no longer in balance; a "monetary excess" can, and most likely *will* appear, representing the desire for excess funding relative to that apparently required for the maintenance of the whole circuit. This monetary excess has, in recent years, taken the spectacular form of the shadow banking system: an immense, off balance-sheet complex of money management operations that can trace its origins directly back to growing demands for liquidity that arrived with the onset of financialisaiton.

To develop some of the issues raised here would require us not just to further develop the social accounting matrix approach of SFC, so as to encompass better the encompassing role of uncertainty, but to push, too, in the other direction, towards an understanding of financial institutions – and their representations in theory – as bounded by social rules and history. "Thick description", alongside model building, is required, even where this comes at the expense of formalisation.

CHAPTER TEN

CONCLUSION

This paper has offered a critique of stock-flow consistent modelling as an approach to understanding and modelling the macroeconomy. While it is in general sympathetic to the attempt made by SFC to reassert some "old-fashioned" (in Krugman's phrase) theoretical claims about the economy, including particularly the treatment of money as central, and of the aggregate as distinct from the micro-level, it suggests that there is still further work to be done.

In particular, the treatment of time and therefore of uncertainty within the textbook SFC model, that of Godley and Lavoie (2007), is inconsistent. Inventories were shown to be treated in a manner that was either inconsistent with profit-maximising behaviour on the part of firms, or inconsistent with the claim of coherency for the whole model; yet, despite this, inventories form a core part of the Godley-Lavoie claim that SFC can represent a viable link between monetary factors and real production. On the basis of this inconsistency, our proposed (and consistent) resolution to the problem in turn suggests that an imbalance is created in the money system: that uncertainty, in impacting on real production, produces a financial imbalance that then manifests itself as an imbalance in the market for money.

This theme is developed further in the following chapter, where we note that the issues of pricing and valuation of capital as a stock (rather than merely inventories) that have beset neoclassical economics apply in somewhat reduced form to SFC. The claim, by Godley and Lavoie, that they can move "smoothly" from monetary factors to real production, or vice versa, is belied by some of the clear difficulties they run into in attempting to value capital – and to value capital relative to the inventories, already considered. We highlight that the economy's net worth, even in this simplified presentation, cannot be equated to the value of the capital stock, and suggest further that the description of the *financing* of investment appears to be incomplete.

The following chapter picks up on these two themes, and explores the motivation to invest (or fail to invest) on the part of entrepreneurs requiring additional initial financing. We consider the presence of uncertainty, following Kinght, as fundamental to how entrepreneurs behave, but note also the presence of a "paradox of profits" that comes into existence once the necessity for initial financing is accepted, as in Keynes' "financial

motive". This chapter then looks at how the circuitist school, which offers to rigorously develop models centred on the provision of this initial investment financing, has attempted to overcome the paradox of profits, and note that given the role of entrepreneurs, if they require additional initial financing, the presence of uncertainty implies the overprovision of credit-money into the circuit.

Chapter seven looks to integrate the insights from the previous chapters into a coherent account of the relationship between credit-money, the credit system, and uncertainty. It uses the work of Marx and later writers in the marxist tradition to build up this account of the centrality of hoarding within the whole economy, and the presence of a credit-system built upon it. This hoarding, and the need for money to act as a real store of value, implies that both quantity theories of money and theories of money as a purely symbolic value cannot function properly: we need, instead, a return to the anti-quantity tradition, in which the operations of hoarding and dishoarding regulate the money system over the course of the economic cycle. The final chapter explores some of these relationships further, in a more empirical setting, examining the development of the shadow banking system and the challenge this poses to both neoclassical and SFC accounts of banking and monetary behaviour. We suggest that the development of a more thorough account of hoarding and the different functions of money may help better develop our understanding of this.

There are, as would be expected, a number of lines of enquiry even within this limited account left open. Future lines of research could be extended backwards, into SFC models, to look more closely at the behaviour of firms. It has, so far, been touched on as far as firms are considered to be impacted by social uncertainty. But we have not particularly developed or explored some of the distinctive claims of post-Keynesian SFC regarding mark-up pricing and investment behaviour. Both of these could be immediate lines to pursue, in light of the discussion of uncertainty as profoundly tied to the experience of firms, and of the line of causality suggested back to its monetary impact.

