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Godley Papers and Notes

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(1) Glossary ✓

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Godley Model: Identities

Given

$S=C+G+IN$	Saving
$Y=S+\Delta I-IVA$	Income
$FN=FU+FD$	Gross Profits
$FU=IN_{-1}$	Undistributed Profits
$K=(1-DEP)\cdot K_{-1}+IN$	stock of fixed capital
$rr=\frac{FD}{K_{-1}}$	nominal rate of return on capital
$rk=\frac{rr}{Q}$	nominal rate of return on equity
$\Pi=\frac{\Delta P}{P_{-1}}$	inflation rate
$\Pi r=\frac{\Pi}{1+\Pi}$	inflation rate expressed as rate of return
$pb=\frac{1}{rbb}$	price of bonds
$rrm=\frac{rm-\Pi}{(1+\Pi)}$	real rate of return on money
$rrbb=\frac{rbb-\Pi}{(1+\Pi)}$	real rate of returnn on bills
$rrb=\frac{rb-\Pi}{(1+\Pi)}$	real rate of return on bonds
$rrk=\frac{rk-\Pi}{(1+\Pi)}$	real rate of return on equity
$Hp\_s=H\_s-Hb\_s$	cash held by households-supply
$Bs\_s=Bsb\_s-Bsp\_s$	total bills-supply

Godley Model: Behavioral Assumptions

$p=(1+\tau)\cdot(1+\gamma)\cdot\frac{HC}{s}$	price of goods
$T=\frac{S\tau}{(1+\tau)}$	tax flow
$\gamma=\frac{FN}{HC}$	
$istar=\zeta sbar\_e$	desired stock of inventories
$i\_p=i_{-1}+w\cdot\left(istar-i_{-1}\right)$	stock of inventories-planned
$FD=\delta K_{-1}$	distributed profits

$in=\beta_1\cdot\left[kstar-(1-dep)\cdot k_{-1}\right]$	
$kstar=\beta_0\cdot sbar\_e$	desired capiatl stock
$\Delta e\_s=\phi\left(q_{-1}-1\right)$	change in stock of equity-supplied
$\ln(N)=\eta_0+\eta_1\cdot\ln(y)$	employment
$c=\alpha_1\cdot yd\_e+\alpha_2\cdot v_{-1}$	consumption
$Hp\_d=\mu c$	cash held by household-demand
$M1star\_d=VN\_e\cdot\left(\lambda_0-\lambda_1\cdot rrbb-\lambda_2\cdot rrb-\lambda_3\cdot rrm-\lambda_4\cdot rrk-\lambda_5\cdot \Pi r+\lambda_6\cdot\frac{YD\_e}{VN\_e}\right)$	M1demand
$Bsp\_d=VN\_e\cdot\left[\left(\lambda_{00}+\lambda 01\right)\cdot rrbb-\lambda_{02}\cdot rrb-\lambda_{03}\cdot rrm-\lambda_{04}\cdot rrk+\lambda_{05}\cdot \Pi r-\lambda_{06}\cdot\frac{YD\_e}{VN\_e}\right]$	bank demand for bills
$pb\cdot Bp\_d=VN\_e\cdot\left[\left(\lambda_{10}-\lambda_{11}\cdot rrbb+\lambda_{12}\cdot rrb-\lambda_{13}\cdot rrm\right)+\lambda_{14}\cdot rrk+\lambda_{15}\cdot \Pi r-\lambda_{16}\cdot\frac{YD\_e}{VN\_e}\right]$	price*demand for bonds
$pe\cdot e\_d=VN\_e\cdot\left(\lambda_{20}-\lambda_{21}\cdot rrbb-\lambda_{22}\cdot rrb-\lambda_{23}\cdot rrm+\lambda_{24}\cdot rrk+\lambda_{25}\cdot \Pi r-\lambda_{26}\cdot\frac{YD\_e}{VN\_e}\right)$	price*equity demand
$Hb\_d=p(M1\_s+M3\_s)$	bankd emand for cash

Godley Model: Equalities

$UC=\frac{WB}{ybar}$	Unit wage cost
$IVA=\Delta UC\cdot i_{-1}$	inventory valuation adjustment
$ybar=sbar+\Delta i$	GDP valued at cost
$i=i\_p-(sbar-sbar\_e)$	stock of inventories
$sbar\_e=sbar_{-1}+R1$	final sales valued at cost-expected
$q=pe\cdot\frac{e\_d}{K}$	Tobin's q
$VN\_e=V_{-1}+YD\_e-C$	wealth excluding cash
$\Delta L\_d=IN+\Delta I-FU-\Delta e\_s\cdot pe$	change in bank loan demand
$\Delta V=YD-C+\Delta pb\cdot Bp\_d_{-1}+\Delta pe\cdot e\_d_{-1}$	change in wealth stock
$Vn=V-Hp\_d$	wealth excluding cash
$V\_e=V_{-1}+YD\_e-C$	wealth stock-expected
$YD\_e=YD_{-1}+R_z$	expected household disposable income
$yd\_e=\frac{YD\_e}{p}$	expected household disposable income

$Bsp\_d = M1\_s + M3\_s - L\_s - Hb\_d$

$rl \cdot L\_s_{-1} = rm \cdot M3\_s_{-1} - rb \cdot Bsp\_d_{-1}$

$\Delta rm = ZED \cdot 0.005 - EX \cdot 0.005$

too many constraints

$EX = Bsp\_d_{-1} \cdot 0.01$

too many constraints

$ZED = Bsp\_d_{-1} \cdot 1.0$

too many constraints

$L\_s = L\_d$

too many constraints

$M1\_s = M1\_d$

too many constraints

$M3\_s = M3\_d$

too many constraints

$e\_d = e\_s$

too many constraints

$Bsp\_s = Bsp\_d$

too many constraints

$Bp\_s = Bp\_d$

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too many constraints

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too many constraints

cash supply
household
demand for bils
lagged loan
supply*loan rate

change in
nominal rate on
money

① Glossary ✓
② Behavior
③ Equil Conditions
④ Identities

Godley Model: [redacted]

Given

$S=C+G+IN$	Saving ✓
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$pe\cdot e\_d=VN\_e\cdot\left(\lambda_{20}\ \ \lambda_{21}\cdot rrbb-\lambda_{22}\cdot rrb-\lambda_{23}\cdot rrm+\lambda_{24}\cdot rrk-\lambda_{25}\cdot\Pi r\ \ \lambda_{26}\cdot\frac{YD\_e}{VN\_e}\right)$	price*equity demand
$Hb\_d=p(M1\_s+M3\_s)$?	bankd emand for cash

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= +

$Bsp\_d = M1\_s - M3\_s \quad L\_s - Hb\_d$

$rl \cdot L\_s_{-1} = rm \cdot M3\_s_{-1} - rb \cdot Bsp\_d_{-1}$

cash supply
household
demand for bils
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supply*loan rate

$\Delta rm = ZED \cdot 0.005 - EX \cdot 0.005$

change in
nominal rate on
money

[illegible]
too many constraints

[illegible]
too many constraints

[illegible]
too many constraints

too many constraints

$M1\_s = M1\_d$

too many constraints

$M3\_s = M3\_d$

too many constraints

$e\_d = e\_s$

too many constraints

$Bsp\_s = Bsp\_d$

too many constraints

$Bp\_s = Bp\_d$

too many constraints

$Bsb\_s = Bsb\_d$

too many constraints

$Hb\_s = Hb\_d$

too many constraints

Wynne's cons. function ⟺ life cycle model of cons.

A. Shaikh September 7, 1996

Comments on Godley's "Money, Finance and National Income Determination: An Integrated Approach"

Dear Wynne:

Jamee and I were very taken by your presentation. We talked about the issues it raised, all the way back to New York on the bus, and have continued talking and thinking about it. I think this is an absolutely pathbreaking paper, but also a difficult one. Here, therefore, are my promised comments (some of which are by way of self-clarification, so please bear with me).

1. It seems to me that this particular paper has two quite distinct dimensions.

First, it attempts to formalize the mechanisms which serve to make money an endogenous element of the macroeconomy. This requires a formal treatment of the private banking sector which is able to fulfill its various functions, including being always being able to meet any existing "effective" loan demand by qualified borrowers, while staying profitable, solvent, and liquid enough to avoid bank runs (p. 19). This last function requires that it be able to secure the reserves its needs in order to underpin its desire to satisfy the (effective) demand for loans. More on this shortly.

Second, this particular treatment of an endogenous money story is plugged into your continually evolving macromodelling framework. Crucial elements here include a rigorously consistent stock-flow accounting framework; the distinction between *ex ante* and *ex post* constraints, the former being behavioral and the latter accounting ones; more specific behavioral relations, such as markup pricing (p.13), accelerator-driven investment (p.15), a consumption function (p.16, equations 44-45a) which embodies a generalization of the Godley-Cripps stock-flow norms argument (e.g. it embodies a propensity to save which varies with the growth rate of output), etc.; convenient simplifications such as your assumption of zero profits in the banking sector (p.11); some "old-fashioned" adaptive expectations with random shocks (p. 14 equation 41, p. 16 equation 46); and some (what is for me still hard to follow) accounting for inventories, profits, and capital gains (pp. 8-10, equations 3-9) which you insist is both necessary for stock-flow consistency (pp.7, 9-10) and is a source of "some important implications later on" (p.8).

2. The strength of your presentation lies in its scope, since it encompasses a whole small macromodel (a mere 80 equations!). But of course this is also what makes it hard to fathom, partly because the general framework is not familiar to most readers, and partly because it is objectively difficult to ascertain how individual parts interact (more on this too, later on). This latter difficulty is a well-known one in macromodels, but is generally acceptable to most readers insofar as the underlying theoretical framework is well known (neoclassical, Keynesian, etc.).

