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Keynesian theorising during hard times: stock-flow consistent models as an unexplored 'frontier' of Keynesian macroeconomics

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This paper argues that the stock-flow consistent approach to macroeconomic modelling (SFCA) is a natural outcome of the path taken by Keynesian macroeconomic thought in the 1960s and 1970s, a theoretical 'frontier' that remained largely unexplored with the end of Keynesian academic hegemony. It does so in two steps. First, it phrases the representative views of Davidson, Godley, Minsky and Tobin as different 'closures' of the same (SFC) accounting framework, calling attention to their similarities and logical implications. Second, it discusses unresolved issues within this approach and how it differs from 'modern' theorising.

Key words: Post-Keynesian models, Stock-flow Consistency, Pitfalls approach
JEL classifications: E12, B22, B31

1. Introduction

Although the 1970s marked the end of its hegemony in macroeconomics, Keynesian thought showed vitality in that period. The 1981 Nobel Prize lecture by James Tobin is perhaps the most well-known and clear version of the ('Old' Neoclassical) Keynesian 'frontier' at the time.[1] According to Tobin (1982, p. 172):

Hicks's 'IS-LM' version of Keynesian [theory] ... has a number of defects that have limited its usefulness and subjected it to attack. In this lecture, I wish to describe an alternative framework, which tries to repair some of those defects .... The principal features that differentiate the proposed framework from the standard macromodel are these: (i) precison regarding time ... ; (ii) tracking of stocks ... ; (iii) several assets and rates of return ... ; (iv) modeling of financial and monetary policy operations ... ; (v) Walras's Law and adding-up constraints.

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[1] See also Backus *et al.* (1980) and Tobin (1980). To some extent, these models are generalisations of previous efforts by Ott and Ott (1965), and Christ (1968), among others. Turnovsky (1977) provides a textbook treatment of this earlier literature. In the heterodox side, the efforts by Godley and Cripps (1983) are also noteworthy.

Tobin's 'alternative framework' is, essentially, what we mean by the stock-flow consistent approach to macroeconomic modelling (SFCA).[1] As is well known, this approach failed to conquer the hearts and minds of the profession and virtually disappeared from the literature in the late 1980s. Indeed, despite the significant revival of the SFCA in the last few years,[2] SFC practitioners are still a minority even among Post-Keynesians.

Yet, we argue, the SFCA can be seen as a natural 'outcome' of the path taken by Keynesian macroeconomic thought in the 1960s and 1970s. Conceived at a time when Keynesian thinking was under severe attack for allegedly lacking analytic rigour, the SFCA aimed precisely to allow integrated and rigorous analyses of a large range of interrelated 'advanced' (and, to a great extent, obscure) issues in Keynesian economics, such as the functioning of financial markets, the financing of investment in fixed capital, the role played by stocks of financial wealth/debt in flow behaviour, and the (dynamically) optimum monetary/fiscal 'mix' to be adopted by policy-makers. The failure of the SFCA to be widely accepted by Keynesians is, therefore, of significance both to those trying to figure out why the mainstream of the economics profession chose a different path in the 1980s and to those still working on the Post-Keynesian research programme.

Accordingly, this work has two main goals. The first is to convince the reader that several Keynesian 'schools' of thought converged—around the 1970s—to a broadly similar view of the economic system, one whose analysis actually presupposes the SFCA (defined in the following section). The second goal is to convince the reader that the issues tackled by SFC authors are crucial ones in macroeconomics and are still essentially open.

2. A simple definition of the SFCA

As aptly summarised by Davis (1987, pp. 111, 112):

> Most neo-Keynesian economic theory tended historically to concentrate on flows and prices rather than stocks of assets and liabilities, and on comparative static rather than dynamic analysis of policy changes . . .. [But] . . . 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. These stocks may be both financial (money, bonds, equities, loans) and real (the capital stock). 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.

The SFCA was created precisely to prevent this problem from happening.[3] In fact, SFC macroeconomic models are, by definition, ones in which the balance sheet dynamics of all assumed institutional sectors (given by sectoral saving flows, portfolio shifts, and capital gains) are explicitly and rigorously modelled.[4]

[1] Even though Tobin himself did not put it that way. Yale people (e.g., Fair, 1984, p. 40) called it the 'pitfalls approach', in a reference to the seminal paper by Brainard and Tobin (1968). The expression 'stock-flow consistent' is commonly associated with the works of Wynne Godley (though used also by Davis (1987) and Patterson and Stephenson (1988)), but it seems to the author that it can and should be applied more generally.

[2] See, for example, Dos Santos (2005), Godley (1996, 1999A), Lavoie and Godley (2001–02), Zezza and Dos Santos (2004), among others

[3] Tobin (1982, p. 188), for example, makes exactly the same point: 'a model whose solution generates flows but completely ignores their consequences may be suspected of missing phenomena important even in the relatively short run, and therefore giving incomplete or even misleading analyses of the effects of fiscal and monetary policies'. See also Turnovsky (1977, Introduction) and Tobin (1980, ch. 4).

[4] See Patterson and Stephenson (1988) for a (more technical) definition in this same spirit. As Turnovsky (1977, p. xi) points out, SFC models are 'intrinsically dynamic', for '. . . [stock-flow] relationships necessarily impose a dynamic structure on the macroeconomic system, even if all the underlying behavioural relationships are static'.

Though simple, this definition implies (as exemplified in the next section) that SFC models are necessarily based on social accounting frameworks that consistently 'integrate' conventional product and income accounts with 'flow of funds' accounts and a full set of balance sheets.[1] This, in turn, implies that the complexity of SFC constructs increases rapidly with the number of assets and institutional sectors assumed. The practical importance of this last point should not be underestimated. It is often (and correctly) argued, for example, that most 'modern neoclassical macroeconomics' is SFC. But SFC requirements can be trivially met in models in which individuals consume, plant and lend or borrow 'corn' in 'islands' (with the help of a Walrasian auctioneer) and, as we argue below, this goes a long way in explaining the peculiar institutional settings assumed in most 'modern' models.

3. Four ('old') Keynesian 'closures'

We argue in this section that the three main Keynesian 'schools of thought' (i.e., the 'Neoclassical Synthesis', and both the 'British' and 'American' Post-Keynesians) converged, around the 1970s to a broadly coherent 'old financial Keynesian' view of the economic system. We do so in two steps. First, we set out the representative views of Davidson (1972, 1994), Godley (1996, 1999A, among others[2]), Minsky (1975, 1982, 1986) and Tobin (1980, 1982, among others),[3] as different 'closures' of the same (SFC) accounting framework.[4] Second, we conclude that the similarities among these 'closures' clearly outweigh their differences.

Before we proceed, however, we must note that our focus on macroeconomic 'closures' implies that we pay scant attention to the 'microfoundations' of the models discussed here. In particular, we simplify away the dichotomies between consumption and capital goods (for we work with a one good economy) and between 'spot' and 'forward' markets, both of which play a crucial role in the 'microfoundations' of aggregate investment in Davidson (e.g., 1972, ch. 4) and Minsky (e.g., 1975, ch. 5).[5] We do understand the biases introduced by this decision. In fact, one can convincingly argue that both Minsky and Davidson spent more time discussing alternative ('truly Keynesian') 'microfoundations' to macroeconomic models than actually developing the latter. While we do agree that a ('Structuralist'[6]) comparison of 'model-builders' (Tobin and Godley) and (mostly) 'literary' authors (Davidson and Minsky) is not neutral, we argue that: (i) Davidson (1972, 1994) proposed several formal aggregate specifications which can be used—together with his literary descriptions—to build a coherent Davidsonian macromodel; and (ii) the specifications

[1] Interestingly enough, national accountants (e.g., Ruggles and Ruggles, 1982) were also working on this (stock-flow) integration in the 1970s and 1980s, a research effort which culminated in the United Nation's 1993 'System of [Integrated] National Accounts'. See NBER (1962) and Dawson (1996) for details on the intellectual history of the flow of funds accounts.

[2] Godley's writings in the 1990s are essentially refinements of his work in the 1970s and 1980s (see Dos Santos, 2003, ch. 2 and 3, for details).

[3] We hope the reader will agree that the—unavoidably biased—selection of authors is sufficiently representative.

[4] As put by Taylor (1991, p. 41), 'Formally, prescribing a closure boils down to stating which variables are endogenous or exogenous in an equation system largely based upon macroeconomic accounting identities, and figuring out how they influence one another'.

[5] Incidentally, stock-flow considerations affect crucially the (Marshallian, partial) markets for capital goods assumed by these authors. Note, however, that SFC requirements apply to all stocks and flows assumed in one's model, not just to the modelling of the stock of capital goods/flow of investment.

[6] In the sense of Taylor (1991, 2004).

proposed in the 'formal Minskyan literature' (FML)[1]—together with Minsky's own literary descriptions—can be used to build a coherent Minskyan model.

3.1 Structural hypotheses

All authors discussed here have—at some point, at least—phrased their views as relating to (closed) monetary capitalist economies with a government sector and developed financial markets. Table 1 presents the sectoral balance sheets of one such economy.

Table 1 summarises many theoretical assumptions. In particular, it implies that: (i) households neither invest (i.e., buy 'capital') nor get bank loans; (ii) firms do not hold government bills and high-powered money; (iii) the government neither invests nor holds equity or money (in any form); and (iv) banks (including the central bank) neither issue nor hold equities, do not invest, and distribute all their profits (so their net worth is zero). These simplifications are standard in the works of Tobin and Godley and in the FML, and appear to be broadly consistent with both Davidson's and Minsky's literary analyses.[2] Note, however, that we are simplifying away 'non-bank financial intermediaries'—deemed by Davidson (1972, pp. 146–7) indispensable to 'any model of a monetary ... economy which attempts to provide insights about the real world'. In our interpretation, Davidson's point is meant simply to emphasise that investment in fixed capital in modern capitalist economies relies heavily on institutions that borrow 'short' and lend 'long' (such as, say, investment banks). While we do agree with this view, we prefer to model commercial banks as (also) performing (a proxy of) this role here, as opposed to adding another institutional sector to the analysis.[3]

As emphasised by Minsky (1975, p. 118), the hypotheses above have 'cash-flow' implications. Specifically, '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'(*ibid.*). Table 2 aims precisely to formalise these flows of funds.

