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Keynesian Theorizing During Hard Times: Stock-Flow Consistent Models as an Unexplored "Frontier" of Keynesian Macroeconomics

by

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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."

Tobin's "alternative framework" is, essentially, what we mean by the stock-flow consistent approach to macroeconomic modeling (SFCA, from now on)[2]. As it 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[3], 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. In fact, conceived in a time in which Keynesian thinking was under severe attack for allegedly lacking analytic rigor, the SFCA aimed precisely to allow integrated and rigorous analyses of a large range of inter-related "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 behavior, and the (dynamically) optimum monetary/fiscal "mix" to be adopted by policy-makers. The failure of the SFCA to be widely

[1] See also Brainard and Tobin (1968), Tobin and Buiter (1976), Backus et.al. (1980), and Tobin (1980, 1982). To some extent, these models are generalizations of previous efforts by Ott and Ott (1965), Christ (1968), and Blinder and Solow (1973). Turnovsky (1977) provides a textbook treatment of this earlier literature. In the heterodox side of the aisle, the efforts by Davidson (1972), Minsky (1975, 1986), and Godley and Cripps (1983), among others, are also noteworthy.

[2] Even though Tobin himself didn't call 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), among others], but it seems to us that it can and should be applied more generally.

[3] See, for example, Godley (1996, 1999a, 2004), Lavoie and Godley (2001-2002), Zezza and Dos Santos (forthcoming), and Dos Santos (2004), among others.

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 program.

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. We tried to do that (in the long sections 1 and 2) adopting Taylor's (1991, 2004) structuralist methodology of phrasing the alternative views of Davidson (1972, 1994); Godley (1996, 1999a, Godley and Cripps, 1983; and Lavoie and Godley, 2001-2002); Minsky (1975, 1986); and Tobin (1980, 1982, and Backus et.al. 1980); as different "closures" of the same (SFC) accounting framework[4,5]. The second goal is to convince the reader (in the brief section 3) that the issues tackled by SFC authors are crucial ones in macroeconomics and still essentially open.

We begin, as one must when discussing this literature, by the accounting framework.

1 – THE ACCOUNTING FRAMEWORK

Accounting structures are not neutral. People often disagree not only on what to account for, but also on how to account for what they think is right to account for. As a consequence, the structuralist methodology used here may imply a significant bias—a kind of "home court advantage" for some views (more in line with the ones underlying the accounting) over others. Fortunately, all authors discussed here have—at some point, at least—phrased their views as relating to (closed) monetary capitalist economies with developed financial markets.

As Minsky (1975, p. 118) once wrote "an ultimate reality in [such] 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" (*ibid*, p. 70). We therefore begin our

[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] The particular authors chosen here aim to represent the three main "Keynesian schools," i.e. the so-called "Neoclassical Synthesis of Keynes," and both the "British" and "American" Post-Keynesians. Others could have been chosen, of course, but we hope the reader will agree that our—unavoidably biased—selection is sufficiently representative.

exposition with the balance sheets of the sectors in our "artificial Keynesian economy." These are depicted in Table 1 below, which we hope the reader will find self-explanatory[6].

Table 1 summarizes many theoretical assumptions. In particular, its empty cells make clear we are simplifying away bank loans to households and money holdings of the government. We also assume that banks: (i) neither issue nor hold equities; and (ii) distribute all their profits, so their net worth is zero. These simplifications are standard in the works of Tobin and Godley and in the Structuralist/Post-Keynesian "formal Minskyan" literature (FML, from now on) and appear to be broadly consistent with both Davidson's and Minsky's literary analyses[7].

Table 1. Balance sheets in our "artificial economy."
A (+) before a variable denotes an asset while a (-) denotes a liability.
"*Pe*" stands for the price of one equity, and "*E*" for the number of equities issued.

	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 – Bills	*+Bh*		*+Bb*	*+Bc*	*-B*	*0*
6 – Capital Goods		*+K*				*+K*
7 – Equities	*+E·Pe*	*-E·Pe*				*0*
8 – Net Worth (Column Totals)	*+ Vh*	*+ Vf*	*0*	*0*	*-B*	*+K*

The theoretical assumptions summarized above have important logical implications. First and foremost, as stressed by Minsky (*ibid*, p. 118), "items in the balance sheets set up cash flows." More precisely, "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*, p. 118). These cash-flows, by their turn, necessarily affect the sectoral budget constraints, i.e. the resources available to

[6] Note that, since any financial asset must have a counterpart financial liability, rows 1-5 and 7 in Table 1 must add up to zero.

[7] Even though the specific financial architectures assumed by Davidson and the FML papers do not exactly match the one above (see discussion below). Taylor and O'Connel (1985) is widely seen as the seminal FM paper. For a critical survey of this literature, see Dos Santos (2004).

firms, households, banks and the government to finance their consumption and accumulation plans.