This leads me directly to my first proposal. You rightly emphasize the importance of formalizing the endogeneity of bank credit, and in particular the endogeneity of bank reserves via mechanisms such as the ones you identify (and/or others emphasized by Moore, Lavoie, Palley, etc.) But since your particular treatment is embedded within your own fairly distinct general framework, its effects are hard to disentangle. I therefore propose that we consider three basic experiments.

i. First, we ask what might happen to the standard theoretical neoclassical macromodel (9-10 equations) if we were to replace the monetarist assumption of a fixed money supply with one of some endogenously generated money stock. The monetarist story itself is composed of three critical assumptions:

-- a fixed ratio of required reserves to deposits
-- the assumption that banks extend credit until their excess reserves have fallen to zero (i.e. until their actual reserve ratio has fallen to the minimum level indicated by the required reserve ratio)
-- and the assumption that the quantity of high powered money, and hence of bank reserves, is determined by the state via its monetary and fiscal policies.

Of these, you yourself adopt a fixed required reserve ratio (p. 20, equation 63); you allow for the fact that the actual reserve ratio *may* fall to the required level (p.20, equation 61); but you emphatically reject the notion that the quantity of bank reserves, and hence the loan capacity of banks, is directly determined by monetary and fiscal policy. Instead you propose a mechanism whereby banks can always attract the necessary reserves from the public by raising the interest rate on deposits (rm) *above* the interest rate on short-term government debt (the "bills" rate rb), thereby inducing the public to sell bills back to the government in return for cash, which in turn flows into interest-bearing bank deposits and hence into bank reserves (pp. 19-21). Such a mechanism allows the banks to alter their reserves independently of the reserves provided directly through government policy.

Neoclassical models of course assume full employment:

-- the equilibirum real wage (w^*) and level of employment (n^*) are determined in the labor market.
-- the equilbrium labor market level of employment (n^*) in turn determines a *fixed* level of aggregate supply via a short-run aggregate production function ($ys^* = f(n^*,k)$) for a given capital stock k
-- at the same time, the equilibrium level of the real wage (w^*) determines the level of real aggreggate consumption ($c^* = c(w^*)$) deriving from the utility-maximizing behavior of households.
-- this means that in order to have equilibrium in the commodity market, i.e. to have aggregate demand ($c^* + i(r)$) equal the fixed level of aggregate supply (ys^*), it is the interest rate (r) which must somehow adjust to make investment ($i(r)$) fit the gap between the given level of aggregate supply (ys^*) and the given level of aggregate consumption (c^*).

Another way to put this is that in the neoclassical model, equilibriium real savings $s^* = ys^* - c^* = ys(n^*) - c(w^*)$ is determined directly by the labor market equilibrium outcomes w^*,n^* -- so that the equality of savings and investment in equilibrium can only come about if the latter does the adjusting through the necessary movements of "the" (real and nominal) interest rate (r).

With all the action taking place in the real sector, independently of any monetary magnitudes, the money supply can then only determine the equilibrium price level (p^*). And so the question arises, how will a variable money stock fed by bank credit change these outcomes? The crucial issue here, it seems to me, is the treatment of "the" *interest rate* (r). Once we confront the possibility of bank credit, then on your argument the interest rate on deposits (rm) serves to regulate the flow of bank reserves, while the interest rate on bank loans (rl) serves to regulate the flow of bank credit. Does the block-recursive character of the neoclassical model survive this extension? What now regulates real investment so as to make it fit the fixed level of real savings. You will recall how we struggled with similar issues in our earlier attempts to critique the neoclassical model.

The importance of this experiment is that it attempts to isolate the effects of a different treatment of bank credit within the neoclassical framework which retains perfect competition, marginal productivity theory, etc..

ii. A similar experiment can be conducted by introducing endogenous and variable bank credit into the "synthesis" model itself. This latter model is derived from the pure neoclassical one by inserting rigidities, uncertainty and/or other "imperfections" in order to justify the proposition that the levels of income and output (y) *also* enter into the decision making behavior of agents (Clower, Leijonhufvud, etc.) -- i.e. that now c = c(y), i = i(r,y), etc. How does this model change when we introduce bank credit? This experiment gets much closer to the concerns with which we struggled in our infamous and unseen joint paper. It allows for effects on the equilibrium level of employment which are excluded from the pure neoclassical model, since in the latter equilibrium is synonomous with full employment [Patinkin 1956, p.328].

iii. Lastly, how would your own macromodel behave if the government did *not* endogeneize high powered money by agreeing to buy and sell bills at a fixed bill interest rate (rm)? This experiment would serve to isolate the properties of your own framework, as distinct from that of the preceding two.

3. Now for specific comments on your treatment of the banking sector.

Your central objective here is to show that bank credit is not reserve-constrained. This means that there must be some mechanism of acquiring bank reserves as needed.

i. Moore assumes that the state will provide necessary reserves, at least when they get too low, so as to prevent widespread defaults. When excess reserves get too low, banks get into trouble and the state broadens the discount window access of banks. This amounts to a lender-of-last-resort policy of adjusting the "width" of the discount window at the Fed.

ii. Lavoie assumes that the state maintains a constant Fed Funds interest rate, which means that it must supply private banks with reserves when banks need more because excess reserves have gotten too low. This amounts to a fixed unit-cost-of-reserves policy at the discount window.

iii. You assume that the state maintains a fixed rate of interest on its short-term debt (bills). Then as banks extend loans, deposits also increase, but by less since some money is withdrawn from the system as cash. The rise in deposits increases the required level of reserves, while the leakage of cash into public holdings lowers the actual level of reserves. On both counts, therefore, the extension of bank credit lowers excess reserves. You argue that if excess reserves get too low, banks act to attract additional reserves from the public by raising the interest rate on deposits (rm) *above* the interest rate on short-term government debt (the "bills" rate rb), thereby inducing the public to sell bills back to the government in return for cash. Except for the portion of the new high powered money which the public decides to hold as additional cash, the rest flows into bank reserves (pp. 19-21). Such a mechanism allows the banks to alter their reserves independently of the reserves provided directly through the discount window, or through open market operations specify aimed at reserves.

A. Shaikh September 7, 1996

Comments on Godley's "Money, Finance and National Income Determination: An Integrated Approach"

First of all, note that as stated in your paper this mechanism seems to be similar to those of Moore and Lavoie, in that it too seems to depend on a particular policy regime of the state in which the bill rate of interest is held constant. Is a fixed bill-rate assumption strictly necessary? Would it not also work if banks offered a *premium* over the bills rate -- i.e. if rm - rb > 0 whenever excess reserves got too low? As long as the state will buy back bills at some bill rate of interest -- which it must if the market in bills is to be credible -- then a fixed bill rate does not seem necessary.

Secondly, it seems to me that the focus on the state tends to divert our attention from a separate and more fundamental mechanism, which is rooted in the *cash holding portion of the liquidity preference of the public.* If banks raise their interest rate on deposits, for whatever reason, then the public will tend to hold relatively less money as cash (C) and more as interest-bearing deposits (M3), which *in itself* will expand bank reserves. A similar effect operates via short-term international capital flows. These endogenous market mechanisms were discussed within the classical tradition (Hume, Ricardo, Marx), and since they predate modern institutional configurations and particular policy stances, I regard them as being more fundamental. Jamee and I had taken up this particular issue in the context of long run theories of interest rate determination in the classical tradition, and we are in the process of writing up a simple model illustrating these effects. In the present version of your model, you abstract from this process altogether, since you assume that cash holdings to transactions is completely independently of the interest rate on the grounds that "the decision about how much cash to hold is, these days, completely unimportant" (p. 16, equation 47). *How far back in time does this unimportance go, and what happened before it?* In particular, are you saying that if the state did not directly or indirectly augment reserves in one or more of the three ways outlined above, that then the monetarist story would be correct? In other words, is the monetarist story about bank credit incorrect only in certain periods when it has been vitiated by particular state policies? Might there not be an intrinsic connection between the relative decline in cash holdings and the increasing need of banks to invent new methods to augment reserves or push for new policies to do so?

[By the way, would it be possible for you to graph the relative holdings of high powered money by banks and the public, respectively, as a fraction of actual and/or required reserves? This would give us some empirical grounds for further discussion. I don't yet have a feel for such magnitudes]

Thirdly, I am not at all convinced that you need to go into the distinction between primary and secondary reserves, or that between short-term and long-term government debt, in order to make your main point. For instance, even if banks held only high powered money as reserves, and if all government debt was in the form of "bonds", wouldn't the mechanism you propose work equally well? If banks raised their interest rate on deposits, this would not only attract existing cash from the public (my point), but also induce the public to sell bonds back to the government and deposit the extra cash in interest bearing accounts (your point), thereby directly expanding reserves on both accounts. If this is sufficient to illustrate the essential mechanism, then the basic model should be correspondingly simplified.

Finally, I don't think that a current government *deficit* plays any essential role in all of this. Even if the government budget was in balance (so that taxes covered only interest payments on pre-existing government debt), then the banks could still attract additional reserves in the manner you propose, as long as the government is willing to stand behind its debt by buying back bonds at some interest rate (bond price). If that is true, then it should be clarified.

4. The last set of comments has to do with your accounting matrix which provides the scaffolding for your work. I have some difficulties with it, because it is essentially an *ex post* accounting framework which you say has been adapted from the Blue Book tables (5), and I find that it must be modified in order to represent *ex ante* accounts. In an *ex post* mode, the funds received by one party to a transaction are identical to those spent by the party on the other side. For instance, *ex post* wages paid out by firms (-WB) in your matrix are identical to those received by households (+WB), *ex post* consumption expenditures by households (-C) are identical to those received by firms for the sale of consumption goods (+C). Therefore *ex post* row sums are always zero. But in the case of *ex ante* magnitudes no such equality need hold, since (say) the wages *planned* by firms ($-WB^{p}_{f}$) do not need to match wages *expected* by households ($+WB^{e}_{h}$). Such a difference is crucial to *ex ante* analysis, since the two magnitudes (and all others with similar differences) enter into different components of the sectoral and aggregate budget restraints which form the basis of Walras' Law (and of what I call Keynes' Law). In his "Walras' Law and All That..." article, Buiter explicitly recognizes this difference, but he confines it only to dividends planned and dividendes expected.

hence row sums represent expectational errors.