Despite its unfriendly appearance, Table 2 summarises very intuitive phenomena. Households, for example, receive income in form of wages, interest (on deposits and government bills) and distributed profits (of banks and firms), and use it to buy consumption goods, pay taxes and save (see households' 'current' column).[4] The government, in turn, receives money from taxes (and dividends from the central bank) and uses it to buy goods from firms and pay interest on its (lagged stock of) debt, while firms use sales receipts (and whatever interest they receive on their deposits) to pay wages, dividends, taxes and interest on their (lagged stock of) loans, retaining the rest to help finance investment. Finally, banks (including the central bank) receive money from their loans and holdings of Treasury bills and use it to pay dividends and (in the case of commercial banks) interest on households' deposits and central bank advances. For simplicity, banks are assumed not to pay taxes.

[1] Taylor and O'Connell (1985) is widely seen as the seminal FM paper. See Dos Santos (2005) for a critical survey of this literature.

[2] Similar assumptions are made also in Patterson and Stephenson (1988).

[3] In Davidson's writings (e.g., 1972, ch. 12 and 13) commercial banks only lend 'short'. But, as Minsky (1986, p. 225) reminds us, this traditional 'division between commercial and investment banking is artificial and has been breaking down rapidly'.

[4] Our discrete time accounting assumes that (i) the interest rates on money deposits (rm), bank loans (rl), government bills (rb), and central bank advancements (ra), are all fixed during a given accounting period, and (ii) interest on loans obtained in period t are paid in period $t+1$ at rates pre-determined in t. See Patterson and Stephenson (1988) for a discussion of SFC accounting in continuous time.

Table 1. *Nominal balance sheets in our 'artificial Keynesian economy'*

	Households	Firms	Banks	Central Bank	Government	Row Totals
(1) High-powered money	$+Hh$		$+Hb$	$-H$		0
(2) Central bank advances			$-A$	$+A$		0
(3) Bank deposits	$+Mh$	$+Mf$	$-M$			0
(4) Bank loans		$-L$	$+L$			0
(5) Govt. Bills	$+Bh$		$+Bb$	$+Bc$	$-B$	0
(6) Capital		$+pk$				$+pk$
(7) Equities	$+peE$	$-peE$				0
(8) Net worth (col. totals)	$+Vh$	$+Vf$	0	0	$-B$	$+pk$

Note: p and k stand, respectively, for the price of the single good produced in the economy and the number of units of this good used in production, while pe and E stand for the price of one equity and the number of equities issued. + before a variable denotes an asset, while − denotes a liability.[1]

More importantly from our perspective, Table 2 allows an explicit and rigorous derivation of the 'current saving' of all sectors (given by 'current' column totals[2]) and its end-of-period implications. In particular, row 17 summarises the economy's sectoral budget constraints, i.e., the fact that the net worth of the sectors (depicted in Table 1) are related to the flows depicted in Table 2 by the following accounting identity

$$\mathrm{NW}i_t \equiv \mathrm{NW}i_{t-1} + \mathrm{SAV}i_t + \mathrm{CG}i_t$$

or, in words, the net worth of sector i is increased by its current saving plus the capital gains (CG) arising from changes in the market value of its assets during the period. Besides that, and equally important, the hypotheses above are such that households' saving necessarily implies changes in their holdings of money (i.e., cash and/or bank deposits), and/or government bills, and/or stocks. Government deficits, in turn, are necessarily financed with the emission of bills, while investment is necessarily financed by a combination of retained earnings, equity emissions, bank loans and liquidation of bank deposits. Of course, these complex and interrelated balance sheet changes (summarised in row 16) are only possible because banks (including the Central Bank) adjust their balance sheets to allow them.

We finish this section reminding the reader that, while the accounts presented above were phrased in nominal terms, all stocks and flows in Tables 1 and 2 have straightforward 'real' counterparts given by their nominal value divided by p (the price of the single good produced in the economy). Using lower-case letters to denote 'real' variables, we have (from Table 2, row 18), for example

$$s \equiv S/p \equiv C/p + p\Delta k/p + G/p \equiv c + \Delta k + g$$

Things are different, however, with capital gains and losses. Only firms and households have nominal capital gains/losses in the economy above,[3] but the real value of *all* financial

[1] Firms' capital is valued 'at replacement cost' in Table 1. The alternative would be to follow Tobin (1982) and some FM papers (e.g., Taylor and O'Connell, 1985) and value firms' capital 'at market value' (forcing Vf to zero) but, in our view, this procedure obscures the analysis unnecessarily. Note also that, since any financial asset must have a counterpart financial liability, rows 1–5 and 7 must add up to zero.

[2] $SAVh$ (households' 'current' saving), for example, is given by $W + rb_{-1}Bh_{-1} + rm_{-1}Mh_{-1} + Ff + Fb - C - Th$.

[3] We assume that treasury bills last exactly one period, so fluctuations in the market value of equities are the only sources of nominal capital gains for households. Firms have nominal capital gains also when p increases.

Table 2. *Nominal transactions in our 'artificial Keynesian economy'*[a]

	Households		Firms		Banks		Government		C. Bank		
	Current	Cap.	Current	Cap.	Curr.	Cap.	Current	Cap.	Curr.	Cap.	Row total
(1) Cons.	$-C$		$+C+G$				$-G$				0
(2) Invest.[1]			$+p\Delta k$	$-p\Delta k$							0
(3) Wages	$+W$		$-W$								0
(4) Taxes	$-Th$		$-Tf$				$+T$				0
(5) Interest on loans			$-rl_{-1}L_{-1}$		$+rl_{-1}L_{-1}-ra_{-1}A_{-1}$		$-$		$+ra_{-1}A_{-1}$		0
(6) Interest on bills	$+rb_{-1}Bh_{-1}$				$+rb_{-1}Bb_{-1}$		$-rb_{-1}B_{-1}$		$+rb_{-1}Bc_{-1}$		0
(7) Int on deposits	$+rm_{-1}Mh_{-1}$		$+rm_{-1}Mf_{-1}$		$-rm_{-1}M_{-1}$						0
(8) Dividends	$+Ff+Fb$		$-Ff$		$-Fb$		$+Fc$		$-Fc$		0
Uses and sources of funds											
(9) Current saving (col. total)	$+SAVh$		$+Fu$		0		$+SAVg$		0		$+SAV$
(10) ΔCash		$-\Delta Hh$				$-\Delta Hb$				$+\Delta H$	0
(11) ΔCB advances						$+\Delta A$				$-\Delta A$	0
(12) ΔBank deposits		$-\Delta Mh$		$-\Delta Mf$		$+\Delta M$					0
(13) ΔLoans				$+\Delta L$		$-\Delta L$					0
(14) ΔGovt. Bills		$-\Delta Bh$				$-\Delta Bb$		$+\Delta B$		$-\Delta Bc$	0
(15) ΔEquities		$-pe\Delta E$		$+pe\Delta E$						0	
(16) Curr. sav. + net capital transactions	0		0		0	0	0	0			
Accounting memos											
(17) ΔNet worth	$SAVh+\Delta pe\cdot E_{-1}$		$Fu+\Delta p\cdot k_{-1}-\Delta pe\cdot E_{-1}$		0		$SAVg$	0			$SAV+\Delta pk_{-1}$
(18) Final sales $\equiv S \equiv C+G+p\,\Delta\,k \equiv W+FT \equiv Y$											
(19) Firms' gross profits $\equiv FT \equiv S-W$											
(20) Households' disposable income $\equiv Yh \equiv W+rb_{-1}Bh_{-1}+rm_{-1}Mh_{-1}+Ff+Fb-Th$											
(21) Government's disposable income $\equiv Yg \equiv T-rb_{-1}B_{-1}+Fc$											
(22) National income $\equiv Y \equiv Yh+Yg+Fu \equiv Yh+Yg+FT-rl_{-1}L_{-1}+rm_{-1}Mf_{-1}-Tf-Ff \equiv S$											

[a] + sign before a variable denotes a receipt (or source of funds), while − sign denotes a payment (or use of funds).
[1] We follow here the broad Keynesian literature in simplifying away investment in inventories (see discussion below). We also simplify away capital depreciation.

assets decline with inflation. Accordingly, households' real capital gains in a given period, for example, are given by

$$cgh_t \equiv \Delta pe_t E_{t-1}/p_t - v_{t-1}\Delta p_t/p_t$$

3.2 Behavioural hypotheses

Flow of funds accounting structures like the one above were proposed by American economist Morris Copeland in the 1940s and have been published for the US economy since 1952. Interestingly enough, economists at first did not know what to do with them, the consensus being that the 'Keynes of Flow of Funds Analysis ... [had] not yet revealed himself' (NBER, 1962, p. 173). This section aims to evaluate the contributions of some of the major candidates for the job.[1] Owing to space constraints, we discuss them simultaneously, as different hypotheses about the treatment of time, the behaviour of institutional sectors and the (dis)equilibria of the system.