Table 2. Transactions in our "artificial Keynesian economy"
A (+) sign before a variable denotes a receipt while a (-) sign denotes a payment

	Households	Non Financial Firms Currrent	Non Financial Firms Capital	Govt	Banks	Central Bank	Row Totals
1 – Cons.	$-C$	$+C$	-	-		-	*0*
2 – Govt. Expenditures		$+G$	-	$-G$		-	*0*
3 – Invest. in fixed K[8]	-	$+\Delta K$	$-\Delta K$	-		-	*0*
4 – Accounting Memo (1): "Final" Sales at market prices ≡ $S \equiv C + G + \Delta K \equiv W + FT + IT \equiv Y$							
5 – Wages	$+W$	$-W$	-	-	-	-	*0*
6 – Taxes	$-DT$	$-IT$	-	$+T$	-	-	*0*
7 – Interest on Loans		$-rl_{-1} \cdot L_{-1}$	-	-	$+ rl_{-1} \cdot L_{-1} - ra_{-1} \cdot A_{-1}$	$+ ra_{-1} \cdot A_{-1}$	*0*
8 – Interest on Bills	$+ rb_{-1} \cdot Bh_{-1}$		-	$- rb_{-1} * B_{-1}$	$+rb_{-1} \cdot Bb_{-1}$	$+rb_{-1} \cdot Bc_{-1}$	*0*
9 – Interest on Deposits	$+rm_{-1} \cdot Mh_{-1}$	$+rm_{-1} \cdot Mf_{-1}$	-	-	$-rm_{-1} \cdot M_{-1}$	-	*0*
10-Dividends	$+Ff + Fb$	$-Ff$	-	$+Fc$	$-Fb$	$-Fc$	*0*
11– Column Totals	*SAVh*	*Fu*	$-\Delta K$	*SAVg*	*0*	*0*	*0*
12 – Accounting Memo (2): Households' Disposable Income ≡ $Yh \equiv W + rb_{-1} \cdot Bh_{-1} + rm_{-1} \cdot Mh_{-1} + Ff + Fb - DT$							
13 – Accounting Memo (3): Firms' Gross Profits ≡ $FT \equiv S - W - IT$							
14 – Accounting Memo (4): Government's Disposable Income ≡ $Yg \equiv T - rb_{-1} \cdot B_{-1} + Fc$							
15 – Accounting Memo (5): National Income ≡ $Y \equiv Yh + Yg + Fu \equiv Yh + Yg + FT - rl_{-1} \cdot L_{-1} + rm_{-1} \cdot Mf_{-1} - Ff \equiv S$							

Indeed, Table 2 above is easier to understand when considered as a logical "flow" implication of Table 1[9]. In particular, rows (7)-(10) depicting the interest and dividend payments among sectors are directly implied by their liability structures, our assumptions being 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*." We assume also

[8]We follow here the broad Keynesian literature in simplifying away investment in inventories (see discussion below). We also simplify away capital depreciation.

[9] Both Godley (1996, 1999a) and Tobin (1980, 1982) explicitly used accounting structures closely related to tables 1-3 above. Minsky did not, but came very close (see Minsky, 1975, chapter 7 and 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 emphasize the logical discipline imposed by the accounting structures above.

that: (i) banks do not pay taxes; (ii) banks distribute all their "current profits" (*Fb*), so that their net worth is zero; (iii) the central bank distributes all its "current profits" (*Fc*) to the "Government" (understood here as a "Treasury"), so its net worth is zero; and (iii) firms do retain a part (*Fu*) of their after tax profits (or Marshallian "quasi-rents"). Note also that *DT* stands for "direct taxes" (paid by the households on their income), while *IT* stands for "indirect taxes" (paid by the firms on their total receipts). Note, finally that, Table 2 makes sure that "every financial flow comes from somewhere and goes somewhere" (Godley, 1999a, p. 394), and allows an explicit derivation of the sectors' "current savings" (given by "current" column totals)[10].

The columns in table 3 below, by their turn, demonstrate how the sectors' balance sheets (which will constrain the flow behavior in the next period) are (necessarily) modified by these savings. In this sense, they can be interpreted as sectoral budget constraints. Indeed, the net worth of the sectors in Table 1 is related to the capital account flows in Table 3 (and the current savings in Table 2) by the accounting identity:

$$NW_t \equiv NW_{t-1} + SAV_t + CG_t ,$$

or, in words, the net worth of sector "*i*" is increased by its current savings plus the capital gains (*CG*) arising from changes in the market value of its assets during the period.

[10] In particular, adding up the "current" savings of households $(SAVh \equiv W + rb_{-1}\cdot Bh_{-1} + rm_{-1}\cdot Mh_{-1} + Ff + Fb - C - DT)$, firms' retained earnings ($Fu \equiv S - IT - W - Ff - rl_{-1}\cdot L_{-1} + rm_{-1}\cdot Mf_{-1}$), and government's savings ($SAVg \equiv T + Fc - G - rb_{-1}\cdot B_{-1}$), one gets the economy's total savings (*SAV*) that ex-post is identical to investment (ΔK).

Table 3. Flows of Funds (positive figures denote sources of funds, while negative ones denote uses of funds)						
	Households	Firms	Banks	Central Bank	Govern-ment	Row Totals
Current Savings	$+SAVh$	$+Fu$	0	0	$+SAVg$	
Δcash	$-\Delta Hh$		$-\Delta Hb$	$+\Delta H$		0
ΔCentral Bank advances			$+\Delta A$	$-\Delta A$		0
ΔBank deposits	$-\Delta Mh$	$-\Delta Mf$	$+\Delta M$			0
Δloans		$+\Delta L$	$-\Delta L$			0
ΔTreasury Bills	$-\Delta Bh$		$-\Delta Bb$	ΔBc	$+\Delta B$	0
Δcapital		$-\Delta K$				$+\Delta K$
Δequities	$-\Delta E \cdot Pe$	$+\Delta E \cdot Pe$				0
Column Totals	0	0	0	0	0	$+\Delta K$
Δnet Worth (Accounting Memo)	$SAVh + \Delta Pe \cdot E_{-1}$	$Fu - \Delta Pe \cdot E_{-1}$	0	0	$SAVg$	$SAV \equiv \Delta K$

We finish this accounting "*tour de force*" reminding the reader that all accounts presented so far were phrased in nominal terms. Assuming a single price deflator P for all the variables, all stocks and flows in tables 1 and 2 above have straightforward "real" counterparts given by their nominal value divided by P. Using lower case letters to denote deflated variables we have, for example:

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

Things are different, however, with capital gains and losses. Only equity holders/issuers can have nominal capital gains/losses in the economy above[11] but the real value of **all** assets decline with inflation. Accordingly, households' real capital gains in a given period, for example, are given by:

$$cgh \equiv \Delta Pe_t \cdot E_{-1}/P_t - v_{-1} \cdot \Delta P/P_t$$

[11]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 and losses in this economy.