The *behavioral* assumption that the *ex ante* uses and sources of funds of each sector are internally consistent -- which Leijonhufvud calls the fundamental assumption of economics -- can be represented in your framework by retaining the requirement that columns sum to zero. But *rows* only sum to zero when all *cross-sectoral* expectations are exactly correct (e.g. when the wages *planned* by firms ($-WB^{p}_{f}$) happen to exactly match the wages *expected* by households ($+WB^{e}_{h}$), or the consumption *planned* by households ($-C^{p}_{h}$) exactly matches the consumption demand *expected* by firms ($+C^{e}_{f}$)). At best, this would only hold in an appropriately defined equilibrium. How, if at all, is your model altered by dropping the zero sums of rows in the case of *ex ante* magnitudes?

Lastly, is the distinction between current and capital accounts really necessary in the basic exposition? You do not employ it for households or the government, but do so for firms. As an *ex post* device, it imposes no real constraints, since accounting categories always incorporate one variable which is defined to make it all balance. On the other hand, separate *ex ante* current and capital account columns suggest corresponding separate budget constraints at the two levels. Is that what you intended, and if so, what is the behavioral basis for this? If it is only an accounting devices, then perhaps it should be left to later, more detailed, presentations, since it makes it harder to discern the strictly necessary elements of your argument.

I hope you find these comments useful. I have been thinking about these issues for a long time (since first reading your book with Cripps, and since working on my own dynamic growth model based on endogenous credit which was published in 1988). As always, I learn a tremendous amount from your writings and from our interaction. Hope to hear from you soon.

Anwar

① wants to integrate money into eco. analysis: linked via budget restraints, and endogenous

② Models get too complex, so simulation is used (3).

③ Quantities adjust faster than prices (à la Hicks 1989) (5)

④ Finance bridges gaps between investment & returns, & buffers errors in short-term expectations. Banking system does all of this (3)
[NOTE: credit creation + financial intermediation are not the same]

⑤ "Bills" = Borrowed reserves (from Central Bank)

FIRST DRAFT

MONEY, FINANCE AND NATIONAL INCOME DETERMINATION: AN INTEGRATED APPROACH

⑤ Matrix does not distinguish between (say) W^e_H and W^p_f (6). Hence it only applies in equilibrium or ex post.

Wynne Godley
Jerome Levy Institute
May 21 1995

(1) Breaks bus. flows into current & capital accounts. Are these genuinely two separate balances, or only an accounting convention?
- It is only an accounting convention, because RE is the definitional balance term $\equiv S_f \equiv \Delta NFA^p_f \equiv (I+\Delta INV+\Delta H)^p_f - (p_e \Delta eq + \Delta L)^p_f$
- Same could (& should) be done for HH's by defining $S_H \equiv \Delta NFA_H \equiv [\Delta H + \Delta M_1 + \Delta M_3 + \dots]$, so we could show current & cap. accounts here also

INTRODUCTION[1]

Modern textbooks on macroeconomics treat money in a remarkably uniform - and remarkably silly - way. In the primary exposition the stock of "money" is treated as exogenous in the two senses a) that it is determined outside the model and b) that it has no accounting relationship with any other variable. The reader is then invited to assume, pro tem, that the central bank controls "the money supply" so that it is constant through time. When the operations of banks are described, typically some thirty chapters later, the quantity of money is some multiple of commercial banks' reserves as a consequence of these institutions having become "loaned up".

(4) The banking capital account is different since $\Delta H^e_B \equiv \Delta D^e_B - \Delta L^p_B$ follows from the fact that deposits cannot be used for bank expenses

⑥ He insists that only a "correct" definition of profit is consistent with matrix format ?? →

Silly? The money stock, as revealed in real life financial statistics, is as volatile as Tinkerbell - for good reasons, as I shall argue below. How can it be sensible to undertake a thought experiment in which the flickering quantity called "money" is literally constant through periods at least long enough for capital equipment to be planned, built and commissioned - and for lots of other things to happen as well? And the other, "money multiplier", story has the strange defect that, while giving some account of how credit money might be created, it completely ignores the impact on spending of the counterpart changes in bank loans which are assumed to be taking place; perhaps it is because loan expenditure would mess up the solution of the IS-LM model when alternative - assumptions about "the money supply" are used, that the supposed process of money creation normally gets separated from that of income determination by so many chapters[2].

⑦ What is the simplest possible version of this? HH, Firms + Banks

⑧ What is the disciplinary role of profitability here?
(i) In NC eco, MR = MC determines y^*, etc.
(ii) Same in Keynes proper
④ (iii) Zero profit (p.11) assumption on banks allows him to determine the loan rate r_L from the deposit rate r_M → This translates easily into a normal rop "markup" for banks

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[1] This paper is part of a research programme I am undertaking in collaboration with George McCarthy and owes a special debt to Ken Coutts and Anwar Shaikh. I am grateful to Sheila Dow and George Bibow for their comments on an earlier draft.

[2] It is interesting that Joseph Stiglitz, in his 1996 Marshall lectures at Cambridge, emphatically took the view that the ISLM model could not be used for realistic policy guidance, drawing particular attention to the fact that the ISLM model assumes a constant money stock and has no place for a financial system.

⑨ Bills ≡ short term liquid bills issued by Central Bank, & the key is that they serve as bank defensive reserves
- In effect, banks can bolster reserves to support loans by buying "T-bills" ⇒ Reserves are endogenous through a discount window linked to govt deficit
= A govt deficit financed by bills (see p. 2)

Harrod on trade

The bibles of the neo-classical synthesis don't help. There is a spectacular lacuna in the constructions presented, for instance, by Patinkin, Samuelson and Modigliani with regard to the asset side of commercial banks' balance sheets. Usually the role and even existence of bank credit is simply ignored. Modigliani (1963) gives banks (with regard to their assets) no role other than to hold government bonds; and Milton Friedman famously used a helicopter when he wanted to get more money into the system.

There is a reason for all this. It is that mainstream macroeconomics postulates in its basic model that macroeconomic outcomes are all determined by relative prices established in Walrasian markets. Individual agents are held to engage in a market process of which the outcome is to find prices for product, labour and money which clear all three markets plus, by Walras's law, the market for "bonds". But as is now well known, there is no use for money in the Walrasian world even though, paradoxically, "money" is a logical necessity if the model is to be solved.

The impoverished and ambiguous role of money and credit in the standard model carries over when the market process does not quite work because of rigidities or information failures. Thus in the system proposed by Malinvaud (1974) (to take only one example), in which the prices of labour and product are assumed to be wholly exogenous, no market clears except by accident. Yet all agents know exactly what to do - how much of x they are going to exchange for y (?having produced it instantaneously) - as soon as exogenous prices are declared, so there is still neither any need nor any place for inventories or finance. But the Malinvaud model still needs a money stock if it is to have a solution though this is not emphasised!

ANOTHER TRADITION

A radically different macro-economic tradition does exist although this is largely, for the time being, ignored. The names which come first to (my) mind are Wicksell, D.H. Robertson, Keynes (when not writing the General Theory), Kaldor, Graziani and Hicks, particularly Hicks (1989) as well as a large number of authors in the post-Keynesian tradition (e.g. Chick, Davidson, Sheila Dow, Wray, Minsky and Moore). Threads linking these authors, and distinguishing them sharply from today's mainstream, is first their perception that investment, production and distribution are processes which take up historical time - a period which must elapse before sales can take place, hence generating a systemic need for finance. A second thread is the perception that all decisions have to be taken in a state of uncertainty, without agents knowing what their sales or incomes are going to be.

In what follows I am going to present a greatly simplified, but within its limitations realistic, model of how a modern monetary economy may work. Looked at one way, it contains nothing new. Keynes, Kaldor and Hicks (I hardly need say) all

Initially $G-T=0$)

Govt def. financed by bills

$i_{Bills}\uparrow$ to attract buyers $\rightarrow \Delta Bills_S = \Delta(G-T) \rightarrow \boxed{\Delta(\text{Bank Reserves})_S = \alpha\,\Delta(G-T)}$

fraction of new bills held by banks

$\Delta(G-T)>0 \rightarrow \Delta Y = m\cdot\Delta(G-T) \rightarrow \Delta INV = \gamma\Delta Y = \gamma m\,\Delta(G-T) \rightarrow \Delta L = \Delta INV$

$\rightarrow \boxed{\Delta(\text{Bank Reserves})_D = \rho\,\Delta L = \rho\gamma m\,\Delta(G-T)} < \Delta(G-T)$

because $\rho, m, \gamma < 1$

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 chose to formalise their systems, so it is extremely difficult to teach them reliably or rigorously, and there remains a penumbra of ambiguity around too much of what they wrote; for instance, there is still much room for argument about "what Keynes really meant".

I shall instead adopt the methodology pioneered by James Tobin[3] wherein a whole 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. The model is large by the standards of theoretical models, having about eighty equations. But even so, a great many simplifying assumptions have been made to prevent the scale of this (preliminary) operation from getting completely out of hand. I am all too aware that for some people I will have simplified away some of the features of a monetary economy which they regard as crucially important. For instance, I have assumed that the economy is closed and that households neither borrow nor invest; and all my asset demand and supply functions work mechanically so there is no place for waves of confidence which can generate substantial cycles of activity. I just have to ask the reader to suspend disbelief on these, and some other questions.

It is a matter of ascertainable fact that the real world is characterised by a huge and complex structure of interdependent institutions such as governments, firms, banks and households. I do not accept that these institutions are "veils" with nothing more to do than passively sponsor or facilitate the optimising aspirations of individual agents; and wish, rather, to start from a conceptual framework which takes cognisance of (something remotely approaching) the real world as we know it. However crudely motivated and characterised, my model will provide an account of a complete system of physical and financial stocks and flows between four sectors, evolving through historical time.