3.2.1 Treatment of time. All the authors in question work with 'period' models,[2] i.e., they describe (the logical mechanisms that supposedly determine) end-period results, not the precise process by which they are achieved in true historical time (i.e., what precisely happens within the 'period', and even its length).[3] In this context, it is invariably assumed that 'in any one period, each of the simultaneously determined endogenous variables assumes one and only one value' (Tobin, 1980, p. 82). Therefore—at least at this level of abstraction—all markets assumed by all authors discussed here are 'instantaneous ones', in the precise sense that their (equilibrium or disequilibrium, it does not matter) outcomes are, in fact, the mathematical result of 'period' (and therefore static or, at best, quasi-static) demand and supply equations.[4] As a consequence, the Post-Keynesian concept of 'historical model' (Davidson, 1972, p. 26) only makes sense when interpreted as a defence of: (i) specific functional forms (allegedly compatible with 'procedural' rationality at the micro level) for the quasi-static 'period' aggregate supplies and demands; and (ii) disequilibrium outcomes in these 'instantaneous' markets, presumably associated with 'reaction functions' specifying how disequilibrium outcomes in period t affect the supplies and demands in period $t+1$.

3.2.2 The household sector. Households play three key roles in SFC models. First, their consumption expenditures are a crucial part of aggregate demand. Second, their financial decisions are crucial determinants of financial markets' behaviour. Third, their nominal wage demands affect prices and, therefore, inflation. We discuss the first two decisions here, leaving the third to a later section.

[1] Both Godley (1996, 1999A) and Tobin (1980, 1982) explicitly used accounting structures closely related to Tables 1and 2. Minsky did not, but came very close (see Minsky, 1975, ch. 7; Delli Gatti *et al.*, 1994). In fact, he went so far as stating that his own 'alternative interpretation [of Keynes] can be summarized as a theory of the determination of the effective budget constraints [of the various macroeconomic sectors]' and that 'the economics of the determination of the budget constraint logically precedes and sets the stage for the economics of the selection of particular items of investment and consumption' (Minsky, 1975, p. 132). Davidson (1972, 1994), however, does not emphasise the logical discipline imposed by the accounting structures above.

[2] For completeness, it should be noted that Tobin also worked with continuous time specifications. He noted, however, that while 'either representation of time ... is an unrealistic abstraction ... many statistical data are available only in arbitrary finite periods' (Tobin, 1982, p. 189), making the use of 'period' models unavoidable in empirical work (a point also emphasised in Godley and Cripps, 1983, p. 60). See Foley (1975) for a discussion of the theoretical assumptions implied in 'period' models.

[3] For elegant discussions of—and actual modelling tools to deal with—production and market processes in true historical time, see Foley (1975, 1986).

[4] Such as the ones used, for example, by Davidson (1972, ch. 4).

We begin by noting that both Davidson and Minsky neglect the impact of households' wealth on households' consumption decisions. Indeed, while Minsky consistently assumed (*à la* Kalecki) that the propensity to save out of (disposable) wage income is lower (or zero in the simplest case below) than the propensity to save out of non-wage household (disposable) income, Davidson oscillated between doing the same (as in Davidson, 1972, ch. 5) and (more often) using a simple linear Keynesian consumption function (as in Davidson, 1972, ch. 7). One can, therefore, write

$$c_t^{\mathrm{d}} = \alpha_0 + \alpha_1 yh_t^{\mathrm{e}} \qquad \text{(D.1a)}$$

and

$$c_t^{\mathrm{d}} = w_t^{\mathrm{e}} - th_t^{\mathrm{e}} + \alpha_2 (yh_t^{\mathrm{e}} - w_t^{\mathrm{e}} - th_t^{\mathrm{e}}) \qquad \text{(M.1, D.1b)}$$

where superscripts d and e mean 'desired' and 'expected'; α_0, α_1, and α_2 are fixed parameters; and *yh*, *w* and *th* stand, respectively, for households' real disposable income, wage bill and taxes paid on wages.

Of course (given their disposable income), households' consumption decisions determine their saving and, therefore (given their capital gains) their accumulation of wealth. Accordingly, a large number of Keynesian authors (including Patinkin, 1965; Modigliani and Brumberg, 1954) have argued that households' wealth accumulation goals should also affect their consumption decisions. Godley's specification below aims to capture a similar idea, i.e., the notion that 'aggregated across the [households'] sector, wealth is accumulated at a particular rate and that there exists a desired [and exogenous households'] long run wealth–income ratio' (Godley, 1999A, p. 396).

$$c_t^{\mathrm{d}} = \alpha_3 yh_t^{\mathrm{e}} + \alpha_4 vh_{t-1} \qquad \text{(G.1)}^{[1]}$$

Tobin's story can be seen as a generalisation of Godley's. In fact, Tobinesque households are assumed to 'formulate long-run target asset and wealth positions, based on current and expected interest rates, incomes and other relevant variables' (Backus *et al.*, 1980, pp. 272–3)—so that, in Tobin's 'closure', the households' desired long-run wealth–income ratio is endogenous. This idea can be modelled as follows

$$[c_t^{\mathrm{d}}, v_t^{\mathrm{d}}] = f(rr_t^{\mathrm{e}}, v_{t-1}, yh_t^{\mathrm{e}}) \qquad \text{(T.1a)}$$

where $v = [Hh/p, Mh/p, Bh/p, peE/p] = (hh, mh, bh, peE/p)$ is the vector of households' real stocks of the various financial assets (i.e., *vh* is given by the sum of the components of *v*); $rr^{\mathrm{e}} = [rrh^{\mathrm{e}}, rrm^{\mathrm{e}}, rrb^{\mathrm{e}}, rre^{\mathrm{e}}]$ is the vector of (expected, one period) real returns in cash, money deposits, government bills and equities (respectively, including real capital gains),[2] and $f: R^9 \rightarrow R^5$ expresses the demands for consumption goods and the four financial assets above (i.e., five equations) as functions of households' expected disposable income; the (four) real rates of return of the financial assets, and households 'beginning of the period' holdings of these (four) assets (i.e., nine variables).

The formalisation above implies that households' consumption (and, therefore, accumulation) and portfolio decisions are 'integrated' (Tobin, 1982, p. 187), in the

[1] Indeed, if (in the absence of expectation errors) $c_t = \alpha_3 yh_t + \alpha_4 vh_{t-1}$, then in a (stationary) steady state in which $\Delta vh = cgh = 0$ (so $c_t = yh_t$), it is easy to prove that $vh = (1 - \alpha_3) \cdot yh/\alpha_4$, where $\lambda = (1 - \alpha_3)/\alpha_4$ is Godley's exogenous long-run wealth–income ratio. Anwar Shaikh has called to my attention that (in the steady-growth case with zero capital gains) λ will depend on the steady-growth rate (*gs*) assumed. Indeed, if $\Delta vh = gs \cdot vh_{t-1}$ and there are no capital gains, it is easy to prove that $\lambda = (1 - \alpha_3) \cdot (1 + gs)/(\alpha_4 + gs)$.

[2] That is to say, $rrh_t^{\mathrm{e}} = [1/p_{t+1}^{\mathrm{e}}] - [1/p_t]$; $rrm_t^{\mathrm{e}} = [(1 + rm_t)/p_{t+1}^{\mathrm{e}}] - [1/p_t]$; $rrb_t^{\mathrm{e}} = [(1 + rb_t)/p_{t+1}^{\mathrm{e}}] - [1/p_t]$; and $rre_t^{\mathrm{e}} = [(pe_{t+1}^{\mathrm{e}} + Rf_{t+1}^{\mathrm{e}}/E_t)/p_{t+1}^{\mathrm{e}}] - [pe_t/p_t]$.

precise sense of being simultaneously determined by the same set of variables. As a matter of accounting (given cgh^e and yh^e), any four of the five variables in [c^d, v^d] are enough to determine the fifth (which is, in this sense, 'redundant'). In the Tobinesque system, the four components of v^d (and v_{t-1}) fully determine Δvh^d and (given cgh^e and yh^e) $savh^d$ and c^d, so (as noted by Fair, 1984, p. 42) c^d is the 'residual' variable[1]

$$c_t^d = yh_t^e - savh_t^d = yh_t^e - \Delta vh_t^d + cgh_t^e \qquad \text{(T.1)}$$

$$v_t^d = g(rr_t^e, v_{t-1}, yh_t^e) \qquad \text{(T.2 – T5)}$$

and

$$\Delta vh_t^d = \text{the sum of the components of } v_t^d - vh_{t-1} \qquad \text{(T.6)}$$

Linear specifications of the asset demand functions (T.2–T.5) are discussed in Brainard and Tobin (1968) and Backus (1980). These are elegantly constrained to make sure households respond to (expected) differentials in the rates of return of the various assets in ways deemed 'rational' (i.e., a bigger expected rate of return of a given asset increases this asset's share in the sector's portfolio, decreasing the combined share of the other assets so that the sector's budget constraint is respected). Essentially the same specifications are used also by Godley (1996, 1999A), with the proviso that Godley's independent consumption function makes one of the financial assets' demand 'redundant'. One can, therefore, write

$$v_t^d = g_1(rr_t^e, v_{t-1}, yh_t^e) \qquad \text{(G.2 – G5)}$$

and

$$\Delta vh_t^d = yh_t^e - c_t^d + cgh_t^e \qquad \text{(M.2, D.2 and G.6)}$$

Davidson (1972, p. 254) agrees with both Godley and Tobin that 'money and financial vehicles will be the only vehicles to use to transfer generalised purchasing power over time'. He prefers, however, to aggregate the financial assets above in two categories, i.e, 'money' (money deposits and, presumably, cash) and 'placements' (equities and bonds issued by firms), neglecting government bills.[2] We believe we do no harm to the essence of Davidson's analysis by including government bills in his definition of 'money'[3] and excluding bonds issued by firms from the 'private placements' at the disposal of wealth-holders.[4] In this case, we can write (in the spirit of Davidson, 1972, p. 255)[5]

[1] As mentioned, Tobin could have chosen any other financial asset demand if he so wanted. Indeed, from yh^e and c^d, one gets $savh^d$ and (given cgh^e) Δvh^d, which is equal to the sum of all the four components of v^d. Therefore, given any three components of v^d, the fourth can be calculated as a residual. Note also that in his applied work (e.g., Backus *et al.*, 1980) Tobin has used an 'independent' consumption function (as a rough preliminary approximation), therefore making one of the asset demands 'redundant'. As noted by Davidson (1972, p. 291), Keynes favoured 'independent' consumption functions himself.