Prices, in general, have made little appearance, and we have touched on them only in relation to the very theoretical discussion of quantity theory and anti-quantity theory. Godley and Lavoie devote many pages to the determination of general price levels, and it is perhaps the sheer length of their notes here that suggests deeper problems to be explored. The interest rate, especially, and its determination would warrant a far deeper consideration: the singular merit of SFC, motivating Tobin and other neoclassicals' research some decades ago, is the possibility of providing a more nuanced account of interest rates

and rates of return across a range of assets, with a more detailed understanding of the spread and subsequent monetary transmission mechanisms open to the researcher. While we have noted the creation, in general, of a credit system, we have left the determination of interest rates alone. Subsequent research could usefully develop the relationship between systemic uncertainty and interest rates, along the lines of the Dafermos (2012) paper considered in the literature review, but perhaps with a focus on its impacts on real production. The arguments offered in chapter seven, on hoarding and dishoarding in relation to systemic uncertainty might offer a pointer to more empirical research on the balance of hoarded and non-circulating money in relation to the real economy.

And while we have raised a number of issues from marxist political economy as perhaps helping resolve problems encountered in SFC, these are open to be developed more formally. Marx was, as noted, one of the pioneers of the monetary circuit of production, developing a series of "reproduction schemes" in volume two of his Capital. With a more sophisticated mathematical treatment than Marx had at the time, these can be usefully developed, as indeed Foley (1982) has attempted. Integration between these marxian reproduction schemes, and the kind of analysis SFC (and, for that matter, the circuitists) could open up very useful insights into the nature and development of the financial system, in particular.

In a similar vein, the temporal single system interpretation (TSSI) of Marx's reproduction schemes has gained ground in recent years, following in particular the work of Andrew Kilman (2007; 2011). The former book laid out, in detail, the case for treating Marx's own resolution to the longstanding "transformation problem" as not being flawed or "inconsistent", as often claimed, but of being fundamentally misunderstood, summarising previous work and providing a canonical statement of the TSSI case. Freeman (2010) has provided a useful summary of this research history, with Ernst (1982), Mandel and Freeman (1984) and Kliman (1988) as particularly notable early contributions. By revising Marx to include an explicit identification of the economy process as a single dynamic system, TSSI's proponents claim to resolved the problem of relating Marx's value-production system consistently to the observed price-output system. At the same time, TSSI offers a critique of the common simultaneous equations approaches to Marx, popularised particularly after the work of Nobuo Okishio (1961) claimed to demonstrate that the tendential law of the falling rate of profit no longer held in simultaneous equations solution to Marx's transformation problem. Ian Steedman (1977) synthesised the neo-Ricardian case for

solving Marx's system as a set of simultaneous equations, thereby seemingly resolving the transformation problem (in the sense of rendering it redundant), but at the cost of losing the falling rate of profit.

TSSI is of interest here in that, like the post-Keynesian stock-flow consistent models this thesis has considered, it attempts to offer a modelling of an economy that is properly dynamic, in the sense of considering time as a *sequence* of events rather than an *index* (hence "temporal"). Where it differs sharply is, according to at least some of its critics, in underplaying the monetary aspects of the economy in favour of a focus on value movements, with monetary expressions of variables (it is claimed) arbitrarily created (Veneziani 2004; Mohun and Veneziani 2009). If post-Keynesian SFC of the Godley-Lavoie type considered here has problems dealing with real foundations of monetary values, TSSI, it can be charged, has problems dealing with the monetary expressions of real values. (See, however, Freeman and Kliman 2009 for a reply to Mohun and Veneziani.)

We have at least implied the need for an understanding not of a *single* money only circuit, but of several, interlocking circuits able to account for the complete set of hoarded and circulating funds, circuits of credit money, and circuits of real production – to pick the three most obvious choices. The relationships here would be complex, although not conceptually impossible to define and operationalise, perhaps as Shaikh (1984) has indicated. Uncertainty, we would suggest, can act as the critical link between the different sets of literature: moving away from a purely deterministic classical system (as in Marx), and more towards the monetary and non-deterministic systems that Farjoun and Machover (1983) have attempted to describe. Cockshott et al. (2007) are another potential avenue to explore, in reasserting the potential utility of an objective measure of value in resolving some of the conundrums of valuation touched on elsewhere in this thesis.

Our general conclusion, then, is that by adopting a relatively high-level and theoretical approach to the issues raised in SFC modelling, we have attempted to show how some of its broad claims to universality and coherency do not necessarily hold. We propose a number of resolutions to this, using both an internal and a distinctive, Marxian critique to do so. The presence of uncertainty, and the problems this causes for a monetary economy based on the circulation of credit money only, are the two we highlight in this setting. The disguising of the real, productive economy behind balance sheets and accountancy rules is part of this problem: uncertainty, as we have suggested throughout, has real impacts; money cannot be treated separately from it. Developing more sophisticated macro models

will require breaking with the more “hydraulic” of the Keynesian elements within SFC, and extending the representation to include the multiple circuits highlighted above.