At a more theoretical level, following Hicks (1989), my model incorporates the fact that "markets" in real life can only, with extremely rare exceptions, function by virtue of the activities of professional intermediaries who both buy and sell, and who therefore hold inventories[4] and quote fix-prices. As Hicks[5] put it

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[3] My debt to Tobin is enormous; I could not possibly have made this model without his work, particularly on asset choice.

[4] The statement holds as well for financial assets as for merchandise as Kregel (1995) has shown.

[5] Ibid. p.11

The increment in...stock, during a period, is the difference between what is held at the end and what was held at the beginning, and the beginning stock is carried over from the past. 'So the demand-supply equation can only be used in a recursive manner, to determine a sequence; it cannot be used directly to determine price, as Walras and Marshall had used it.'(Emphasis added)

Investment, production and distribution all take time and are all activities which have to be undertaken under conditions of uncertainty. One role of the financial system will be to provide the finance required for investment in fixed and working capital (in advance of sales taking place) if production and distribution are to proceed smoothly or at all. And it will also provide residual "buffer" finance for fluctuating inventories as short term expectations are falsified. But simultaneously the financial system accommodates the needs of the household sector with regard to asset accumulation and allocation under conditions of uncertainty analogous to, but quite distinct from, those facing firms. The model will show how the banking system is motivated to carry out all these functions simultaneously and how it can achieve this profitably so long as its debtors do not default. A subsidiary, but still very important, purpose of the model is to show how prices determine the distribution of income and wealth.

THE ACCOUNTING FRAMEWORK

[Note. A summary of variables is provided in the appendix. The convention will be adopted that stock and flow variables at current prices will be described by upper case symbols; lower case symbols will describe constant price "volume" variables. The suffixes _e, _p, _d and _s will denote, respectively, that a variable is expected, planned, demanded or supplied. A star means that the variable is in a steady state relationship. The full model, in the exact form in which it is read by the computer, is given in the appendix. For various reasons this differs slightly - though in unimportant ways - from what is described in the text; for one thing the computer demands a degree of rigour which becomes tedious in a verbal exposition. The keen reader may, however, wish to have recourse to the appendix version, which has been tried in the fire of numerical simulation]

The standard macro-economic model employs a very impoverished conceptual framework, consisting of little more than the national income identity (between expenditure and factor income) plus, having deducted taxes and transfers from both sides of the equation, the identity between the aggregate financial balances of the three main sectors - government, overseas and private domestic. It is left mysterious how credit money and, more generally, financial institutions, fit into the story at the level of accountancy.

In what follows, I start from the real world as described in, for instance, Table 11.1 of the National Income Blue Book which shows, for single years, a comprehensive matrix describing flows of funds in the British economy. The table which follows shows the adaptation of the Blue Book table which I shall use in this paper and which forms the accounting basis of my simulation model. Like much of what follows it is heavily indebted to Tobin's work (e.g. in Backus *et al*.(1980))

$C \cong C^p_H + \varepsilon_{CH}$ (Assumpt on realiz. of plans)

$C^e_F \cong C + \varepsilon_{CF}$ (" " realiz. of expect.)

Table 1: Flow of funds at current prices

	H'hlds.	Firms		Banks		Gov't.	Total
		Crnt.	$\boxed{\text{Cptl.}}$	Crnt.	$\boxed{\text{Cptl.}}$		
Consumption	$-C^p_H$	$+C^e_F$					Exp Error
Government expenditure		$+G^e_F$				$-G^p_G$	0
Fixed investment		+IN	-IN				0
Stockbldng. (bef. IVA)		$+\Delta I$	$-\Delta I$				0
[Stock app.]		[-IVA]					
[National income]		[+Y]					
Tax		-T				+T	0
Wages	+WB	-WB					0
Profits = DIV	(DIV) +FD	(Profit) -FN	+FU (RE)				0
Debt interest		$-rl.L_{-1}$		$+rl.L_{-1}$			0
Interest on - money	$+rm.M3_{-1}$ — interest bearing deposits			$-rm.M3_{-1}$			0
- bills	$+rb.Bsp_{-1}$ — T-bills (?), $P_{BL} = 1$?			$+rb.Bsb_{-1}$ — T-bills held by banks		$-rb.Bs_{-1}$	0
- bonds	$+Bp_{-1} = r_{BN} P_{BN} BN_{-1}$, $r_{BN} = \frac{1}{P_{BN}}$ — govt bonds, P_{BN} is a variable					$-Bp_{-1}$	0
Δ stocks of - cash	$-\Delta Hp$		$-\Delta Hf$		$-\Delta Hb$	$+\Delta H$	0
- current deposits	$-\Delta M1$				$+\Delta M1$		0
- demand deposits	$-\Delta M3$	?		?	$+\Delta M3$		0
- bills	$\boxed{-\Delta Bsp}$				$\boxed{-\Delta Bsb}$	$+\Delta Bs$	0
- govt bonds	$-\Delta Bp.pb$					$+\Delta Bp.pb$	0
- equities	$-\Delta e.pe$		$+\Delta e.pe$				0
- loans			$+\Delta L$		$-\Delta L$		0
Total	0	0	0	0	0	0	0

Assumes that DIV^p_B are planned as payments by bus. to HH's and RE^p_B are planned as payments by bus to their own cap. acct

N.B. Nominal capital gains or losses (on bonds and equities) are:

$\Delta pb.Bp_{-1}$

and $\Delta pe.e_{-1}$

$\boxed{\text{Sources}}$ = $\boxed{\text{Uses}}$

Variables in square brackets are important accounting auxiliaries which are not transactions and therefore have no counterpart entries in other columns.

$$HH: \quad W^e_H + DIV^e_H + r_M M_{3H_{-1}} + r_{BLG} BLG_{H_{-1}} + r_{BNG} P_{BNG} BNG_{H-1} = C^p_H + [\overbrace{\Delta H + \Delta M_1 + \Delta M_3 + \Delta BLG + P_{BNG} \Delta BNG + p_e \Delta eq}^{\Delta NFA}]^p_H$$

$$\text{Firms:} \begin{cases} Y^e_f = T^p_f + WB^p_f + DIV^p_f + RE + r_L L_{f-1} & \text{[Current Acct]} \\ RE^{<} + p_e \cdot \Delta eq^e_f + \Delta L^p_f = I^p_f + \Delta INV^p_f + \Delta H^p_f & \text{[Capital Acct]} \end{cases}$$

$$\text{Banks:} \begin{cases} r_L L_{B-1} + r_{BLG} BLG_{B-1} = r_M M_{3H-1} & \text{[Current Acct]} \\ \Delta M1^e_B + \Delta M3^e_B \; 6 = \Delta H^p_B + \Delta BLG^p_B + \boxed{\Delta L^p_B} & \text{[Capital acct]} \checkmark \end{cases}$$

This simplifies, we note ($\Delta H^e_B = \Delta D^e_B - (\Delta L^p_B + \Delta BLG^p_B)$) ΔDep[illegible]

$$\text{Govt} \; \{ \; T + \Delta BLG + \Delta BNG_H = G + r \ldots$$

In some respects Table 1 is simpler than the Blue Book table. As already mentioned, the model assumes that the economy is closed and also that the household sector neither invests nor borrows and this is reflected in my table. On the other hand it does use a double entry matrix so that every flow can be seen to be a transaction involving at least two sectors. And while many of the component parts of Table 1 are more aggregated than the Blue Book table, others are less so; in particular, credit money and government securities are disaggregated and interest flows are represented as opening asset stocks multiplied by the interest rate appropriate to the asset in question.

Table 1 defines most of the symbols which describe the current price flows of the model and it is hoped that the general schema will be largely self-explanatory. It is assumed that "bonds", Bp, are perpetuities, each paying #1 per period, hence the interest flow is given by Bp(-1), the long interest rate by 1/pb where pb is the price of bonds and the end period value of the stock of bonds is Bp.pb. Similarly, equity consists of bits of paper, e, which entitle their owners to receive the flow of distributed profit, FD, and which have a price, pe.

Central to the methodology I am putting forward is the notion that the accounting should be comprehensive in the sense that there are no "black holes" - every flow comes from somewhere and goes somewhere. But this is easier said than done. In a fully articulated model with N equations, the Nth equation is always implied by the other N - 1, so a numerical solution can only be found if one equation is dropped from the specification. It is then possible to test the model's accounting by ascertaining whether or not the "dropped" equation is indeed satisfied. In the model deployed here I have habitually dropped the equation which makes banks' demand for bills equal to the supply of bills to the banks. It was my experience that, to a humiliating extent, the dropped equation initially turned out not to be satisfied and it was often a devil of a job to find out why. All of which is some justification for the very tedious section on accounting which immediately follows. I found the definition of profits and the way in which prices distribute the national income particularly difficult to sort out. And I found too that recourse to manuals and textbooks was fruitless. But unless we are operating with a logical system we will get nonsense answers. Stocks should be accumulating somewhere but are not in fact doing so etc. etc.

So here goes.

The top six entries in Column 2 of Table 1 show the familiar National Income identity as part of the current transactions of firms.

1) $Y = C + G + IN + \Delta I - IVA$

where Y is GDP, C is consumption, G government consumption, IN fixed investment, ΔI the change in the value of inventories and IVA stock appreciation. Note that the change in the value of inventories, in common with the change in the value of all stock variables, may be divided into two components

2a) $\Delta I = i.UC - i_{-1}.UC_{-1}$

2) $= \Delta i.UC + \Delta UC.i_{-1}$

where the lower case describes the volume of inventories and UC is the deflator for inventories. As inventories are assumed to be valued at cost, the deflator is taken to be equal to wage costs per physical unit of output ?

3) $UC = \frac{WB}{\bar{y}}$

where WB is the wage bill and $\bar{y}$ is output valued at the unit cost obtaining in some base year (so that unit cost (UC) takes on the value 1 in the base year).