[2] As Davidson (1972, p. 254) states, 'at each point in time, wealth-holders ... decide how much of their postponed command of resources to hold in the form of debt obligations of firms or titles to capital goods and how much in the form of bank deposits'. In fact, even though the economy has a monetary authority conducting monetary policy operations, these are made in the market for private securities (*ibid.*, p. 259).

[3] Government bills are, after all, as safe as money in most relevant contexts.

[4] Davidson (1972, p. 249) acknowledges that the aggregation of heterogeneous (privately issued) financial assets under the generic label of 'placements' is 'unrealistic', but sees further disaggregation as an 'unnecessary complication'.

[5] Equation (D.3) differs from Davidson's, among other things, by incorporating the determinants of households' money demand (see Davidson, 1972, ch. 7 and 8) among the determinants of the demand for placements—a logical implication of the fact that (given total wealth) one implies the other (see below).

$$pl_t^d = pe_t \cdot E_t^d / p_t = h(c_t^d, rr_t^e, vh_{t-1}, \kappa_t, \zeta_t) \quad (D.3)$$

where pl^d is households' real demand for 'placements', κ stands for the public's (exogenous) confidence in its expectations, and ζ stands for the composite effect of a set of other exogenous parameters.[1] The partial derivatives of pl_t^d with respect to rre_t^e, $vh_{t-;1}$ and κ_t are positive, while the others are negative.

Note, however, that c_t^d, vh_{t-1}, cgh_t^e and yh_t^e imply $savh_t^d$ and vh_t^d and, by definition, $(hh_t^d + mh_t^d + bh_t^d)$, i.e., households' 'money' demand, is equal to $(vh_t^d - pl_t^d)$. As a consequence, one can write

$$hh_t^d + mh_t^d + bh_t^d = vh_t^d - pl_t^d = vh_{t-1} + yh_t^e + cgh_t^e - c_t^d - pl_t^d \quad (D.4)$$

In other words, Davidson's households' 'money' demand is formally 'redundant'.[2]

Of the authors discussed here, Minsky is the one who paid less explicit attention to the portfolio decisions of the households. Even though formal Minskyan models usually deal with simplified financial structures and portfolio decisions (Dos Santos, 2005), we believe Minskyans would agree with the use of Tobinesque specifications, provided that κ is added to them.[3,4] We could, therefore, write

$$v_t^d = g_2(\kappa_t, rr_t^e, vh_{t-1}, yh_t^e) \quad (M.3 - M.6)$$

3.2.3 Firms. As Lavoie and Godley (2001–02, pp. 107–12) remind us, firms have (at least) four 'decisions to make', i.e., (i) 'they must decide what the mark up on costs is going to be'; (ii) they 'must decide ... how much to produce'; (iii) they must decide 'the quantity of capital goods that should be ordered and added to the existing stock of capital *k*—their investment'; and (iv) 'once the investment decision has been taken, firms must decide how it will be financed'. Here we shall neglect decision (ii), assuming that firms get the point of effective demand 'right'.[5] In fact, we shall be concerned only with decisions (iii) and (iv), leaving decision (i) for a later section.

We start by noting that it is possible to interpret the models described here as assuming that production is financed with loans obtained by firms in the beginning of the period and re-paid at the end of the period, so that a 'monetary circuit', as described, for example, by Graziani (2003, pp. 27–31), is implicit in them. Given that this circuit happens 'within the period', however, it cannot be explicitly described (without heroic assumptions) in our quasi-static framework.[6]

[1] Measuring, among other things, households' risk aversion and transaction costs of portfolio shifts (see Davidson, 1972, p. 255).

[2] Davidson's (1972, p. 214) money demand equation incorporates also the firms' demand for bank deposits, so it cannot be directly compared with equation (D.4). Davidson does not emphasise, however, the accounting constraint that (logically) ties households' demands for money and placements together.

[3] Decreases in κ (and, therefore, in the demand for 'placements') play a crucial role in the 'Minskyan crises' described in Taylor and O'Connell (1985) and Franke and Semmler (1989), while Taylor and O'Connell explicitly mention the inclusion of Tobinesque demands as a natural development of their model.

[4] As noted by Godley (1996, p. 24), it is possible to model changes in κ as changes in the constant terms of linear specifications of T2–T5 and G2–G5 (such as the ones in Brainard and Tobin (1968) and Godley (1996)). We keep the notation above, however, to emphasise that, while Minskyans attribute great importance to these expectations, Godley and (especially) Tobin do not emphasise them nearly as much.

[5] Keynes stated himself that 'the theory of effective demand is substantially the same if we assume that short period expectations are always fulfilled' (Asimakopulos, 1991, p. 39). See Godley(1999A) and Shaikh (1989) for models in which inventory cycles play crucial roles.

[6] This interpretation assumes that the interest rate paid by the firms to the banks on their (end of period) loans (i.e., those which financed their investment in fixed capital) incorporates the costs of the loans obtained (at the beginning of the period) to finance production (and re-paid at the end of the period).

Turning now our attention to firms' investment decisions, both Davidson's (1972, ch. 4) and Minsky's (1975, ch. 5) stories are based on Keynes's (G.T. ch. 11) well-known Marshallian analysis of the market for capital goods. As a consequence, one can write (assuming that i goes from $t+1$ until the relevant horizon of the stock of capital)

$$\Delta k_t^{d} = f_1(rrl_i^{e}, s_i^{e}, \zeta 1_i^{e}, \zeta 2_i^{e}, \kappa_t, k_{t-1}) \qquad \text{(D.5a and M.7a)}$$

where s stands for real ('final') sales, $\zeta 1$ and $\zeta 2$ are parameters measuring the productivity of capital and the profit share of the economy (crucial determinants of the future quasi-rents associated with new investment), the partial derivatives of f_1 with respect to s_i^{e}, $\zeta 1_i^{e}$, $\zeta 2_i^{e}$ and κ_t are all positive, and those with respect to rrl_i^{e} and k_{t-1} are negative.[1]

An investment function in line with Tobin (1980, 1982), in turn, is the following

$$\Delta k_t^{d} = f_2(q_t) k_{t-1} \qquad \text{(T.7)}$$

where $f_2(1)$=Harrods' (1939) warranted rate gw, $f_2' > 0$, and q is Brainard and Tobin's (1968) average q ratio, i.e.,

$$q_t = (pe_t \cdot E_t + L_t)/(p_t k) \qquad \text{(T.8, D.6, M.8, G.7)}^{2,3}$$

It is interesting to notice the relation between the two specifications above. Davidson and Minsky do agree that q's numerator is an elegant ('market') proxy for Keynes's 'demand price' of capital goods, while its denominator approximates Keynes's 'supply price', so that, as summarised by Brainard and Tobin (1968, p. 104), 'investment is stimulated when capital is valued more highly in markets than it costs to produce it [i.e. $q>1$] and discouraged to when its valuation is less than its replacement cost [i.e. $q<1$]'.[4] Tobin's specification above, however, implies that the economy tends (or could tend) to an 'equilibrium' path in which q equals 1 and the economy grows (steadily) at Harrod's warranted rate and, in our view, neither Davidson nor Minsky would agree with that. Indeed, Davidson (1972, p. 290), for example, seems to agree with Harrod that the warranted rate can only be achieved via fiscal policy interventions—for market economies left alone would deviate from it—while Minsky emphasised that the very nature of financial markets is such as to (generate endemic 'manias and crashes' and therefore) prevent Tobin's equilibrium to be achieved. One can, therefore, write (in the spirit of Taylor, 1991, ch. 5 and 6)

$$\Delta k_t^{d} = f_4(q_t, \kappa_t, u_t) k_{t-1} \qquad \text{(D.5.b, M.7b and G.8a)}$$

[1] Note that, in our one-sector economy, we cannot introduce the (relative) 'supply price' of capital goods as a determinant of Δk_t^{d}. Note also that $rrl_t^{e} = [(1 + rl_t)/p_{t+1}^{e}] - [1/p_t]$.

[2] As noted in Table 1, L stands for the nominal stock of bank loans to firms.

[3] Even though Backus *et al.* (1980, p. 261) state that 'we should not be surprised if current cash-flow, as well as long run calculation of profitability, affects business investment [of liquidity-constrained firms]'. Indeed, Tobin and Brainard (1977, 1990) make clear that q is to be understood as 'a' determinant of investment, not 'the' determinant of it. These considerations are usually neglected in their formal models, though.