2 – FOUR DIFFERENT KEYNESIAN CLOSURES

Flow of Funds accounting structures like the one above were proposed by American economist Morris Copeland in the 1940s and have actually been published for the U.S. economy since 1952[12]. 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" (Duesenberry, 1962, p. 173). This section is dedicated to evaluate the contributions of some of the major applicants to the job.

Before we do that, however, we need to discuss a couple of theoretical/methodological issues related to our approach. First, it should be noted that the structure above simplifies away "non-bank financial intermediaries"—deemed by Davidson (1972, p. 146-147) 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 emphasize that investment in fixed capital in modern capitalist economies relies heavily on institutions that borrow "short" and lend "long" (like, 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[13].

Secondly, we also simplify away the dichotomies between consumption and capital goods (for we work with a one-sector economy) and between "spot" and "forward" markets, both of which play a crucial role in the "microfoundations" of aggregate investment in Davidson and Minsky[14]. In fact, given our focus on macroeconomic "closures," we pay scarce attention to the "microfoundations" (if any exist) of the models discussed here. We do understand the biases introduced by this decision. In particular, one can convincingly argue that both Minsky and

[12] Many other countries started producing their own flow of funds accounts after that. In fact, the United Nation's newest 'System of National Accounts 1993" seeks precisely to integrate flow of funds accounts with conventional national income and product accounts along the lines discussed above. See NBER (1962), Dawson (1996), and the Board of Governors of the Federal Reserve (various issues) for more on the intellectual history of the U.S. flow of funds accounts.

[13] In Davidson's writings (e.g. 1972, chapters 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 (…)."

[14] See Davidson (1972, chapter 4), and Minsky (1975, chapter 5). Clearly enough, stock-flow considerations affect crucially the (Marshallian, partial) markets for capital goods assumed by these authors. This does not imply, as discussed below, that these authors are "stock-flow consistent" in our sense, for stock-flow consistency requirements apply to all stocks and flows assumed in one's model, not just to the modeling of the stock of capital goods/flow of investment.

Davidson spent more time discussing/proposing alternative ("truly Keynesian") "microfoundations" to macroeconomic models than actually developing such models. While we do agree that a (structuralist) comparison between "model-builders" (like Tobin and Godley) and (mostly) "literary" authors (like 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 "formal Minskyan literature" (in particular, the models by Taylor and O'Connel, 1985 and Franke and Semmler, 1989) can be used—together with Minsky's literary descriptions—to build a coherent Minskyan model.

Thirdly, it should be noted also that all authors in question work with (short) "period" models, 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)[15]. 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 doesn't matter) outcomes are, in fact, the mathematical result of "period" (and therefore static or, at best, quasi-static) demand and supply equations[16]. As a consequence, the Post-Keynesian concept of "historical model" (Robinson, 1963, p. 25; Davidson, 1972, p. 26) only makes sense when interpreted as a defense 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.*"

[15] As Keynes ([1930] 1958, p. 282) once put it (in a similar context), "credit cycles" are somewhat akin to chess matches, in the particular sense that "one can describe the rules of chess and the nature of the game, work out the leading openings and play through a few characteristic end games; but one cannot catalogue all the games which can be played."

[16] Such as the ones used, for example, by Davidson (1972, chapter 4). Of course, given that "most aggregated data are only available on a quarterly or annual basis" (Godley and Cripps, 1983, p. 60) this simplification is unavoidable in empirical work. For elegant discussions of—and actual modeling tools to deal with—production and market processes in true historical time, see Foley (1975 and 1986).

We are ready now to start the discussion of the relevant "closures" themselves. Due to space constraints, we discuss them simultaneously, as different behavioral hypotheses about the same institutional sectors.

2.1 – 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' behavior. Third, their nominal wage demands affect prices and, therefore, inflation. We'll discuss the first two decisions here, leaving inflation issues to section 3 below.

We begin by noting that both Davidson and Minsky neglect the impact of households' wealth on households' consumption decisions. Indeed, while Minsky consistently assumed a Kaleckian specification according to which 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, chapters 5 and 12) and (more often) using a simple linear Keynesian consumption function (as in Davidson, 1972, chapter 7; and 1994, chapter 3). One can, therefore, write:

$c_t^d = a0 + a1 \cdot yh_t^e$ (equation D.1a)

$c_t^d = w_t^e - dtw_t^e + a2 \cdot (yh_t^e - w_t^e - dtw_t^e)$ (equations M.1, D.1b)

where the "*d*" and "*e*" mean "desired" and "expected"; *a0, a1,* and *a2* are fixed parameters; and *dtw* stands for real taxes paid on wages.

Of course, (given their disposable income) households' consumption decisions determine their savings and, therefore, (given their capital gains) their accumulation of wealth[17]. Accordingly, a large number of Keynesian authors (including Patinkin, 1965 and Modigliani and Brumberg, 1954) have argued that households' wealth accumulation goals should also affect their consumption decisions[18]. Godley's specification below aims to capture a similar idea, i.e., the notion that "aggregated across the [households'] sector, wealth is

[17] From tables 2 and 3 above, one has that $vh_t \equiv vh_{t-1} + yh - c + cgh_t$

[18] Building on the classic paper by Pigou (1943).

accumulated at a particular rate and that there exists a desired [and exogenous households'] long run wealth-income ratio" (Godley, 1999a, p. 396).