Of the two terms on the RHS of 2) above, the first describes the change in the volume of inventories at current prices while the second describes stock appreciation (IVA stands for "inventory revaluation adjustment"). As only the first of these two expressions (Δi) corresponds with a production flow, the second, which describes the change in the value of the opening volume of inventories, IVA, is always deducted in official statistics from the total flow of expenditure to derive aggregate production and this practice has been followed here.

(?)

Unlike consumption and government expenditure, investment in fixed capital and stockbuilding do not originate in other sectors, so in a double entry system of accounts they have to come from a capital account within the firm sector. The funds to pay for this capital expenditure have, in turn, to come from somewhere - to be precise, from some combination of undistributed profits, issues of securities (here assumed all to be equities) and, as a residual source of finance, the change in bank loans net of cash stocks. So, to make column 3 sum to zero

reason for capital account ?

4) $IN + \Delta I = FU + \Delta Hf\_d + \Delta e\_s.pe + \Delta L\_d$

where FU is undistributed profits, Hf is cash held by firms, e is equities, pe the price of equities, L bank loans and Δ is a first difference operator. The subscripts _d and _s, describing demands and supplies are included in the identity to denote that firms plan consistently.

The standard assumption that all profits are instantaneously distributed is absurdly unrealistic, by-passing and trivialising the role of the financial system which is the main focus of interest here. The empirical fact is, of course, that investment is preponderantly financed out of undistributed profits.

I had better bite the bullet at this point and derive profits from the appropriation account of firms shown in column 2 of Table 1 as this will have important implications later on. So long as they are defined gross of all interest and dividends (as well as depreciation), gross profits (FG) are given by the identity

5) $FG = S - T - WB + \Delta I$ = (Sales - Taxes - Wages) + ΔINV = profit on sales + ΔINV

Definition of gross profit

where T describes taxes, assumed here all to be indirect and paid by firms. I have found that people who have not made a special study of accounting sometimes have difficulty in penetrating 5), although the matrix clearly implies (since column 2 sums to zero) that this expression correctly evaluates the flow which can potentially be appropriated by the owners of firms and their creditors (subject to a liquidity constraint) while leaving the firm intact.

Since, with a closed economy and no production taking place outside the firm sector, all costs resolve into wage costs, and since we assume the production period to be shorter than the accounting period, end-period inventories valued at cost are given by

6) $I = \sigma.WB$

where σ is the proportion of the wage bill paid out in the period which was not embodied in sales which took place in that period. Similarly, the opening inventory is given by

6a) $I_{-1} = \sigma_{-1}.\ WB_{-1}$

Putting 6) and 6a) into 5) and collecting terms we now have an intuitive definition of 5)

7) $FG = S - T - (1 - \sigma)WB - \sigma_{-1}\ WB_{-1}$

- an identity which makes gross profits equal to net-of-tax sales less the outlays, counting on a FIFO basis, necessary to produce those sales. To spell it out, the cost of inputs embodied in sales in any period is equal to payments made in the previous period but not embodied in sales that period plus payments made this period which were embodied in sales this period.

As mentioned earlier, the definitions in 5) and 7) refer to profits gross of all interest and dividends. But this is not good enough because, as production and distribution take time, funds are necessarily tied up until sales actually take place. Accordingly there is un unavoidable cost, additional to the wage and salary bill, generated in the course of producing goods and services which is equal each period to the loan rate of interest times the opening value of inventories. Thus the net profit, FN, potentially extractable by the entrepreneur from his whole set of business operations is given by

8a) $FN = S - T - WB + \Delta I - rl.I_{-1}$ = gross

or (using 7)

8) $FN = S - T - (1 - \sigma)WB - \sigma_{-1}\ (1 + rl).WB_{-1}$

It seems to be the universal practice of national income statisticians, having justifiably defined the national income "with" IVA (= after deducting stock appreciation) to go on to define (net) "profits" as gross profits (equation 2) net of stock appreciation as well - for this has the convenience that total factor income is then equal to total production.

But this procedure does not, in general, produce a definition of net profits that is justifiable in balance sheet terms - the one shown in 8) and 8a) above - that is, the profit flow which can be extracted by entrepreneurs (subject to a liquidity constraint) yet leave the business intact. The official definition of profits will only accord with the "balance sheet" definition in the unusual case where (using 2) and 8a))

9) $I_{-1}.rl = I_{-1}.\frac{\Delta UC}{UC_{-1}}$

- that is, when the loan rate of interest is exactly equal to the rate of cost inflation.

Is this true

In what follows, the unconventional but conceptually coherent definition of profits described in 8) and 8a) will be retained. For nothing else will fit meaningfully (i.e without generating meaningless residuals) into the matrix format of Table 1; payments of interest to cover the inevitable financing costs are shown (a component of the entry in column 2) as an explicit charge on gross profits. The balance is net profits, FN, part of which is distributed (FD) and rest is undistributed (FU) and this, in turn, becomes an important source of funds for fixed investment. Stock appreciation is only a memorandum item which has no place at all in the transactions matrix!

ACCOUNTING OF THE HOUSEHOLD SECTOR

Receipts of household income (YP) above the line are shown in column 1 of Table 1 and comprise labour income and flows of property income in the form of interest and dividends.

10) $YP = WB + FD + rm.M3_{-1} + rb.Bsp_{-1} + Bp_{-1}$

Any difference between receipts of household income and payments for consumption all has to accumulate somewhere. As we are assuming that households neither invest nor borrow, all their saving must accumulate in the form of financial assets. It has been assumed here that households have a choice between six financial assets, cash (Hp), two kinds of money (interest bearing (M3) and non-interest bearing (M1)), two kinds of bonds (long (Bp) and short (Bsp)) and equities. Assuming (until we get to the behavioural section) perfect foresight and consistent planning

11) $YP - C = \Delta Hp\_d + \Delta M1\_d + \Delta M3\_d + \Delta Bsp\_d + \Delta Bp\_d.pb + \Delta e\_d.pe$

Note that the change in the nominal stock of household wealth (V) differs from the sum of the flows described in the RHS of equation 11) above by the amount of any nominal capital gain on bonds and equities. To be precise, the change in nominal wealth is given by

12a) $\Delta V = YP - C + CG$

where capital gains are

12) $CG = \Delta pb.Bp_{-1} + \Delta pe.e_{-1}$

It will be convenient to adopt a quasi-Hicksian definition of disposable income (YD) as the flow which, if entirely consumed, will leave the wealth stock unchanged[6]. In nominal terms

13a) $YD = C + \Delta V$

13) $\quad = YP + CG$

The flow identity given in equation 13) above has the important operational meaning that, given the balance between income and expenditure, more of one asset can be acquired only if less of other assets (taken together) are transacted to an equal extent.

THE GOVERNMENT

The accounts of the government (defined here to include the central bank) are very conventional. The government receives taxes and pays for its own expenditure plus interest payments. Any deficit must be met by some combination of changes in cash, bills or bonds.

14) $G + rb.Bs_{-1} + Bp_{-1} = \Delta H\_s + \Delta Bs\_s + \Delta Bp\_s.pb$

As with the household sector, the operational meaning of the identity is that given the financial deficit, no one component can be altered (say, the supply of cash) without an equal and opposite change in the sum of the other entries.

THE BANKS

The appropriation account of the banks is shown in column 4 of Table 1. Strictly speaking there should be a residual item, banks profits, to ensure that the column sums to zero by definition. However, we have assumed that it is legitimate, in a preliminary model like this one, to assume that commercial banks, operating in competition with one another, make zero profits; one could imagine the banking system, for the purpose of this study, to be operating as a kind of public service, following a set of humdrum rules rather like building societies in the UK. So, to make the appropriation account balance, we write, as though it were an identity

15) $rm.M3_{-1} = rb.Bsb_{-1} + rl.L_{-1}$

and this makes the flows into and out of the banks balance one another.In column 5 we have the capital account of the banks, which shows the two forms of credit money as banks' liabilities while their assets consist of loans, reserves and government securities.

16) $M1\_s + M3\_s = Hb\_d + Bsb\_d + L\_s$

We can now draw a conclusion of considerable importance from consideration of accounting relationships alone. We have a matrix in which every row and every column sum to zero. As there are no entries above the line in the banks' capital account, it follows that,

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[6] But in the computer model flow capital gains are not included in the definition of income although they do generate changes in wealth

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ignoring the possibility of default by a debtor, there is no way in which non-bank agents can behave which can unbalance the (consolidated) balance sheet of the banking system; banks' assets must every second be equal to their liabilities, although a "run" on banks (e.g if household want to convert their deposits into cash) can generate a liquidity crisis unless the government acts as lender of last resort. The operational problem for banks will not be to balance their accounts, but to make sure that their operations are indeed profitable - apart from anything else they must be motivated to perform the functions they do.

ACCOUNTING FOR PRICES AND THE DISTRIBUTION OF INCOME

We have been too accustomed to thinking of prices as things which clear markets (or fail to clear them) and not enough about the fact that prices are set by firms in the expectation of making profits. It is realised sales (a quantity times a price) relative to costs that is going to determine the distribution of the national income. The following accounting equations will make it possible to endogenise the flow of profits in the model[7].

We first rewrite the appropriations identity (8) with sales on the LHS and taxes, net profits and historic costs on the RHS

17) $S = T + FN + (1-\sigma).WB + \sigma_{-1}(1+rl).WB_{-1}$

If we now define the tax rate

18) $$\tau = \frac{T}{S - T}$$

the profit mark-up on historic costs

19) $$\gamma = \frac{FN}{(1-\sigma).WB + \sigma_{-1}(1+rl).WB_{-1}}$$

and then divide 17) through by the volume of sales, we can derive an expression for the average price level of goods

20) $$p = \frac{S}{s} = \frac{(1+\tau).(1+\gamma).[(1-\sigma).WB+\sigma_{-1}(1+rl).WB_{-1}]}{s}$$

Finally, using the identities relating real sales to real output and inventory accumulation

21) $s = y + \Delta i$

the rate of cost inflation

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[7] An extended derivation of equation 24) - the main exhibit of the following section is to be found in Godley & Cripps (1983) pp.186-195

22) $\pi c = \frac{\Delta UC}{UC_{-1}}$

and the real loan rate of interest defined with respect to cost inflation

23) $rrc = \frac{rl - \pi c}{1 + \pi c}$

the price identity may be written as a set of mark-ups on wage costs per unit of output with no lagged terms.