[4] In fact, Davidson points out that 'his own [1965] ... approach to ... accumulation ... involved utilizing ... the market price of existing real capital relative to the cost of producing real capital ... as the relevant 'invisible hand' ratio directing the entrepreneurial determination of the rate of investment or disinvestment in real capital. This ratio is, of course, the equivalent of the famous q-ratio that Tobin was to discover in 1968' (Lavoie and Godley, 2001–02, p. 287). Tobin himself (1989A), Crotty (1990, p. 531) and Dimsky and Pollin, 1992, p. 37), on the other hand, agree that Minsky's own view about firms' demand for capital goods (e.g., Minsky, 1986, p. 183) could also be described as a function of q.

where $f'_3(q_t)$ and $f'_3(\kappa_t)$ are both positive, u stands for the economy's capacity utilisation (i.e., s/potential output[1]) and $f'_4(u)>0$. This last specification has the merit to make clear that the economy does not necessarily tend to a Harrodian 'warranted growth' equilibrium, therefore avoiding interpretative ambiguities.[2]

Godley's views on investment demand are somewhat less clear. Indeed, in earlier theoretical writings (e.g., Godley and Cripps, 1983) Godley modelled the economy's 'private expenditure' ($c+\Delta k_t$) as a single variable, neglecting its disaggregation into consumption and investment expenditures.[3] In later works, he used both eclectic versions of equation (G.8a) above (as in Lavoie and Godley, 2001–02) and (partial adjustment) Harrodian specifications (as in Godley, 1996, 2004), such as

$$\Delta k_t^{\mathrm{d}} = \alpha_5(\alpha_6 s_{t+1}^{\mathrm{e}} - k_{t-1}) \tag{G.8b}$$

where α_6 is the (exogenous) desired stock (of capital) flow (of final sales one period ahead) 'norm' of firms, and α_5 is a 'speed of adjustment' parameter.

As Minsky (1986, p. 188) emphasises, the investment demands above only become effective if they can be financed. The authors in question differ considerably on how they conceptualise this issue, though. Yale models, for example, explicitly assume that 'businesses can be modelled as if they are pure equity firms' (Tobin, 1980, p. 90), i.e., 'increases in equity occur either by issue of shares or by retention of earnings; retained earnings are considered as dividends paid matched by sales of shares' (Backus *et al.*, 1980, p. 266). Formally we have that

$$fu = mf = 0 \tag{T.9}$$

and

$$ff_t = s_t - w_t - tf_t - rl_{t-1}l_{t-1} \tag{T.10}$$

where *fu*, *ff*, *mf* and *tf* stand, respectively for firms' real retained and distributed earnings, bank deposits, and taxes.[4] Moreover, assuming (as Tobin, 1982, p. 179) that firms issue 'one share for each unit of capital', i.e.,

$$E_t^s = k_{t-1} + \Delta k_t^{\mathrm{d}} \tag{T.11}$$

row 16 of Table 2 implies that their real demand for bank loans is given by

$$l_t^{\mathrm{d}} = l_{t-1} + \Delta k_t^{\mathrm{d}} - pe_t \Delta E_t^s / p_t = l_{t-1} + (1 - pe_t/p_t)\Delta k_t^{\mathrm{d}} \tag{T.12}$$[5]

Davidson, Godley and Minsky put a much greater emphasis on the role played by undistributed profits in investment financing. The greater this last variable, it is argued, the smaller are both the 'lenders' and borrowers' risks' (G.T. ch. 11; Minsky, 1975, ch. 5, Davidson, 1972, p. 326) and, hence, the greater are the incentives to invest. None of these authors, however, modelled the determinants of the share of undistributed profits over

[1] That is generally assumed to be a fixed proportion of the (beginning of period) real stock of capital, so that $u_t = (s_t/\zeta 1_t k_{t-1})$.

[2] For two opposing views on the plausibility of 'long run' models without full capacity utilisation, see Dutt (1990, pp. 58–9) and Shaikh (1989).

[3] The same hypothesis reappears in his recent applied work (see Godley, 1999B).

[4] Since (by assumption) firms 'get the point of effective demand right', equation (T.10) is written in 'effective' terms.

[5] This result depends on the fact that the capital stock is valued 'at replacement cost' (see n. 1, p. 545).

firms' total after-tax profits. A natural way to proceed, then, is to follow Kaldor (1966) and Lavoie and Godley (2001–02) in assuming that

$$fu_t = \alpha_7(s_t - w_t - tf_t - rl_{t-1}l_{t-1} + rm_{t-1}mf_{t-1}) \qquad (G.9, D.7, M.9)$$

so that

$$ff_t = (1-\alpha_7)(s_t - w_t - tf_t - rl_{t-1}l_{t-1} + rm_{t-1}mf_{t-1}) \qquad (G.10, D.8, M.10)$$

where $0<\alpha_7<1$.

As both Godley and the FML simplify away money holdings of firms, one can also write

$$mf_t = mf_{t-1} = 0 \qquad (G.11, M.11)$$

while a Davidsonian 'closure' would have to incorporate Keynes's 'finance motive' (Davidson, 1972, ch. 7) for holding money, i.e.,

$$mf_t^{\mathrm{d}} = \alpha_8 \Delta k_t^{\mathrm{d}} \qquad (D.9)$$

No firm explanation is usually given also on how to disaggregate firms' liabilities.[1] As a consequence, we can write

$$E_t^s = \alpha_9 k_t^{\mathrm{d}} = \alpha_9(k_{t-1} + \Delta k_t^{\mathrm{d}}) \qquad (G.12, D.10, M.12)$$

and therefore (from Table 2, row 16)

$$l_t^{\mathrm{d}} = l_{t-1} + \Delta k_t^{\mathrm{d}} - pe_t \cdot \Delta E_t^s / p_t - fu_t + \Delta mf_t^{\mathrm{d}} \qquad (G.13, M.13, D.11)$$

3.2.4 The government. The usual hypotheses about government 'flow' behaviour apply to all authors discussed here

$$g_t = g_t^{\star} \qquad (T.13, G.14, M.14, D.12)$$

and

$$t_t = tw_t + tf_t = \theta w_t + \theta(s_t - w_t) = \theta s_t \qquad (T.14, G.15, M.15, D.13)^2$$

Things get more interesting when one notes that the government (including the monetary authority) has to decide also the related issues of (i) how to finance its debt; and (ii) how to 'regulate' financial markets. These are not discussed by Davidson (1972, 1994), however. Nor are they emphasised in the FML, despite the importance that Minsky (1986, ch. 13) attributed to them. As all four authors wrote against Friedman-style 'monetary rules',[3] it seems natural to depict them as assuming (as Zezza and Dos Santos, 2004) that the central bank buys as many government bills as necessary to keep *rb* at a given fixed level.[4] Formally

[1] Even though Franke and Semmler (1989) assume that the demand for loans is a function of expected profitability (for that would decrease borrower's risk), so the demand for equity is a residual. Godley (1996), in contrast models the conventional wisdom that firms try not to 'spoil the market' (and the lending goodwill of banks) assuming that they only issue equity if $q>1$.

[2] In fact, the hypothesis here is slightly different. All authors discussed here have used the simplifying assumption that 'taxes are net of transfers' (Backus *et al.*, 1980, p. 267), i.e., $t_t - rb_{t-1}\,(bh_{t-1} + bb_{t-1}) = \theta s_t$. The problem with this specification is that it introduces the 'hidden assumption' that *tw and tf* fluctuate to accommodate the government's interest payments to the private sector.

[3] See Tobin (1989B, ch. 24), Godley and Cripps (1983, ch. 7), Minsky (1986, p. 322–8), and Davidson (1972, ch. 13).

[4] Even though Tobin (1980,1982) assumes that rb_t adjusts to allow $b_t^s = bh_t^{\mathrm{d}} + bb_t^{\mathrm{d}}$ (so $bc_t^{\mathrm{d}}=0$).

$$rb_t = rb_t^{\star} \qquad (T.15, G.16, M.16, D.14)$$

and

$$bc_t^{d} = bc_t = b_t^{s} - bh_t^{d}(rr_t^{e}, v_{t-1}, yh_t^{e}) - bb_t^{d} \qquad (T.16, G.17, M.17, D.15)^{1}$$

where bb^{d} is banks' real demand for government bills (to be discussed below), and the real supply of government bills b^{s} is given by the government's budget constraint (see Table 2, row 17)

$$b_t^{s} = b_t = (1 + rb_{t-1})b_{t-1} + g_t - t_t - fc_t \qquad (T.17, G.18, M.18, D.16)$$

Assuming also that central bank advances are supplied as demanded, i.e.,

$$a_t = a_t^{d} \qquad (T18, G.19, M.19, D.17)^{2}$$

we have (from Table 1 above) that

$$h_t^{s} = bc_t + a_t \qquad (T.19, G.20, M.20, D.18)$$

The government is also supposed to set the banks' minimum required reserve to deposit ratio (α_{10}) and the interest rates of central bank's advancements (*ra*). Whether (or how much) the 'money supply' is 'endogenous' depends on how these variables affect the behaviour of the banking sector, a point to be discussed below.

3.2.5 Banks. Of the authors discussed here, only Tobin and Godley have tried to formalise banks' behaviour in detail. Indeed, one does not find in Davidson (1972, 1994) a convincing description of the rationale behind financial institutions' behaviour, even though their actions are crucial to the actual outcomes described (e.g., Davidson, 1972, p. 260, 280). Minsky (1986, ch. 10), in turn, dedicated a whole chapter to the topic, as well as many suggestive passages, but never formalised it rigorously.[3]

One of the main advantages of the SFCA is that, by conceptualising the economy as a 'closed system', it makes clear to the analyst the precise implications of such omissions. If, say, one treats the demands and supplies described in the sections above as 'effective' ones (say, by presenting them without superscripts and not providing equations about banking behaviour), he or she is logically implying (consciously or not) that the banking sector (or some kind of Walrasian auctioneer) will always adjust to whatever is being assumed about the other sectors. But banks do not play such a passive role in either Davidson's or Minsky's writings, so in what follows we 'complete' their 'closures' along the lines of Backus *et al.* (1980) and Godley (1999A).

Beginning with Tobin, we assume (in the spirit of Backus *et al.*, 1980, p. 265) that (i) banks must accept whatever deposits people want to make at a fixed nominal interest rate $rm^{\star}$; and (ii) the remainder of their portfolio depends on the (expected, real) rates of return on their assets and liabilities. One way to formalise these assumptions is the following

[1] Assuming, naturally, that such an equilibrium can be obtained with a positive *bc*. A negative *bc* would imply net sales of central bank bills (which were not modelled in Tables 1 and 2).