$c_t^d = a3 \cdot yh_t^e + a4 \cdot vh_{t-1}$ (equation G.1)[19].

Tobin's story can be seen as a generalization 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, p. 272-273)—so that, in Tobin's "closure," the households' desired long-run wealth-income ratio is endogenous. This idea can be modeled as follows:

$[c_t^d, v_t^d] = f(rr_h^e, rr_m^e, rr_b^e, rr_e^e, v_{t-1}, yh_t^e)$ (equation T.1a)

where, $v = [Hh/P, Mh/P, Bh,/P, (Pe/P)E] = (hh, mh, bh, peE)$ 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_h^e, rr_m^e, rr_b^e, and rr_e^e are the (expected, one period) real returns in cash, money deposits, government bills and equities (respectively, including real capital gains)[20]; yh^e is the expected households' real disposable income; and $f:R^9 \rightarrow R^5$ expresses the demands for consumption goods and the four financial assets above (i.e. 5 equations) as functions of households' expected disposable income; the (4) real rates of return of the financial assets, and households "beginning of the period" holdings of these (4) assets (i.e. 9 variables).

The formalization above implies that households' consumption (and, therefore, accumulation) and portfolio decisions are "integrated" (Tobin, 1982, p. 187), in the 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 (whose demand equation is, in this sense, "redundant"). In the Tobinesque

[19] Indeed, if (in the absence of expectation errors) $c_t = a3 \cdot yh_t + a4 \cdot vh_{t-1}$, then in a (stationary) steady state in which $\Delta vh = cgh = 0$ (so $c_t = yh_t$), it is easy to prove that $vh = (1-a3)yh/a4$ [where $\alpha = (1-a3)/a4$ is Godley's exogenous long run wealth-income ratio]. Anwar Shaikh has called my attention that (in the stock steady-growth case with zero capital gains) α 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 $\alpha = (1-a3) \cdot (1+gs)/(a4+gs)$.

[20] The precise formulas of the real rates of return above are the following: $rr_h^e = [1/P_{+1}] - [1/P]$; $rr_m^e = [(1+rm)/P_{+1}^e] - [1/P]$; $rr_b^e = [(1+rb)/P_{+1}^e] - [1/P]$; and $rr_e^e = [(Pe_{+1}^e + Ff_{+1}^e/E)/P_{+1}^e] - [Pe/P]$.

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[21]:

$c_t^d = yh_t^e - sav_h^d = yh_t^e - \Delta v_h^d + cgh_t^e$ (equation T.1)

$v_t^d = g(rr_h^e , rr_m^e, rr_b^e, rr_e^e, v_{t-1}, yh_t^e)$. (equations T.2-T5)

Δv_h^d = the sum of the components of $v^d - vh_{-1}$ (eq.T.6)

Linear specifications of the asset demand functions (T.2-T.5) are discussed in Brainard and Tobin (1968) and Backus et.al. (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 its 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:

$v_t^d = g(rr_h^e , rr_m^e, rr_b^e, rr_e^e, v_{t-1}, yh_t^e)$. (equations G.2-G5)

$\Delta vh^d = yh_t^e - c_t^d + cgh_t^e$ (equations M.2, D.2 and G.6)

Davidson agrees with both Godley and Tobin that "money and financial vehicles will be the only vehicles to use to transfer generalized purchasing power over time" (1972, p. 254). 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),

[21] 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 3 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." Note, finally, that Davidson (1972, p. 291) explicitly opposes Tobin's "integrated" approach.

neglecting government bills[22]. We believe we do no harm to the essence of his analysis excluding bonds issued by firms from (and including government bills among) the "placements" at the disposal of wealth-holders. In this case, we can write (in the spirit of Davidson, 1972, p. 255)[23]:

$$pl^d = bh^d + p_E E^d = h(c_t^d,\ rr_h^e\ ,rr_m^e,\ rr_b^e,\ rr_e^e,\ v_{t-1},\ \beta,\ \kappa,\ T,\ m1) \quad \text{(equation D.3)}$$

where pl^d is households' real demand for "placements," β, κ, T, and $m1$ are parameters measuring households' risk aversion (β) and confidence on their expectations (κ), the transaction costs of portfolio shifts (T), and the "weight" of equities in the overall "basket" of placements ($m1$)[24]. The partial derivatives of pl^d with respect to c_t^d, rr_h^e ,rr_m^e, β,and T are negative, while those with respect to rr_b^e, rr_e^e, a_{t-1}, and κ are positive and the one with respect to $m1$ is either positive or negative (depending on the relative sizes of rr_b^e and rr_e^e).

Note, however, that c^d, yh^e, vh_{-1}, cgh^e and yh^e imply $savh^d$ and vh^d and, by definition, ($hh^d + mh^d$), i.e. households' "money" demand, is equal to ($vh^d - pl^d$). As a consequence, one can write:

$$hh^d + mh^d = vh^d - pl^d = vh_{-1} + yh_t^e + cgh_t^e - c_t^d - pl^d \quad \text{(equation D.4)}$$

In other words, Davidson's households' money demand is formally "redundant"[25].

Of the authors discussed here, Minsky is the one that paid less explicit attention to the portfolio decisions of the households. Even though formal Minskyan models usually deal with

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[22] 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).

[23]Equation D.3 differs from Davidson's, among other things, by incorporating the determinants of households' money demand (see Davidson, 1972, chapters 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).

[24] The parameter $m1$ is crucial to the determination of 'the' real interest rate on placements (that can be understood as a weighted average of rr_b and rr_e). We'll assume also that $m1$ is equal to Keynes' "marginal propensity to buy [private] placements out of households' savings" (Davidson, 1972, p. 272).