24) $p = (1+\tau) . (1+\gamma) . (1+\sigma . rrc) . WB/Y$

The absence of lags means that if 24) is divided through by the price level (p) and multiplied by real output (y), we have an expression which describes how the real national income is divided, period by period, into receipts by the government, net profits, real wages and the real income of the creditors of system[8]

25) $y = (1+\tau) . (1+\gamma) . (1+\sigma . rrc) . wb$

Note that 24) and 25) are both accounting identities and that τ and γ are both variables, one of which determines taxes, the other profits.

We can now derive a large number of deflated variables - consumption, investment, government expenditure, real disposable income and real wealth by dividing them each by the price level, assumed equal to 1 in some base year.

The flow of real disposable income is

26) $yd = c + \Delta v = YP/p + CG/p - v_{-1} . \pi / (1+\pi)$

where cg is real capital gains, π is the inflation rate and the final term is the erosion of real wealth stocks as a consequence of inflation.

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[8] Equation 24) is, in effect, identical in form and substance to that proposed by Graziani in, for example, "Production, circulation et monnaie". The differences are that Graziani omits the government and assumes an accounting period which is equal to the accounting period.

SOME MACROECONOMICS

[Note to readers of the first draft of this paper. The main purposes of what follows are to show how the whole system fits together and cast the banks in a realistic role. The parts dealing with consumption and investment are very scanty; but the framework would survive alternative treatments of these functions.

A) BEHAVIOUR OF FIRMS

Firms have to make decisions regarding how much to invest, what prices to charge, how much to produce and how many people to employ - based on their expectations regarding sales and the extent to which they wish to change the inventories with which they open the period. In what immediately follows we follow line for line the operations described in Hicks (1974)

The production decision may be written

27) $\overline{y} = \overline{s}\_e + i\_p - i_{-1}$

where $\overline{y}$, $\overline{s}\_e$ are respectively real production and expected sales where the bar means that these variables are measured in the same units as real inventories, that is, at constant factor cost, excluding profits and indirect taxes. Equation 27) says that firms decide to produce what they expect to sell plus the change in inventories they wish to bring about.

Firms' desired inventories are described by the following partial adjustment process

28) $i\_p = i_{-1} + \omega.(i^{*} - i_{-1})$

that is, firms intend to move them some distance towards a normal stock/sales ratio described by

29) $i^{*} = \zeta.\overline{s}\_e$

Actual inventories are then determined by the extent to which sales expectations are falsified

30) $i = i\_p + (\overline{s} - \overline{s}\_e)$

For simulation purposes we assume that sales expectations are formed adaptively, subject to random shocks

31) $\overline{s}\_e = \overline{s}_{-1} + R1$

also real income expectations, p. 16

where R1 is a random variable.

Labour productivity is initially assumed not to change, so if average wages (W) are scaled to unity in the base year

32) $WB = W.N$

Employment (N) is related to output and we shall assume to start with that productivity is constant

33) $\ln(N) = \eta_0 + \eta_1 \ln(y)$

For investment I assumed a crude accelerator based on expected sales

34) $k^* = \beta_0 . \overline{s}\_e$

35) $in = \beta_1 . (k^* - (1 - dep) . k_{-1})$

where dep is the rate of capital consumption. So the end-period stock of capital measured at constant prices is

36) $k = (1 - dep) . k_{-1} + in$

and the stock of fixed capital "at replacement cost" is

37) $K = k . p$

For simulation purposes it has been assumed that all of fixed investment is financed, with a lag, out of undistributed profits

38) $FU = \Delta K_{-1}$

Note that this equation, by virtue of 19) and 26), describes the way firms determine the flow of profits through the size of the mark-up.

In addition firms have some resort to new equity issues whenever the level of equity prices makes Tobin's q exceed unity

39) $\Delta e\_s = \phi (q - 1)$

40) $q = \dfrac{pe . e\_s}{K}$

while stocks of cash held by firms follow some trivial rule

41) $Hf\_d = \psi . S$

We are left with bank loans - the indispensable residual component of finance which covers inventories as they take up the slack between actual and expected sales and provide initial finance for fixed investment which gets repaid when undistributed profits rise, by 38), to pay for it in a later period.

42) $\Delta L\_d = IN + \Delta I - \Delta e\_s . pe + \Delta Hf\_d$

There remains, so far as firms' behaviour goes, the distribution of dividends, which is assumed to follow some simple rule e.g.

43) $FD = \delta . K_{-1}$

B) BEHAVIOUR OF HOUSEHOLDS

The conventional (elementary) assumption that consumption is some proportion, less than one, of disposable income obviously cannot describe a steady state since it implies, by 26) above that the real stock of wealth is increasing without limit.

We assume, fairly conventionally, that real consumption is some proportion (less than one) of expected real income plus another proportion of the opening real wealth stock

44) $c = \alpha_1 . yd\_e + \alpha_2 . v_{-1}$ $\Longleftrightarrow s \equiv y_d^e - c = (1-\alpha_1) y_d^e + \alpha_2 v \rightarrow \frac{s}{y} = s' =$ avg propensity to save $= (1-\alpha_1) + \alpha_2 \left(\frac{v}{y}\right)$

↓ This a generalization of the Godley-Cripps stock/flow norm, since it implies $\dot{s} = 0$ when $g_y = 0$ and $s' = s'^*$ when $\left(\frac{v}{y}\right) = \left(\frac{v^*}{y}\right) \Leftrightarrow v = v^*$

This consumption function implies (bearing in mind the definition of real disposable income in 26) that, in a full steady (stationary) state where Δv must be zero, the consumption flow exactly equals the income flow so, in an ex post sense, the average propensity to consume is then one although the marginal propensity to consume out of income obviously remains less than one.

Note that this consumption function can be alternatively written, substituting 26) and collecting terms, as a wealth adjustment function

45) $\Delta v\_e = \alpha_2 \left(\frac{1-\alpha_1}{\alpha_2} . yd\_e - v_{-1} \right)$

or, solving out lagged wealth recursively, consumption can be written as a function of current and lagged income with the coefficients constrained in a particular way, to sum to unity

45a) $c = \alpha 1 . yd\_e + \alpha_2 . (1-\alpha_1) yd_{-1} + \alpha_2 (1-\alpha_1) . (1-\alpha_2) yd_{-2}$ ... —p.14

We shall assume, analogously with our treatment of firms' expectations of sales, that expectations about real income are determined adaptively, with a random component

46) $yd\_e = yd_{-1} + R_2$

where R_2 is another random variable.

Expected end-period wealth is determined by opening wealth, capital gains, expected income and consumption. Any addition to wealth has to be exactly allocated between the six assets shown in Table 1 and described by 11).

It is assumed that the decision about how much cash to hold is, these days, completely unimportant and dependent entirely on the value of transactions carried out

47) $Hp\_d = \mu . C$

So asset choice proper is concerned with expected total wealth excluding cash, a variable termed VN

48) $VN\_e = V\_e - Hp\_d$

The asset demand functions may be arrayed, a la Tobin, as follows, with arguments covering all real rates of return, including that on cash - the negative of the inflation rate - in every one of them

$$49) \quad \frac{M1*\_d}{VN\_e} = \lambda_0 - \lambda_1 \, rrbb - \lambda_2 rrb - \lambda_3 rrm - \lambda_4 rrk - \lambda_5 \pi r + \lambda_6 \, \frac{YP\_e}{V\_e}$$

$$50) \quad \frac{Bsp\_d}{VN\_e} = \lambda_{00} + \lambda_{01} rrbb - \lambda_{02} rrb - \lambda_{03} rrm - \lambda_{04} rrk + \lambda_{05} \pi r - \lambda_{06} \, \frac{YP\_e}{V\_e}$$

$$51) \quad \frac{Bpd\_d.pb}{VN\_e} = \lambda_{10} - \lambda_{11} rrbb + \lambda_{12} rrb - \lambda_{13} rrm - \lambda_{14} rrk + \lambda_{15} \pi r - \lambda_{16} \, \frac{YP\_e}{V\_e}$$

$$52) \quad \frac{e\_d.pe}{VN\_e} = \lambda_{20} - \lambda_{21} rrbb - \lambda_{22} rrb - \lambda_{23} rrm + \lambda_{24} rrk + \lambda_{25} \pi r - \lambda_{26} \, \frac{YP\_e}{V\_e}$$

where rrbb, rrb, rrm and rrk are all real rates of interest, derived using the Fisher formula for discrete time.

The demand for M3 is given by residual

53) M3_d = VN_e - M1_d - Bsp_d - Bp_d.pb - e_d.pe

but the full Tobinesque specifications which I have used ensure that the constant in the implied function is positive and the coefficients have the right signs, that is, a positive sign on the money rate of interest and negative signs on all other arguments.

It is assumed that mistaken expectations about disposable income turn up as differences in holdings of M1 compared with what was targeted in equation 49) above. Thus

53) M1_d = M1* + VN - VN_e

The demand for M1 (again a la Tobin) must be given a non-negativity constraint, which implies that, if households are very badly mistaken with regard to their expectations about income, their demand for M3, by 53) above will take any residual strain.

Note that while income as a share of wealth has been included in all the asset demand functions in deference to the idea adopted by Tobin that there is a transactions demand for M1, we have not allowed, in the simulation model, for any adjustment lags between desired and actual asset structures. This is yet another of the model's weaknesses!