[2] Even tough Tobin did not make *a* explicit in his models, treating it as a negative demand for money (e.g., Tobin, 1980, p. 91). In our view, Tobin's procedure obscures the analysis rather than simplifying it.

[3] But see Delli Gatti *et al.* (1994). This relative neglect of banks can be extended also to the FML (see Dos Santos, 2005).

$$m_t^s = m_t = mh_t^d + mf_t^d \qquad (T.20, G.21, M.21, D.19)$$

$$rm_t = rm^\star \qquad (T.21, M.22a, D.20a)$$

$$l_t^s = fl(brr_t^e)\cdot(1-\alpha_{10})m_t^e \qquad (T.22)$$

$$bb_t^d = fb(brr_t^e)\cdot(1-\alpha_{10})m_t^e \qquad (T.23)$$

$$hb_t^d = \alpha_{10}m_t^e + fh(brr_t^e)(1-\alpha_{10})m_t^e \qquad (T.24)$$

and, of course,

$$fl + fb + fh = 1 \,(\text{so that } a_t^d = 0) \qquad (T.25, M.23a, D.21a)$$

where $(1-\alpha_{10})m_t^e$ are banks' 'available funds',[1] and brr=[rrh, rrm, rrb, rrl, rra] is the vector of real rates of return on banks' assets and liabilities.[2]

The formalisation above does not emphasise (though it also does not deny[3]) the role of expectation shifts and 'credit crunches', emphasised in both Davidson's and Minsky's stories.[4] It is, however, easy to modify the demands above to incorporate also the 'liquidity preference' parameter κ (*à la* Taylor and O'Connell 1985), so dear to these authors. We would then have

$$l_t^s = fl(brr_t^e, \kappa_t)(1-\alpha_{10})m_t^e \qquad (M.24a, D.22a)$$

$$bb_t^d = fb(brr_t^e, \kappa_t)(1-\alpha_{10})m_t^e \qquad (M.25a, D.23a)$$

and

$$hb_t^d = \alpha_{10}m_t^e + fh(brr_t^e, \kappa_t)(1-\alpha_{10})m_t^e \qquad (M.26a, D.24a)$$

Of course, as admitted by Tobin (1982, p. 194) and Backus *et al.* (1980, p. 265), respectively, it is perhaps more realistic to assume that banks: (i) 'can bid for deposits (...)', and (ii) 'regard business loans as a prior claim to their disposable funds', being 'price makers' in the market for loans. This last assumption is formalised by Godley (1999A, p. 408) as follows

$$l_t^s = l_t = l_t^d \qquad (G.22, M.22b, D.20b)^5$$

and

$$rl_t = (1+\alpha_{11})\max[rm_t, rb_t] \qquad (G.23, M.23b, D.21b)$$

[1] The implicit hypotheses here are that banks: (i) only get central bank advances in case of (large) expectation errors; and (ii) pay (all) these advances immediately after getting them.

[2] As one would expect, $rra_t^e = [(1+ra_t)/p_{t+1}^e] - [1/p_t]$.

[3] See n. 4, p. 550.

[4] See, for example, Davidson (1972, pp. 241–4) and Minsky (1986, p. 219). A neoclassical version of essentially the same story appears in Stiglitz and Greenwald (2003, ch. 2–7).

[5] Lavoie and Godley (2001–02, p. 290) say that the assumption above means that 'all credit-worthy demands for loans are granted', even though the 'credit-worthiness' of firms is never modelled. In fact, both Lavoie and Godley (*ibid.*) and Godley and Lavoie (2004A, p. 5) state that changes in the credit-worthiness of firms are (or should be) captured in their ('reduced form') investment functions. But this is precisely the usual Keynesian procedure, criticised by Godley (2004, p. 15) for trivialising the financing of firms' investment decisions. Godley (*ibid.*, pp. 6–9) appears more in line with our 'hierarchical' interpretation above.

where α_{11} is a fixed mark-up. Now note that, from Table 1 (and assuming that $a_t^d = 0$ and $hb_t^d = \alpha_{10} m_t$), Godley's assumption that banks are quantity-takers both in the markets for bank loans and deposits implies that

$$bb_t = \max[(1-\alpha_{10})mt - l_t, 0] \qquad \text{G.24, M.24b, D.22b)}$$

and

$$a_t = -\min[(1-\alpha_{10})mt - l_t, 0] \qquad \text{(G.25, M.25b, D.23b)}$$

But banks have means to avoid liquidity problems in Godley's closure, for they are price-makers in the market (i.e., they 'can bid') for money deposits. Specifically, Godley (1999A) assumes that banks have an exogenous 'norm [α_{12}] ... for the ratio of defensive assets ... to liabilities'[1] and 'increase the rate of interest on ... [deposits] at a [fixed] rate... whenever ... [this ratio] falls below the norm and reduce it when it rises above the norm'. Formally

$$bb_t^d = \alpha_{12} \cdot m_t \qquad \text{(G.26, M.26b, D.24b)}^{[2]}$$

and

$$\Delta rm_t = \alpha_{13} rm_{t-1} \,(\text{if } bb_t < bb_t^d) \text{ or } -\alpha_{13} rm_{t-1} \,(\text{if } bb_t > bb_t^d) \qquad \text{(G.27, M.27b, D.25b)}$$

3.2.6 Complete 'fix-price, equilibrium' closures. Assuming that households' and banks' expectations about *rr*, *brr*, *yh*, *cgh*, *w* and *m* are correct and the markets for stocks, bank deposits and loans, government bills, and cash all 'clear', the discussion so far has provided us with all the equations (and accounting identities) needed to specify complete fix-price ('short' and 'long') 'period' equilibrium 'closures' for each of the authors in question.[3,4] Though lack of space prevents us from analysing the details of such equilibria,[5] we hope it will be clear to the reader that their key assumption is that in each single ('short') 'period' '[financial] markets handle simultaneously flows arising from saving and accumulation and those arising from reshuffling of portfolios ... By the end of the period, simultaneously with the determination of asset prices for the period, ... market participants have the stocks of assets and of total wealth they desire ... at the prevailing prices' (Tobin, 1982, p. 187).

Despite the Post-Keynesian defence of 'historical models', this kind of equilibrium hypothesis is widespread among Keynesians. The problem is that, even though 'no [Keynesian] ... seriously believe that either the economy as a whole or its financial

[1] Godley and Lavoie (2004A, p. 5) describe it as 'a kind of non-compulsory secondary reserve ratio'.

[2] Note that this specification presupposes the existence of a large government debt. The role of public debt in easing banks' finance is an often-neglected 'Big Government' effect along the lines of Minsky (1986, ch. 13).

[3] One can, at a first approximation, assume an exogenous κ, and linear investment functions and (Tobinesque) asset demands for all authors, as well as an exogenous composition of Davidson's 'money demand' equation (D.4).

[4] The SFCA allows for a natural integration of 'short' and 'long' 'period' analyses. In particular, both Keynesian notions of 'long period equilibrium' and 'long run' acquire a precise sense in a SFC context, the former being the steady-state equilibrium of the stock-flow system (i.e., a situation in which all stocks and flows grow at the same rate), and the latter being the more realist notion of a path-dependent sequence of 'short periods' in which parameters are subject to sudden and unpredictable changes, and growth is far from balanced.

[5] Unfortunately, the models above do not admit clear-cut ('period' and, especially, steady-state) analytical solutions, so a thorough analysis of their features requires the help of computer simulations. The reader is, however, welcome to write down the equations of each closure and play around with them, so as to understand exactly why that is so.

subsector is continuously in an equilibrium' (Brainard and Tobin, 1968, p. 105), disequilibrium specifications are necessarily complex, having to answer questions such as: (i) which asset(s) holdings 'adjust' to 'surprise' conditions (in general 'buffer' assets are assumed[1]), and (ii) how the sectors respond dynamically to these surprises. Of the authors discussed here, only Tobin and Godley have tackled these issues. In particular, Tobin models disequilibrium processes in a way similar to Walras's '*tâtonnement*', i.e., assuming that 'the deviation of a variable from its "desired level" ... is diminished by a certain proportion at each time', with attention to the fact that 'the adjustment of any one asset holding depends not only on its own deviation but also on the deviation of the other assets' (Brainard and Tobin, 1968, p. 106).[2] Godley (1996, 1999A), on the other hand, prefers to work with the hypothesis that erroneous portfolio decisions are adjusted completely one period ahead, using partial adjustment mechanisms only for the stock (of wealth and fixed capital) flow (of disposable income and expected sales) processes he assumes for households and firms.

3.3 The 'old financial Keynesian' convergence

The previous sections aimed to convince the reader that several 'old' Keynesian 'schools' arrived in the 1970s at the same (Schumpeterian) 'view' of the economic system, i.e., one in which monetary and financial institutions (including, of course, the Treasury and the Central Bank) played a crucial role in dynamically determining [path dependent] 'real outcomes'. Besides, all of them considered this 'view' crucially different from what textbooks at the time described as Keynesianism.[3] Last, but not least, they all emphasised the (financial) determinants of 'effective demand', spending little time discussing supply factors.[4] In fact, supply considerations only enter these models in the form of a (or, at best, a small bunch of) 'aggregate supply equation(s), so one can write

$$p_t = Wage_t(1+\alpha_{14})/\alpha_{15} \qquad (\text{T.26, G28, M.28, D.26})$$

and

$$s_t^{\star} = \zeta 1_t k_{t-1} \qquad (\text{T.27, G29, M.29, D.27})$$

[1] Specifically, bank deposits are generally assumed to do the job for households, while government bills adjust for banks, and bank loans (and inventories) adjust for firms.

[2] From this perspective, at least, Tobin came closer to being the 'Walras' than the 'Keynes of Flow of Funds Analysis'.