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

simplified financial structures and portfolio decisions (see Dos Santos, 2004), we believe most authors in this literature would agree with the use of Tobinesque specifications, provided that a parameter κ measuring households' confidence in their expectations is added to them[26,27]. We could, therefore, write:

$v_t^d = g(\kappa, rr_h^e, rr_m^e, rr_b^e, rr_e^e, vh_{-1}, yh_t^e)$. (equations M.3-M.6)

2.2 – Firms

As Lavoie and Godley (2001-2002, p. 107-112) remind us, firms have (at least) four "categories of 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 will neglect decision (ii), assuming that firms get the point of effective demand "right"[28]. In fact, we will be concerned only with decisions (iii) and (iv), for decision (i) will be discussed in section 3.

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 in the end of the period, so that a "monetary circuit," as described, for example, by Graziani (2003, p. 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[29].

Turning now our attention to firms' investment decisions, both Davidson's (1972, chapter 4) and Minsky's (1975, chapter 5) stories are based on Keynes' (G.T. chapter 11) well-

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

[27] Davidson (1972, p. 249), by its turn, recognizes that the aggregation of heterogeneous financial assets under the generic label of "placements" is "unrealistic," but sees further disaggregation as an "unnecessary complication" (perhaps because his "placements" do not include government bills).

[28] Keynes stated himself that "the theory of effective demand is substantially the same if we assume that short period expectations are always fulfilled" (quoted in Asimakopulos, 1991, p. 39). See Blinder (1990), Godley(1999a), and Shaikh (1989) for models in which inventory cycles play crucial roles.

[29] 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 K) incorporates the costs of the loans obtained (in the beginning of the period) to finance production (and re-paid in the end of the period).

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)

$\Delta k_t^d = f1(rrl_i^e, yh_i^e, \zeta 1, \zeta 2, \kappa, k_{t-1})$ (equations D.5a, and M.7a)

where $\zeta 1$ and $\zeta 2$s 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 $f1$ with respect to $yh_i^e, \zeta 1, \zeta 2, \kappa$ are all positive, and those with respect to rrl_i^e and k_{t-1} are negative[30].

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

$\Delta k_t^d = f2(q) \cdot k_{t-1}$ (equation T.7)

where q is Brainard and Tobin's (1968) average q ratio [i.e. $q = (Pe \cdot E + L)/K$], $f2(1)$ = Harrods' (1939) warranted rate gw, and $f2' > 0$.

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' ''demand price'' of capital goods, while its denominator approximates Keynes' ''supply price,'' so that, as summarized 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][31]. Tobin's specification above, however, implies that the economy tends 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 emphasized that the very nature of

[30] In our one-sector economy we cannot introduce the (relative) "supply price" of capital goods as a determinant of Δk_t^d.

[31] 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, 2001-2002, p. 287). Tobin himself (1989a) 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 the q ratio.

financial markets is such to (generate endemic "manias and crashes" and therefore) prevent Tobin's equilibrium to be achieved. One can, therefore, write:

$\Delta k_t^d = f3(q, \kappa) \cdot k_{t-1}$ (equations D.5b, and M.7b)

or, in the spirit of Taylor (1991, chapter 5 and 6),

$\Delta k_t^d = f4(q, \kappa, u) \cdot k_{t-1}$ (equations D.5.c, M.7c, and G.7a)

where $f3'(q)$ and $f3'(\kappa)$ are both positive, u stands for the economy's capacity utilization (i.e. s / potential output[32]), and $f4'(u) > 0$. 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[33].

Godley's views on investment demand functions are somewhat less clear. Indeed, in earlier theoretical writings (such, for example, Godley and Cripps, 1983) Godley modeled the economy's "private expenditure" (i.e. $c^d + \Delta k_t^d$) as a single variable, neglecting its disaggregation into consumption and investment expenditures[34]. In later works he has used both eclectic versions of equation G.7a above (as in Lavoie and Godley, 2001-2002) and (partial adjustment) Harrodian specifications (as in Godley, 1996 and 2004). Note, however, that only the latter is consistent with his more general view according to which "the tendency of the [macroeconomic] system as a whole is governed by stock-flow norms rather than (…) equilibrium (or disequilibrium) conditions postulated by neoclassical theory" (Godley, 1999a, p. 396). One can, therefore, write:

$\Delta k_t^d = \beta_0 \cdot (\beta_1 \cdot s_{t+1}^e - k_{t-1})$ (equation G.7b)

where β_1 is the (exogenous) desired stock (of capital)-flow (of final sales one period ahead) "norm" of firms, and β_0 is a "speed of adjustment" parameter.

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[32] That is generally assumed to be a fixed proportion of the real stock of capital, so that $u = s/\zeta 2 \cdot k_{t-1}$

[33] For two opposing views on the plausibility of "long run" models without full capacity utilization, see Dutt (1990, p. 58-59) and Shaikh (1989).

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

As Minsky (1986, p. 188) emphasizes, the investment demands above only become effective if they can be financed. The authors in question differ considerably on how they conceptualize this issue, though. Yale models, for example, explicitly assume that the Modigliani-Miller theorem applies[35] and, therefore, the value of the firms' liabilities (i.e. $L + Pe \cdot E$) exhausts all the value of its assets (i.e. K, for Mf is simplified away), so the net worth of firms is zero. In this case, "businesses can be modeled as if they are pure equity firms" (Tobin, 1980, p. 90), what justifies the explicit hypothesis that "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:

$Fu = Mf = 0$ (equation T.8)

$I^d = f5\ (rrl^e,\ rr_e^e)$ (equation T.9)

$pe \cdot E^s = k_{-1} + \Delta k^d - I^d$ (equation T.10)

where $f5'(rrl^e) < 0$ and $f5'(rr_e^e) > 0$. In words, firms are assumed to look for the cheapest way to finance themselves.