Note however that the constraints on the coefficients are somewhat more elaborate than those proposed by Tobin, at least in Brainard and

Tobin (1968). For surely the effect on the demand for any asset as result of a given rise in the rate of return on that asset cet. par. will not be different from that of a fall (of the same size) in the rates on all other assets, the own rate held constant. Accordingly it has been assumed in the simulation model that, reading each function horizontally, the sum of all coefficients on other rates of return will equal that on the own rate, and that the coefficient of each individual rate is roughly proportionate to the share of the asset in question in the total wealth stock.

What did we mean by rk, the rate of return on equity? Define the rate of (distributed) profit

55) $$rr = \frac{FD}{K_{-1}}$$

Once again following Tobin, we define the rate of return on equity

56) $$rk = \frac{rr}{q}$$

where q is the ratio of the total value of equity to the stock of physical capital valued at replacement cost described in 40).

If we now postulate an equilibrium condition

57) $ed = es$

then equation 52) determines the price of equity.

C) BEHAVIOUR OF THE GOVERNMENT

The government has four policy instruments at its disposal government expenditure, the tax rate, the short term (bill) rate of interest (which it announces) and the outstanding stock of long bonds, which it determines by open market operations. To say that the bill ratē is an exogenous policy instrument is also to say that bills are supplied on demand (i.e. at the declared rate of interest) to whoever pays for them, households or banks

58) Bsb_s = Bsb_d

59) Bsp_s = Bsp_d

Savings accounts

This is obvious enough in a way. But note that banks can only get more bills, cet. par. if they exchange them for reserves and households, to get more bills must exchange them for some other asset, typically the closest substitute - M3. But households will only be motivated to do this, in the model, if relative interest rates change in favour of bills and against M3.

The assumption that the government engages in open market operations with regard to bonds means that the equation equating demand and supply for long bonds

60) Bp_d = Bp_s

is an equilibrium condition which determines the long bond rate via the price of bonds in equation 51)

BEHAVIOUR OF BANKS

Financial Intermediation (transfer) vs. credit creation

[Note to readers of the first draft. While I feel very confident about my accounting I am particularly uncertain about the section which follows although I believe it to be more important than anything else in this paper. So I am particularly anxious to get comments on this. The modern literature has very little, so far as I know, on the role of commercial banks in a macroeconomic model. In fact, the only piece of real stature that I know is Tobin (1969). However banks in Tobin's paper are essentially agents operating in financial markets who do nothing but make an asset choice exactly like the asset choice of households and conducted according to the same principles. The role of banks is thus nothing more than to extend the range of asset and liability choice open to households and firms. I am proposing something completely different from this which although not new has never so far as I know been formalised before. I am saying that (within strict limits e.g. concerning credit-worthiness) banks respond passively to the needs of business for loans and to the asset allocation activities of households (as well as providing the means of payment). They make profits not by deciding where to invest but by setting prices (i.e loan and money rates of interest) in response to quantity signals. Loans are not (negative) assets but factors of production which imply a cost of production as much as the employment of labour]

We come at last to the core of what this paper is designed to show as regards systemic behaviour (as opposed to systemic accounting). On the one hand we have the demand for cash from households and businesses and the demand for the two kinds of credit money from households which together make up the liability side of banks' balance sheets. And all these demands fluctuate at short notice in response to household income, expenditure and asset allocation as expectations are falsified or as expectations themselves shift. At the same time the demand for bank loans, being the residual source of finance for business, fluctuates in response to "the needs of trade" as demand and output evolves and as diverse expectations are formed and always to some extent falsified. The fluctuations in the demand for loans are the outcome of set of influences quite distinct from those determining the demand for money. Yet the banks have no difficulty (at least in the model) in fulfilling all the functions required of them, passively. By this I mean that they will always "accept" a deposit made with them whether M1 or M3 (which means that they will always exchange one deposit for another or for cash or bills); and they will always make loans to finance certain types of expenditure, subject to security being satisfactory, which means that the loanee makes a draft on an account which has nothing in it, which turns up as someone else's deposit. And banks can do all this and stay continuously solvent and profitable.

How? The key resides in the fact, already pointed out, that as all other rows and columns in the flow of funds matrix sum to zero, the banks' balance sheet must always do the same thing - it is literally impossible for any configuration of demands for money, cash or loans whatever to disturb the equality between banks' assets and their liabilities so long as there is no default.

But this is not (yet) to say that the banks' activities will always be profitable. One threat to banks' profitability resides in the possibility that for one reason or another (for instance if non-banks' holdings of money fall at the expense of their holdings of government securities) banks' holdings of bills falls towards zero and threatens to become negative. At that point the profitability of banks' operations becomes threatened because the government (central bank) may not issue negative bills i.e. lend, except at penal rates of interest. Accordingly, it is assumed in the model that banks, if their holdings of bills threaten to become negative, will raise the money rate of interest, thereby inducing households to exchange government securities for holdings of M3. I have modelled this response, admittedly very crudely, by introducing a logical function which says that the rate of interest on money will be raised whenever banks' holdings of bills approach zero and reduced whenever they are above some low number.

RR = Required Reserves = ρ. Deposits so as L ↑, D ↑ RR ↑, so ER = level of excess reserves → 0 as L ↑

hence banks attract cash into their coffers by raising the interest rate (rm) in (interest-bearing) deposits (M3). – above the exogenously given int. rate on bills (rb): then if rm > rb, HH's sell T-bills back to govt, put cash into

why not total reserves / total deposits ?

61) $\Delta rm > 0, \ Bsb < 0; \ \Delta rm < 0, \ Bsb > 0.1$

Banks' freedom (in this model) to offer whatever rate they like on M3 will ensure that, except in some very short term, they do not have to borrow from the government.

The profitability of banks' operations as a whole can now be guaranteed because they can set the loan rate of interest at whatever rate ensures such an outcome. The condition which guarantees zero profits is that the loan rate is set such that[9]

62) $rl.L_{-1} = rm.M3_{-1} - rb.Bsb_{-1}$

We can now write in the remaining equations which describe, formally, the functions of banks.

It is assumed that, whether by law or custom, banks operate a fractional reserve system which keeps their liabilities as some multiple of their reserves

63) $Hb\_d = \rho \ (M1 + M3)$ Required Reserves = ρ. (Total deposits)

For the rest, we now have enough degrees of freedom to write down the following equalities

64) $M1\_s = M1\_d$

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[9] This equation has already appeared in the accounting section as 15)

65) M3_s = M3_d

66) L_s = L_d

The meaning of these equations is that once money rates have been set such that banks do not have to borrow from the central bank and loan rates such as will guarantee the profitability of their operations as a whole, banks *can profitably match any configuration whatever* of demand for money on the part of households and, determined quite separately, demand for loans on the part of firms.

If this account of banks' operations is correct in very broad outline, it makes no sense to attribute unidirectional causality to any part of their operations - to say, for instance, that "every loan creates a deposit". For we are looking at a completely interdependent system in which the final outcome, looked at *ex post*, is the resolution of a huge number of diverse impulses. It may sometimes be the case that an additional loan, for some period of time, can clearly be said to create a deposit. But it may equally be the case that a holding of money is used in such a way that it extinguishes a loan (as well as itself). Whatever else may be the case, it can never make any sense whatever to say of the stock of credit money that it is "exogenous" or that it can be "treated" as exogenous.

GATHERING SOME THREADS TOGETHER

Barring a few bits of accounting[10] too trivial to be worth a line in the text, I have now described a complete model. It has about eighty equations, and therefore eighty endogenous variables, which comprise all expenditures at constant and current prices, the national income and its distribution between wages and profits, stocks of real capital and inventories and six different financial assets, the price of goods, equity prices and several interest rates. The main exogenous variables, counting the way normally used by macro-economists, are the policy variables (government expenditure, the tax rate, the short interest rate, the stock of long bonds and banks' reserve ratio) plus nominal wage rates. However in my very strong view, those concepts which enter the functions in the form of "parameters" should be thought of as themselves being variables. It is, I believe, a crazy aspect of the econometric study of time series that it seeks to discover stable parameters where stability is obviously not there to be found[11]. For instance, there is every reason to suppose that in the real world the demand for M1, and therefore the demand for all other financial assets as well, will be dominated by continuously changing expectations and by uncertainty with regard to a wide range of imponderables - the political outlook, the prospects for inflation, the exchange rate, and equity and other asset prices, as well as by self-generated and self-reinforcing swings in confidence.

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[10] These were a few accounting equations too trivial to merit discussion in the text but which were necessary to complete the model. All the equations are gathered in a reasonably organised sequence in the appendix.

[11] See Hendry's attempt (in Baba *et. al.* 1992 to find a stable demand for money function for a good example of this.)

The two most important things which a model of this kind does are first, simply to show with precision how all the concepts - a comprehensive system of stocks and flows at constant and current prices - fit together. Then, with numerical solutions easy to obtain, we can gain insights into how the system as a whole functions, by first obtaining a base solution and then changing one exogenous variable at a time to see what difference is made. It might seem as though any particular model "run" depends so much on the particular numbers used that the results are completely arbitrary and have no general application at all. However, it is my experience that repeated simulation, combined with iterative modification of the model itself, does progressively lead to improved understanding, for instance of what the stability of the system turns on, what combinations of parameters are plausible and how the whole thing responds when subjected to shocks. So finally I note some general properties of the model and describe what happened when it was shocked in one or two ways.

The model solves easily and is stable. For reasons well known ever since the famous (1967) paper of Christ (further developed by Blinder and Solow (1975) and also by Tobin and Buiter (1976), a stock flow model (of a closed economy) of this kind has a theoretical full steady state in which the real output flow is equal to real government expenditure (defined to include the flow of interest payments) times the reciprocal of the tax rate. However the existence of a financial system may involve a very substantial degree of disturbance to the economy's evolutionary path. The most striking disturbance arises when wage inflation (which I have so far treated as exogenous) occurs. The important thing to say about inflation is that there is no way to prevent it from destroying large quantities of financial wealth which has a deflationary impact on real demand. (This has already been pointed out by Tobin (1982). If real interest rates are kept constant the (adverse) impact effect on real wealth stocks is even greater. However, it is also the case that if the government adopts a neutral fiscal stance, the economy does, after a long time, return to the same steady state. During the recovery period - and helping to generate the recovery - the government must be held to be running a deficit and therefore shelling out financial assets which eventually restore the depleted wealth stock.