[3] This point is perhaps more obvious in the case of the two leading 'American Post-Keynesians' (see, Davidson, 1972, ch. 13; Minsky, 1975, introduction). Note, however, that the Kaldorian Post-Keynesian tradition—often criticised in the past for trivialising monetary policy and financial issues—have with time shifted towards the 'American' view. Skott (1989, p. 2), for example, admits that 'the explicit inclusion of financial stocks offers ... more reasonable description(s) ... than traditional Keynesian formulations based on flows alone'. In the same spirit, Godley (1992, p. 198) remembers 'with some frustration' being 'badly outflanked by the rise in the influence of monetarism ... [in] the 1970s', because by that time he 'was only just beginning to incorporate balance sheet concepts systematically' and, therefore, found himself 'unable, at the elementary level of accountancy, to give convincing answers to perfectly simple questions about where money "was" in ... [his] model'. Finally, despite Tobin's 'Walrasian' influences, we believe it is possible to interpret him along the lines proposed here. In particular, the heterodoxy of Yale authors is increased by their admission that 'it's convenient to imagine agents who make decisions sequentially or hierarchically' (Backus *et al.*, 1980, p. 273). As demonstrated above, these hypotheses bring Tobin's models much closer to Godley's and, as the authors recognise (*ibid.*, p. 273), are in sharp contrast to neoclassical economics.

[4] Though in all the 'closures' discussed above, the 'real' determinants of profitability affect households' wealth (via dividends) and, therefore, financial markets and (through q and retained earnings) investment and total production.

where, for simplicity, the nominal wage rate (*Wage*), the firms' mark up (α_{14}), and the average labour productivity (α_{15}) are all exogenous,[1] so s_t is implicitly assumed to be smaller than the maximum technically allowed, $s_t\star$.[2]

Of course, even a casual look at the equations above is sufficient to establish that the authors in question differed considerably on many issues. We do believe, however, that these disagreements were mostly due to matters of emphasis and style. Davidson and Minsky, for example, spent a lot of time describing the complexities associated with financially sophisticated capitalist economies. Anyone familiar with Keynes's original writings, they believed (and hence their urging of the profession to return to them), would quickly understand the draconian simplifications assumed in IS/LM-based and 'neoclassical growth' constructs and, therefore, be suspicious of policies based on (or rationalised with) them. That Davidson never fully embraced Minsky's views on the unavoidable character of financial crises in capitalist economies (though he clearly acknowledged their logical possibility) is, in our opinion, a matter of emphasis, as much as the fact that neither author cared to 'close' their 'models' with formal assumptions about banks' behaviour (though their own writings emphasise its importance) or to present their views in the context of formal SFC frameworks (though their writings are obviously compatible with them). As often happens with 'literary' authors, Minsky and Davidson focused on issues that were broad and qualitative enough to be successfully tackled without recourse to mathematical formalisation. The drawback of their approach, of course, is that it prevented them from understanding fully the logical implications of their own hypotheses.

Tobin's style and emphases were clearly different. Coming from a neoclassical background, he was less willing to concede that capitalist economies with sophisticated financial markets were inherently unstable, but (to his credit) obviously did not deny the complexities associated with them. Moreover, and perhaps because he was writing for the mainstream of the profession, his arguments were almost always more formal and general—and, therefore, less eloquent and direct—than those of the other authors in our sample. To be sure, his faith in (government controlled) markets showed up in the fact that his models usually admitted the hypothesis that the economy could reach (or be placed in) some sort of virtuous equilibrium—therefore proving that IS/LM-type conclusions could also be true in more sophisticated contexts (provided the 'right' assumptions were made). But the contrary is also true. It is not difficult, as Godley's writings have made clear, to modify a Tobin 'closure' (e.g., with 'hierarchical' assumptions) and reach very heterodox conclusions. In fact, it appears to us that Godley stands in the 'middle ground' between Tobin and the American Post-Keynesians. He obviously shares Tobin's enthusiasm for the analytical discipline imposed by SFCA, for example, but not his faith in the ability of markets. As a consequence, even if his style and emphases differ considerably from Minsky's and Davidson's, he is theoretically closer to them than to Tobin. In fact, an illuminating way to see his work is as an attempt to formalise and simulate—building on Tobin's original writings and adapting them with 'realistic' institutional hypotheses—classical ('British' and 'American') Post-Keynesian insights about capitalist economies

[1] The specification above is too simple even for the standards of these authors, though. Davidson (1972), for example, uses Marshallian short period specifications. Tobin (1982) suggests the usual neoclassical synthesis textbook hypothesis of a Phillips' curve (with fixed α_{14} and α_{15}), while Godley (e.g., 2004) proposes a (related) specification in which workers have [exogenous] 'target real wages' and the mark-up is affected by financing costs. However, virtually all FM papers are fix-price ones (Dos Santos, 2005).

[2] All models above are compatible with 'forced saving' closures (*à la* Taylor, 1991, p. 47) if this is not the case. Lack of space forces us to avoid a detailed treatment of inflation issues, though.

with developed financial markets.[1] From this perspective, Godley's work both extends and sheds light on the merits and limitations of Tobin's.[2]

Be that as it may, it is beyond doubt that: (i) all authors above have worked with 'period' equilibrium models of economies with households, firms, banks and a government; and (ii) sectoral balance sheets play a crucial role on these 'period' equilibrium solutions, which, in turn, involve income redistributions among sectors and non-zero sectoral saving (and investment) flows and capital gains. In this precise sense, these models can only be rigorously described/analysed with the help of SFC accounting frameworks. The alternative, as should by now be clear to the reader, is to work with either theoretically incomplete and/or logically inconsistent specifications.

4. The 'unexplored frontier'

The remaining point we want to make is that SFC 'Financial Keynesian' models are a relatively 'unexplored' frontier of Keynesian thought. Here, again, we proceed in two steps. First, we argue that 'modern' theorising not only does not provide better answers to the questions addressed by the authors discussed here but, in fact, avoids many of them. Second, we discuss a couple of unresolved issues within this 'Financial Keynesian' paradigm.

4.1 Aren't 'old' Keynesian SFC models simply outdated?

It is difficult to define 'modern' macroeconomics. Indeed, any typical 'modern' textbook presents 'literally dozens of models' (Romer, 1996, p. 3) which do not fit in any reasonably coherent 'big picture'.[3] For our purposes, however, it is enough to assume that 'modern macro' 'proposes that the actual economy can be read as if it is acting out or approximating the infinite-time discounted utility maximising programme of [either] a single, immortal

[1] In his own words, 'looked at one way, [my work] contains nothing new. Keynes, Kaldor and Hicks (I hardly need to say) all had very well worked out notions as to how economies—extremely complicated interdependent systems changing through historical time—function. The trouble is that none of these authors [nor the American Post-Keynesians] chose to formalise their systems . . . I shall instead adopt a methodology pioneered by James Tobin wherein a whole [SFC] model is set out formally and then subjected to numerical simulation; it is perhaps the only way in which the properties of a very complicated dynamic system can be ascertained with precision' (Godley, 1996, p. 3). In particular, Godley emphasises (much more than Tobin, actually) the methodological advantages of phrasing (SFC) macroeconomic models as computer simulation programmes, not only to allow rigorous checks of their accounting consistency, but also—and equally importantly—to allow quick 'period by period' (and, therefore, essentially Post-Keynesian) dynamic solutions of these stock-flow systems. It is in this spirit, the author believes, that Lavoie and Godley (2001–02, p. 131) portray the SFCA as an 'alternative [and solid] foundation' for heterodox macroeconomics, which 'is sometimes accused of lacking coherence, formalism, and logic'. Lack of space prevents a discussion of numerical simulations of the models above, though.

[2] As far as we know, Tobin essentially gave up trying to convince the profession of the merits of SFC models (once known as 'Yale macro') in the middle of the 1980s (though the approach reappeared in Tobin and Brainard, 1992). Empirical failures, apparently, played an important role in these events. As reported by Buiter (2003, p. 7) 'the empirical implementation of complete systems of portfolio balance and flow-of-funds models has been a mixed success at best . . . [because] problems of collinearity among asset returns make the accurate estimation of . . . [Tobinesque asset demands] problematic' (see also Backus *et al.*, 1980). One might, therefore, conjecture that Tobin was more concerned with his own version of (macro) portfolio theory than with the broader implications of SFC requirements in macroeconomic models. As noted above, there is no theoretical reason to believe that the parameters of Tobinesque portfolio demands will be amenable to econometric identification in the first place.

[3] Essentially the same view is espoused by Tobin (1989B, p. 19) and Fair (1994, pp. 14–15).

representative agent [or "overlapping generations" of single mortal ones]' (Hahn and Solow, 1995, p. 2).[1]

Indeed, most 'modern' models start with a 'representative agent' dynamically maximising some sort of utility function over a given (often infinite, and never uncertain in the Knight–Keynes sense of the term) time horizon. Mainstream practitioners take great pride from this fact, often stating that such 'dynamic general equilibrium' models are 'rigorously founded on microeconomic principles' (Mankiw, 1990, p. 1653) and, therefore, represent a 'methodological advance' (Clarida *et al.*, 1999, p. 1665) over 'ad hoc' models 'that directly specify relations among aggregate variables' (Romer, 1996, p. 6). Specifically, Taylor (2001, p. 2) notes that 'the representative agent approach is attractive because it automatically builds in people's responses to policy [therefore avoiding the so-called "Lucas critique"[2]] and because it allows policy to be evaluated using the utility function of the representative agent [i.e., it allows a "rigorous" treatment of welfare issues[3]]'.

It seems to us, therefore, that 'modern' theorists would object to the use of the models discussed above on at least two grounds. First, they would note that SFC requirements are taken into consideration in the intertemporal maximisation 'problems' of the 'representative agents' assumed in their models. Second, they would argue that their models are 'more rigorous' than 'old Keynesian' SFC ('ad hoc') ones.