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 is both the "lenders' and borrowers' risks" (G.T. chapter 11; Minsky, 1975, chapter 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 firms' total after-tax profits. A natural way to proceed, then, is to follow Kaldor (1966) and Lavoie and Godley (2001-2002) in assuming that:

$Fu = x1 \cdot (FT - rl_{-1} \cdot L_{-1} + rm_{-1} \cdot Mf_{-1})$ (equations G.8, D.6, M.8), so that

[35] Even though M-M conclusions are dependent on the existence of perfect financial markets, a hypothesis often criticized by Tobin himself. It's precisely because financial markets are not perfect that 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 and 1990) make clear that q is to be understood as "a" determinant of investment, not "the" determinant of it. These considerations are often neglected in their formal models, though.

$Ff = (1-x1)\cdot(FT - rl_{-1}\cdot L_{-1} + rm_{-1}\cdot Mf_{-1})$ (equations G.9, D.7, M.9), where $0 < x1 < 1$.

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

$Mf = 0$ (equations G.10, M.10),

while a Davidsonian "closure" would have to incorporate Keynes' "finance motive" (Davidson, 1972, chapter 7) for holding money, i.e. $mf = \sigma\cdot\Delta k^d$ (eq. D.8).

No explanation is usually given also on how disaggregate firms' liabilities[36]. We can, therefore, write:

$pe\cdot E^s = x2\cdot(k_{-1} + \Delta k^d + \Delta mf - fu)$ (equations G.11, D.9, M.11)

so that $I^d = (1-x2)\cdot(k_{-1} + \Delta k^d - fu)$ (equations G.12, M.12), and

$I^d = (1-x2)\cdot(k_{-1} + (1+\sigma)\cdot\Delta k^d - mf_{-1} - fu)$ (equation D.10), where $0 < x2 < 1$.

2.3 – The Government

The usual hypotheses about government "flow" behavior apply to all authors discussed here. Simplifying away indirect taxes, one can then write:

$g = g0$ (equations T.11, G.13, M.13, D.11),

$it = 0$ (equations T.12, G.14, M.14, D.12), and

$dt = \theta\cdot Yh$ (equations T.13, G.15, M.15, D.13)[37].

[36] Even though the Minskyan model by Franke and Semmler (1989) assume that the demand for loans is a function of expected profitability (for that would decrease borrower's risk), while the demand for equity is a residual. Godley (1996), on the other hand, 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 $q > 1$.

[37] In fact, the hypothesis here is slightly different. All authors discussed here have used the simplifying assumption that i.e. $dt = \theta\cdot s$, i.e. "*taxes are net of transfers*" (Backus et. al. 1980, p. 267). The problem with this specification is that it introduces the "hidden assumption" that g fluctuates to accommodate the

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" the financial markets. These are not discussed by Davidson (1972, 1994), however. Nor are they emphasized by the FML, despite the importance that Minsky (1986, chapter 13) attributed to them. As all four authors wrote against Friedman-style "monetary rules,"[38] 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 (rb^*)[39]. Formally:
$Bc = bh^d(rr_h^e, rr_m^e, rr_b^{e^*}, rr_e^e, v_{t-1}, yh_t^e) + bb^d(rb^*)$[40](equations T.14, G.16, M.16, D.14), where $rr_b^{e^*}$ is the households' real rate of return on government bills associated with a nominal interest rate rb^* and bb^d is banks' demand for government bills (to be discussed below). Assuming also that A is supplied as demanded, i.e.

$a = a^d$ (equations T.15, G.17, M.17, D.15)[41],

we have (from table 1 above) that $h = bc + a$ (equations T.16, G.18, M.18, D.15).

The government is also supposed to set the banks' minimum required reserve to deposit ratio (φ) 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 behavior of the banking sector, a point to be discussed below.

2.4 – Banks

Of the authors discussed here, only Tobin and Godley have tried to formalize banks' behavior in detail. Indeed, one does not find in Davidson (1972, 1994) a convincing description of the rationale behind financial institutions' behavior, even though their actions are crucial to the actual outcomes described (e.g., Davidson, 1972, p. 260, 280). Minsky (1986, chapter 10), by its

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interest payments on government debt (net of the interest payments received by the monetary authority on advancements made to banks).

[38] See Tobin (1989b, chapter 24), Godley and Cripps (1983, chapter 7), Minsky (1986, p. 322-328) and Davidson (1972, chapter 13).

[39] Even though the specific formalization in Tobin (1982) is more general.

[40] 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 modeled in tables 1-3 above).

[41] Even though 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.

turn, dedicated a whole chapter to the topic, as well as many suggestive passages, but never tried to formalize it rigorously[42].

Perhaps the main advantage of the SFC structuralist methodology adopted here is that, by conceptualizing 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 sections 2.1-2.3 above as "effective" ones (say, by presenting them without superscripts and not providing equations about banking behavior), he or she is logically implying (consciously or not) that the banking sector will always adjust to whatever is being assumed about the other sectors. But neither Davidson's nor Minsky's writings are compatible with banks playing such a passive role. We shall, therefore, "complete" their closures along the lines of Backus et.al. (1980), and Godley (1999a). In these formalizations banks' are assumed to keep a fraction φ of their (uncertain) total deposits (i.e., M) in the form of reserves and to use their "free reserves" to do three things: (i) give loans to businesses (L); (ii) buy government bonds (Bb) and (iii) keep holdings of base money "reserves" (Hb).