We do not think SFC provides the level of generality and consistency necessary to offer a completely convincing account of the totality of economic relationships within the macroeconomy; nonetheless, it represents both a distinct improvement over general equilibrium modelling in its explicit treatment of money and the aggregate as a meaningful capacity and, with further refinements, can help to offer valuable insights for the development of effective macroeconomic models – and, on that basis, provide a guide for better policymaking.

APPENDIX: SOLVING THE GODLEY-LAVOIE *SIM* MODEL

Godley and Lavoie present a very early version of their model, *SIM*, in chapter three of their textbook. It includes a government sector, but excludes fixed investment, overseas trade and private banking, so we can consider it here as the barest minimum model with a financial asset (government-issued credit money). The analytical solution shown here is intended as an illustration of the more general principles and issues involved in solving SFC models, as the main text in chapter four describes in more detail. Working from the balance sheet matrix, the system's equations are:

$$C_s = C_d$$

$$G_s = G_d$$

$$T_s = T_d$$

$$N_s = N_d$$

$$Y_d = WN_s - T_s$$

$$T_d = \theta WN_s$$

$$C_d = \alpha_1 YD + \alpha_2 H_{h-1}$$

$$\Delta H_s = H_s - H_{s-1} = G_d - T_d$$

$$\Delta H_h = H_h - H_{h-1} = YD - C_s$$

$$Y = C_s + G_s$$

$$N_d = \frac{Y}{W}$$

Where *C* is household consumption, *G* is government consumption, *H* is household wealth, held here as government-issued money, *T* is taxes, *N* is labour (supply or demand, depending on subscript), *W* is the wage rate and *YD* is household disposable income. The subscripts s and d indicate "supply" and "demand" respectively, enabling flows to and from sectors to be properly identified. Subscript h is intended to indicate a holding of household wealth at the end of a period. Finally, the parameters: theta is a tax rate, set as a fraction of income by government, and alphas 1 and 2 are the marginal propensities to consumer from disposable income and household stocks of wealth, respectively. Godley and Lavoie assume that the MPC for disposable income is higher than that for stocks of wealth, and that

government expenditure not covered by taxes is met through the creation of more money, ΔH_s. The final equation expresses the demand for labour, given a level of output and the wage rate. The "quasi-Walrasian" redundant equation, that appears as a result of the other equations being balanced, is here that the money supply is equal to the money demanded. This is of no economic relevance in this instance, but is an artefact of the system's construction.

A steady-state solution, defined by Godley and Lavoie as the point where the variables remain in a constant relationship to each other (as in the Solow balanced growth path), can be found as follows. For a model without growth (as in the simple case shown here), the not only the ratios between variables will be constant – so, too, will be the levels, the model finding a stationary stable point.

In the current model, without growth and with only a government sector in addition to the private sector (that is, without private banks), stability of the main ratios (here, consumption:income) implies that government must be running a budget balance, or else be either continually drawing down on income, or running a permanently larger and larger debt. Setting the budget to balance, G=T, and noting therefore that the change in the money supply will be zero, the government requiring no additional financing, we can rearrange the relevant sections of the above (via the consumption function) to find:

$$G = T = \theta WN = \theta Y^*$$

(Omitting subscripts since we are in equilibrium.) This shows a steady-state level of income at Y*, dependent on the level of taxation and the level of government spending,

$$Y^* = \frac{\theta}{G}$$

This "ratio of government expenditure to its fiscal share" (Godley and Cripps 1983: 111) is fundamental to the model, in the sense that it determines entirely the steady-state level of income. It illustrates immediately the demand-led nature of the stock-flow consistent modelling, in which a government's fiscal stance can be assumed to determine not just income in the short-run, but over the long-run, too. As Godley and Lavoie note (2007: 72), it is fundamental to any of their models with a government sector.

Savings by households will be zero, the average propensity to consume rising to unity, and disposable income and consumption will necessarily be equal to each other. Using the

above result on steady state income and government spending, and setting *YD*=C**, we can rearrange through the definition of national income above to find the steady-state level of household disposable income and consumption:

$$YD^* = C^* = \frac{G(1-\theta)}{\theta}$$

This reflects the joint impact of government spending with a balanced budget: both positive, through the multiplier effect, and negative, due to additional taxes. Household consumption is overall positive with government spending, even if this is fiscally neutral, as a result of its impact on the wider economy – a result familiar from conventional macroeconomics as the balanced budget multiplier.

Introducing further elements, like fixed capital, private banking, and an open economy, complicates the analysis significantly. It is not generally possible to derive an analytical solution once accumulated assets like inventories are introduced, since there are possibly multiple stable states strongly dependent on the initial values of the system.

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