Beginning with the latter critique, we note that knowledgeable mainstream practitioners are well aware that the idea that 'representative agent' models are 'rigorously founded on microeconomic principles' is simply false. As Kirman (1992, p. 134) points out, rigorous neoclassical microeconomics makes clear 'that well-behaved individuals need not produce a well-behaved representative agent; that the reaction of a representative agent to change need not to reflect how the individuals of the economy would respond to change; [and] that the preferences of a representative agent over choices may be diametrically opposed to those of the society as a whole'.[4] Kirman's (1992, p. 125) conclusion that 'the assumption of a representative individual is ... the fiction by which macroeconomists can justify equilibrium analysis and provide pseudo-microfoundations [to their conclusions]' may surprise some, for it implies that mainstream macroeconomists consciously ignore proved logical flaws in their theorising. But exactly the same pattern reappears (as reported by Felipe and Fisher, 2003) in the spurious and widespread use of well-behaved aggregate production functions in the 'new growth' literature, several decades after the Cambridge controversies.

[1] This approximation leaves out of the picture an influential group of 'New-Keynesians' who 'agree that [important macroeconomic] problems ... simply cannot be studied in the context of a macroeconomy consisting only of an aggregated representative agent' (Greenwald and Stiglitz, 1993, p. 42). Perhaps more seriously, it neglects the fact that most mainstream practitioners acknowledge the need and/or convenience of 'rely[ing] on ... models that cannot be derived from first principles' (Blanchard and Fischer, 1989, p. xii)—an obvious example of which being Solow's neoclassical growth model, 'the starting point for almost all ["modern"] analyses of growth' (Romer, 1996, p. 16).

[2] As summarised by Mankiw (1990, p. 1647), 'Lucas pointed out that most policy interventions change the way individuals form expectations about the future. Yet the proxies for expectations used in ... ['Old' Neoclassical Keynesian macroeconometric] models failed to take account of this change in expectation formation. Lucas concluded, therefore, that these models should not be used to evaluate the impact of alternative policies.' Of course, as noted by Fair (1994, p. 14), 'one encouraging feature regarding the Lucas critique is that it can be [econometrically] tested [in the context of "old" models]'.

[3] As Romer (1996, p. 6) points out, 'without individuals in the model, we cannot say whether different outcomes make individuals better or worse off'.

[4] On the same issue, Tobin (1989B, p. 18) remarks that 'why this 'representative agent' assumption is less ad hoc and more defensible a simplification than ... constructs of early macro modelers ... is beyond me'. Similarly, Hahn (1984) characterises 'microfoundations' of 'new classical' macroeconomic models as oversimplified and misleading.

Turning to the first critique, we note that while it is true that most 'modern' models are SFC, it is also true that most of them have only two institutional sectors (the government and the sector of household-producers of one single good) and (if at all) one financial asset (money).[1] This simplified framework, in turn, greatly facilitates the specification of the representative agent's maximisation problem. To put the same point differently, the maximisation problem of a 'representative household' in the economy discussed earlier is infinitely more difficult to write, among other things because—under reasonable assumptions—asset prices necessarily depend on the actions of 'other' 'representative agents' as well (i.e., the 'representative CEO', the 'central banker', the 'president' and the 'representative banker'), making 'rational' portfolio choice extremely difficult. In other words, a convincing 'modern closure' of the accounting above would imply the specification and solution of a very complex 'dynamic game', and hence the fact that it does not exist.

It seems, therefore, proper to conclude that 'modern macro' can only be deemed 'rigorous' by people (like Barro, 1990, p. 27) who believe that 'the primitive environment of Robinson Crusoe contains the essence of choice problems that arise in complicated market economies', so its lessons 'remain valid . . . in . . . settings that look more like modern industrialised economies'. This is obviously not the case of the authors discussed in the sections above, though.

4.2 What lies ahead? A Post-Keynesian/structuralist perspective

We start by noting that the dynamic properties of the models described above are essentially unknown. In particular, while meaningful steady states are readily available, the possibility of financial crises (and therefore, abrupt and significant changes in the stock variables) sheds considerable doubt on the usefulness of conventional stability analyses based on the linearisation of the model in the neighbourhood of its intertemporal equilibria. Even those are not straightforward, however. In fact, as shown by Franke and Semmler (1989), the mere existence of 'one-period' equilibria (in simplified similar models) cannot be taken for granted. This point is important, because one can comfortably phrase virtually all classic and recent Keynesian debates as specific (comparative static or dynamic) exercises of SFC 'Financial Keynesian' models like the ones above. These include issues such as how much an increase in households' saving affects the 'financing of investment', or whether or not the 'real balance effect' operates and private investment is 'crowded out' by government deficits in any significant scale, or even whether or not the monetary authority should try to affect asset prices, for example. The fact that we do not know how these dynamical systems behave implies that we cannot give precise theoretical answers to these questions.

But a lot will remain to be done even when this knowledge becomes available. We are perfectly aware, in particular, that the economy described above is at best a useful caricature of some general features of actual capitalist economies. In fact, an illuminating way to see the models described above is as a subset of what Taylor (1991, 2004) calls 'Structuralist' macroeconomics. As such, they must be modified and/or extended to incorporate economy-specific institutional detail if they are to be of any practical use,[2]

[1] As noted by Gertler (1988, p. 559), 'most macroeconomic theory presumes that the financial system functions . . . smoothly enough to justify abstracting from financial considerations'. Interestingly enough, when the few mainstream economists who reject 'perfect capital markets' hypotheses and work with reasonably realistic institutional frameworks (e.g., Stiglitz and Greenwald, 2003, ch. 1–2) finally present their models (*ibid.*, ch. 3–6) they often do so in the old (inconsistent) IS/LM form.

[2] An obvious extension would be to 'open' the economy described above. See Godley and Lavoie (2004B) for a discussion of open economy Keynesian SFC models.

implying not only that many other institutionally rich SFC models must be constructed, but also that their 'fit' to specific historical experiences must be carefully studied. The discussion of appropriate policy-making, in particular, is bound to benefit as much from these historical and institutional contexts as from the knowledge of the formal properties of the chosen models *per se*.

Even if precise 'positive' conclusions remain elusive or contingent on institutional and historical detail, the view described here implies general (and heterodox) 'normative' conclusions, for it shifts (to a great extent) the emphasis from macroeconomic flows to stocks. From this perspective, the government's fiscal policy, for example, has to be examined not only by reference to its possible contribution to effective demand in one particular period, but also (and dynamically more importantly) from its contribution to the nominal stock of private wealth of the economy.[1] Analogously, how, say, *rb* affects the economy will depend not only on the substitution effects it induces but also, and crucially, on the composition of the sectoral balance sheets (for these will determine its impact on the sectoral disposable incomes). As is well known, these effects are largely neglected in current mainstream models, and so is the broader normative 'Minskyan' message on the importance of keeping sectoral balance sheets 'healthy'—for 'modern' constructs completely ignore 'transmission mechanisms' and assume that sectoral balance sheets and financial market outcomes always reflect the (history of) 'optimal' decisions of agents. Yet, if stock-flow ratios are growing without bounds or tending to a very high level, one has every reason to suspect that some structural or parametric change will happen in the system to prevent these outcomes, an adjustment that (as stressed by Godley, 1999B, and Minsky, 1982, 1986) often takes the form of financial/political crises and/or (forced) government interventions.[2]

5. Final remarks

Keynesian SFC practitioners strongly believe that their models are closer than others to the ideal of providing macroeconomists with logical equivalents to 'artificial economies'. By making sure model-builders take into consideration all 'system-wide' constraints implied by their hypotheses, the approach forces them to recognise the intrinsic limitations of macroeconomic analysis and to be explicit about how they deal with them. In particular, Keynesian SFC models provide considerable insight on the implications of dropping the currently favoured (though obviously non-robust) 'shortcut assumptions' of representative agents, well-behaved aggregate production functions, perfect capital markets and instantaneous equilibrium.

These advantages have a price, of course. Keynesian SFC models are intensive in theoretical assumptions and are often difficult to deal with.[3] However, it seems to

[1] Indeed, as the authors discussed here saw inflation as largely independent of fiscal deficits and deemed 'Ricardian Equivalence' arguments unappealing, the government is assumed to be able to create real wealth just by issuing money/bills (see Table 1 above).

[2] As Godley and Cripps (1983, p. 44) point out, even though 'the evolution of whole economies, like their political systems, is a highly contingent historical process . . ., we must exploit logic so far as we possibly can'. In particular, certain things (e.g., a continuous 'explosion' of, say, firms' loan to capital ratio in a context of fixed real interest rates) simply cannot happen (for it would imply a continuous 'explosion' of firms' interest payments to banks and, therefore, a continuous 'implosion' of their net profits).

[3] As Malinvaud (1977, pp. 6–7) once put it, 'if one objects to thinking with equilibria, one must use a dynamic formulation in which the relevant variables will simultaneously move according to some properly specified rules. We then quickly realise that a correct [disequilibrium] dynamic model cannot be simple . . . [for] one has to portray . . . the short-run decisions of [the government, banks,] firms and individuals . . . To ask for a satisfactory answer to all these questions . . . is first to require a very extensive knowledge and second to suggest the elaboration of a model that will be very complex to handle . . .'.

us that these difficulties are largely overestimated by a profession addicted to oversimplified parables. As Hahn (1984, p. 310) reminds us, 'if you are a true simplifier and not just sloppy and lazy then you must be able to claim to arrive at essentials which are also to be found in what you regard as complicated'. Unfortunately, his conclusion (*ibid*.) that 'current ... writing does not survive this test' remains as valid today as it was in 1984.

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