Beginning with Tobin, we assume (in the spirit of Backus et.al., ibid, p. 265) that banks' desired portfolio depends on the (expected real) discount rate ($rra^e = [(1+ra)/P_{+1}^e] - [1/P]$) as well as on the expected real rates of return on government bills, loans to firms, and reserves ($rrl^e, rrb^e,$ and rrh^e). One way to formalize this assumption is the following:

$l^s = fl(rrl^e, rrb^e, rrh^e\ rra^e)\cdot(1-\varphi)\cdot(m - a_{-1})^e$ (equation T.17)

$bb^d = fb(rrl^e, rrb^e, rrh^e\ rra^e)\cdot(1-\varphi)\cdot(m - a_{-1})^e$ (equation T.18)

$hb^d = \varphi\cdot m^e + fh(rrl^e, rrb^e, rrh^e\ rra^e)\cdot(1-\varphi)\cdot(m - a_{-1})^e$ (equation T.19)
and, of course, $fl + fb + fh = 1$ (so that t $a^d = 0$).

Yale models also assume that banks are price-takers, in the sense that (i) the (nominal) interest on deposits (which banks are forced to accept) is fixed at a given value rm^*; and (ii) the real rate of return on bank loans to firms is given by the intersection of firms' demand for and banks' supply of these loans. One can, therefore, write:

[42] This relative neglect of banks can be extended also to the FML (see Dos Santos, 2004).

$M = Mh^d + Mf^d$ (equations T.20, G.19, M.19, D.16)

$rm = rm^*$ (equations T.21, M.20a, D.17a)

The formalization above does not emphasize (though does not necessarily deny) the role of expectation shifts and "credit crunches," emphasized in both Davidson's and Minsky's stories[43]. It is, however, relatively easy to modify the demands above to incorporate also the "liquidity preference" parameter κ (a la Taylor and O'Connel, 1985), so dear to these authors. We would then have:

$l^s = fl(rrl^e, rrb^e, rrh^e\ rra^e, \kappa) \cdot (1- \varphi) \cdot (m - a_{-1})^e$ (equations M.21a, D.18a)

$bb^d = fb(rrl^e, rrb^e, rrh^e\ rra^e, \kappa) \cdot (1- \varphi) \cdot (m - a_{-1})^e$ (equations M.22a, D.19a)

$hb^d = \varphi \cdot m^e + fh(rrl^e, rrb^e, rrh^e\ rra^e, \kappa) \cdot (1- \varphi) \cdot (m - a_{-1})^e$ (equations M.23a, D.20a)

and, again, $fl + fb + fh = 1$.

Of course, as admitted by Tobin (1982, p. 194) and Backus et. al. (ibid, 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" and adjust rl as they see fit. Accordingly, Godley (1999a, p. 408 and 409) assumes that:

$l^s = l^d$ (equations G.20, M.20b, D.17b)[44],

[43] See, for example, Davidson (1972, p. 241-244) and Minsky (1986, p. 219).

[44] Lavoie and Godley (2001-2002, 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 modeled. In fact, both Lavoie and Godley and Godley and Lavoie (2004, 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, criticized by Godley (2004, p. 15) for trivializing the financing of firms' investment decisions. Godley (2004, p. 6-9) appears more in line with our "hierarchical" interpretation above.

and that banks have a "norm (*B1*) for the ratio of defensive assets (bills) to liabilities *BR*"[45] and "increase the rate of interest on (…) [deposits] at a [fixed] rate (…) whenever *BR* falls below the norm and reduce it (at the same rate [ψ]) when it rises above the norm." The interest rate on loans, on the other hand, is determined as a mark-up (*Φ*) on either *rm* or *rb* (whichever is higher). Formally:

$BR^* = B1$ (equations G.21 M.21b, D.18b)

$BR = Bb/M$ (equations G.22, M.22b, D.19b)[46]

$\Delta rm = (\psi \cdot rm_{-1})$ (if $BR > BR^*$) or $-(\psi \cdot rm_{-1})$ (if $BR > BR^*$) (equations G.23, M.23b, D.20b)

$rl = (1 + \Phi) \cdot max\,[rm, rb]$ (equations G.24, M.24b, D.21b)

If this is the case, then table 1 above implies that:

$bb = (1 - \varphi) \cdot m^d - l^d$ (equations G.25 M.25b, D.22b), and

$a = 0$ (if $bb > 0$) or $a = -bb$ (if $bb < 0$) [-] (equations G.26, M.26b, D.23b)

2.5 – Complete "Fix-Price, Equilibrium" Closures

Assuming that households and banks expectations about *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 virtually all the equations (and accounting identities) needed to specify complete fix-price (one period) equilibrium "closures" for the authors in question[47]. In these equilibria "(…) markets handle simultaneously flows arising from saving and accumulation and those arising from reshuffling of portfolios (…). By the end of the period,

[45] Godley and Lavoie (2004, p. 5) describe *BR* as "a kind of non-compulsory secondary reserve ratio."

[46] 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, chapter 13).

[47] One can, at a first approximation assume adaptive expectations and an exogenous *κ* on both Godley's and Tobin's 'closures' and specifications a la Taylor and O'Connel (1985) or Franke and Semmler (1989) for the others.

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 defense 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 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" markets are assumed[48]) 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 diequilibrium processes in a way similar to Walras' "tatonnement," 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)[49]. 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 – THE "UNEXPLORED FRONTIER"

The long previous section aimed to convince the reader that—despite inevitable idiosyncrasies, problems and emphases—several Keynesian "schools" arrived in the 1970s to 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) play a crucial role in dynamically determining [path dependent] "real outcomes." Besides, all of them considered this

[48] In general bank deposits are assumed to do the job for households, and government bills for banks (see, e.g. Brainard and Tobin, 1968, and Godley, 1999a). See also Backus et.al. (1980).
[49] From this perspective, at least, Tobin came much closer to being the "Walras" than the "Keynes of the Flow-of Funds."

"view" crucially different from what textbooks at the time described as Keynesianism[50]. We hope to have demonstrated also this "Financial Keynesian view" can only be rigorously described/analyzed with the help of SFC accounting frameworks, for the alternative is to work with either theoretically incomplete and/or logically inconsistent specifications.

The remaining point we want to make here is that SFC "Financial Keynesian" models are a relatively "unexplored" frontier of Keynesian thought. We start by noting that the dynamic properties of such systems are essentially unknown. In fact, as showed by Franke and Semmler (1989), even the 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 statics or dynamics) exercises of SFC "financial Keynesian" models like the ones above. Issues like how much an increase in households' savings affects the "financing of investment," or whether or not the "real balances 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. On the other hand, the approach can be extended in several ways, for example to deal with open-economy issues and other financial and non-financial assets.

Second and related to the first, it is possible to argue that this view spends little time discussing real-financial interactions. In fact, supply considerations only enter these models in

[50] This point is, perhaps, more obvious in the case of the two leading 'American Post-Keynesians' (see, Davidson, 1972, chapter 13; and Minsky, 1975, introduction). Note, however, that the Kaldorian Post-Keynesian tradition - often criticized in the past for "trivializing" 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, Tobin's "Walrasian" influences might have led some to misunderstand his views, but 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 recognize (ibid, p. 273), are in sharp contrast to neoclassical economics.

the form of a (or, at best, a small bunch of) "aggregate supply equation(s)." A simplified specification would be:

$P = Wr \cdot (1+\omega)/\xi$ (equations T.20, M.27, D.24)

where the nominal wage rate (Wr), the firms' mark up (ω), and the average labor productivity (ξ) are all exogenous[51]. Godley (1996, 2004) also adds a finance cost component to the equation above, so that $P = Wr \cdot (1+ rl) \cdot (1+\omega)/\xi$ (equation G.27).

While Godley's specification probably exaggerates the effect of interest rates on pricing[52], it touches an old and crucial issue in macroeconomics, i.e. the relation between the profit rate and the interest rate. In all four authors above (as in Keynes), the various real interest rates of the economy are determined by the portfolio decisions of asset holders, having little to do with "real factors." Given that all recognize that no one would invest in fixed capital to get less than the interest rates on loans, this would imply a financially determined ("normal") "lower limit" to the "real" profit rate of the economy. This contradicts both classical (e.g. Ricardo, [1821] 1951 p. 297) and neoclassical (e.g. Hall and Jorgenson, 1967) views on the matter. The inclusion of land among the assets one uses "to transfer generalized purchasing power over time" would presumably bring the "financial Keynesian" models discussed above closer to its predecessors.

Third, even if precise "positive" conclusions remain elusive, the view described here implies 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 its possible contribution to effective demand in one particular period, but also (and dynamically more importantly) from its contribution to the

[51] Even though Davidson (1972) uses Marshallian short period specifications. Tobin (1982) suggests the usual textbook neoclassical synthesis hypothesis of a Phillips' curve (with fixed ω and ξ), while Godley (e.g. 2004) proposes a (related) specification in which workers have [exogenous] "target real wages." Zezza and Dos Santos (2004), on the other hand, have discussed the impact of Kaldor-Verdoorn specifications of ξ (as a development of a Godley specification), a hypothesis that contradicts the Minskyan (1986, chapter 11) notion that a negative effect of "Big Government" is a long-term decline in productivity growth.

[52] For it implies that prices of goods always and immediately react to any change in rl.

nominal stock of private wealth of the economy[53]. 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 it is well known, these effects are largely neglected in mainstream models, say, of the modern "New Keynesian Consensus"[54]. And so is the broader normative "Minskyan" message on the importance of keeping sectoral balance sheets "healthy."

4 – FINAL REMARKS

Perhaps the best way to see a SFC macroeconomic model is as something equivalent to an (logically coherent) "artificial economy"[55]. On one hand, this procedure is intensive in theoretical assumptions and generates models that are difficult to deal with. On the other, it makes sure the model-builder takes into consideration all the "system-wide" constraints of his or her hypotheses and forces him or her to recognize the intrinsic limitations of macroeconomic analysis and to be explicit about how he or she deals with them.

Whether or not the much smaller and less demanding "new consensus" models provide a more effective way to describe and/or understand the behavior of economies as a whole is far from clear. Krugman (2000, p. 42), for example, believes that:

> "(…)microfounded models have not lived up to their promise" (in the particular sense that they didn't add "noticeably to our ability to match the phenomena," ibid, p. 39) and, therefore, "after 25 years of rational expectations, equilibrium business cycles, growth and new growth, and so on, when the talk turns to the next move by the Fed, (…), tries to see a away out of Argentina's dilemma, or ask why Brazil's devaluation turned out relatively well, one almost inevitably turns to (…) old-fashioned (…) macro (…)."

We do not disagree with that. In any case, not all "old-fashioned" macro models were created equal, and people are hardly using the best ones available.

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[53]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).

[54]See the papers in J.B. Taylor (ed., 2001) for an introduction.

[55] This is also the opinion of Brainard and Tobin (1968, p.99). As they remind us, "[this procedure] guarantees us an Olympian knowledge of the true structure that is generating the observations. (…). [But] (…) the lessons derived or illustrated by (…) our particular structure will not be very convincing or even interesting to people who believe that the model bears no resemblance to (…) [reality]."

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