Now for a few experiments. Compared with some given "alternative" position, try assuming that the government reduces short term interest rates and, by implication, simultaneously increases the stock of cash and reduces the stock of bills. What happens? The net effect is to reduce all interest rates, increase the price of equity and stimulate demand sure enough. Moreover, as we have assumed a fractional reserve banking system, the total stock of credit money goes up in proportion to the rise in banks' reserves (not the same thing, incidentally as the rise in total cash because households change their cash holdings too). But the mechanism by which the stock of money goes up is entirely different from that in the textbooks. For loans increase only by some second order amount to cater for the needs of trade. The main counterpart of the increase in the stock of money is a reduction in non-bank holdings of government securities, which comes about because banks' change the money interest rate relative to the bill rate in order to satisfy the zero profit condition.

→ by buying T-bills raising their price & lowering rm, thus reducing stock of T-bills & raising stock of high powered money

*

Another interesting simulation result is that with mark-up pricing, even if one makes the assumption that money wages follow a random walk, a regression of wage inflation on price inflation invariably turns up with a coefficient in the region of unity. If one adds employment this takes on a positive coefficient and lagged real wage rates takes on a negative coefficient. So although as Creator we know that wages behave randomly the regression is telling us that we have a vertical Phillips curve!

I have read speculations in the post-Keynesian literature about what may happen if (other things being equal) there is a collapse in confidence which increases the demand for cash. One might say (I have seen it said) that this will reduce activity because it implies a reduction in the demand for other assets which will reduce their price, thereby giving rise to a wealth effect on consumption.

The model presented here, even in its present very undeveloped form, makes it possible to think about a proposition of this kind with increased precision. Thus, one's first impulse might be to shock the solution by entering a higher constant in the demand for M1 equation (λ in equation 49). However if that is all one does, the structure of the model is such that (*ex ante*) the whole of the increased demand for M1 has its counterpart in reduced demand for M3 - clearly an extreme assumption. So (as we discover) the only sensible way to do the experiment is to specify just where the money is to come from by adding to λ_0 but simultaneously deducting appropriate amounts from λ_{10} and λ_{20} - the constants in the other asset demand functions. When I actually did shock the system in this way, I found that initially there was, indeed, a fall in the price of equity, which had the effect of reducing total real demand. However, this effect was not necessarily enduring, depending on the extent to which the rise in holdings of M1 was offset by a fall in holdings of M3 (as compared with other assets). Thus any switch from M3 to M1 increases banks' *ex ante* profits (for their total liabilities cost them less at given individual interest rates) and this puts a downward pressure on money and loan rates which (by equation 52) has the effect of *raising* equity prices again.

Equations of the model

The equations are exactly the ones used in the computer model and differ slightly from those in the text because of the exigencies of computer logic. For this reason the following equations have a different numbering system. Note that the endogenous variable determined in each equation is always placed on the extreme LHS, e.g. equations X43 and X44 determine, respectively, bond and equity prices

X1 $S = C + G + IN$ D

X2 $Y = S + \Delta I - IVA$ D

X3 $C = c.p$ D

X4 $G = g.p$ D

X5 $IN = in.p$ D

X6 $I = i.UC$ D

X7 $WB = W.N$ D

X8 $UC = WB/\bar{y}$ D

X9 $IVA = \Delta UC.i_{-1}$ D

X10 $\bar{y} = \bar{s} + \Delta i$ - Def

? X11 $\bar{s} = \varepsilon.s$

X12 $s = c + g + in$ D

X13 $y = s + \Delta i$ D

X14 $p = (1 + \tau)\ (1 + \gamma)\ HC/s$ —— B (Markup pricing)

X15 $HC = WB - \Delta I + rl.Ld_{-1}$

X16 $T = S.\tau/(1 + \tau)$ —— B

X17 $\gamma = FN/HC$ —— B ? (Desired FA/HC ?)

X18 $i^{*} = \zeta.\bar{s}\_e$ —— B

X19 $i\_p = i_{-1} + \omega.\ (i^{*} - i_{-1})$ B

X20 $i = i\_p - (\bar{s} - \bar{s}\_e)$ B

X21 $\bar{s}\_e = \bar{s}_{-1} + R1$

X22 $FN = FU + FD$ D

? X23 $\boxed{FU = IN_{-1}}$ eq. 38 in text as $FU = \Delta K_{-1}$ B ?

X24 $FD = \delta.K_{-1}$ B (p.15)

X25 in = β_1 (k* - (1 - dep) k$_{-1}$) B

X26 k* = β_0 $\overline{\text{s}}$_e B

X27 k = (1 - dep). k$_{-1}$ + in D

X28 K = k.p D

X29 rr = FD/K$_{-1}$ D

X30 rk = rr/q D

X31 q = pe.e_d/K D

X32 Δe_s = ϕ (q$_{-1}$ - 1) B

X33 ΔL_d = IN + ΔI - FU - Δe_s.pe B

X34 ln(N) = η_0 + η_1 ln(y) B

X35 YD = WB + FD + rm.m3_d$_{-1}$ + rb.Bsp_d$_{-1}$?
+Bp_d$_{-1}$

X36 yd = YD/p D

X37 ΔV = YD - C + Δpb.Bp_d$_{-1}$ + Δpe.e_d$_{-1}$

X38 v = V/p D

X39 c = α_1 yd_e + α_2.v$_{-1}$ B

X40 Hp_d = μC B

X41 M1*_d = VN_e. (λ_0 - λ_1 rrbb - λ_2 rrb - λ_3. rrm
-λ_4 rrk - λ_5 πr + λ_6 YD_e/VN_e)

X42 Bsp_d = VN_e(λ_{00} + λ_{01} rrbb - λ_{02} rrb - λ_{03} rrm -
- λ_{04} rrk + λ_{05} πr - λ_{06} YD_e/VN_e)

X43 pb.Bp_d = VN_e (λ_{10} - λ_{11} rrbb + λ_{12} rrb = λ_{13} rrm
- λ_{14} rrk + λ_{15}.πr - λ_{16} YD_e/VN_e)

X44 pe.e_d = VN_e (λ_{20} - λ_{21} rrbb - λ_{22} rrb - λ_{23} rrm
+ λ_{24} rrk + λ_{25} πr - λ_{26} YD_e/VN_e) B

X45 M1_d = M1*_d + (VN - VN_e).Z

X46 Z = M1*_d.GT.O

X47 M3_d = V - Hp_d - M1_d - Bsp_d - Bp_d.pb - e_d.pe

X48 VN_e = V_e -Hp_d

X49 $Vn = V - Hp\_d$

X50 $V\_e = V_{-1} + YD\_e - C$

X51 $YD\_e = YD_{-1} + R_2$

X52 $yd\_e = YD\_e/p$

X53 $\pi = \Delta p/p_{-1}$

X54 $\pi r = \pi/(1 + \pi)$

X55 $pb = 1/rbb$

X56 $rrm = (rm - \pi)/(1 + \pi)$

X57 $rrbb = (rbb - \pi)/(1 + \pi)$

X58 $rrb = (rb - \pi)/(1 + \pi)$

X59 $rrk = (rk - \pi)/(1 + \pi)$

X60 $Hp\_d = \mu C$

X61 $\Delta H\_s = G + Bp\_s_{-1} + rb.Bs\_s_{-1} - T - \Delta Bs\_s - \Delta Bp\_s.pb$

X62 $Bsb\_d = M1\_s + M3\_s - L\_s - Hb\_d$

X63 $Hb\_d = \rho(M1\_s + M3\_s)$

X64 $rl.L\_s_{-1} = rm.M3\_s_{-1} - rb.Bsb\_d_{-1}$

X65 $\Delta rm = ZED. .005 - EX. .005$

X66 $EX = Bsb\_d_{-1}.GT. .01$

X67 $ZED = Bsb\_d_{-1}.LT. 0$

X68 $Hp\_s = H\_s - Hb\_s$

X69 $Bs\_s = Bsb\_s - Bsp\_s$

X70 $L\_s = L\_d$

X71 $M1\_s = M1\_d$

X72 $M3\_s = M3\_d$

X73 $e\_d = e\_s$

X74 $Bsp\_s = Bsp\_d$

X75 $Bp\_d = Bp\_s$

X76 $Bsb\_s = Bsb\_d$

equilibrium conditions

X77 $Hb\_s = Hb\_d$

LIST OF VARIABLES

N.B. When variables are given in two versions, UC and LC, the former refers to current prices, the latter to constant prices

Bills = ?

Bp = Bonds
Bsb = Bills held by banks ?
Bsp = Bills held by households
Bs = Total bills
C,c = Consumption
dep = Rate of capital consumption
e = stock of equity
EX = 1 or 0 (as ZED below)
FG = Gross profits Net profits
FN FD = Distributed profits (DIV)
fr = Reserve ratio
FU = Undistributed profits (RE)
G,g = Government expenditure
H = Total cash
HC = Historic costs
Hb = Cash held by banks
Hp = Cash held by households
I,i = The stock of inventories
IVA = Stack appreciation ("inventory valuation adjustment" in American English)
K,k = The stock of fixed capital
L = Bank loans
M1 = Non interest bearing credit money
M3 = Interest bearing money
N = Employment
p = price of goods
pb = price of bonds
pe = price of equity
pi = inflation rate
pir = ditto expressed as a rate of return
q = Tobin's q
Ra1, Ra2 etc = A random variable
rb, rbb, rl, rm, rk, rr = nominal rates of interest on bonds, bills, loans, money, equity, capital
rrb, rrb, rrl, rrm, rrk = real rates of interest ditto
S,s = Total final sales
sbar = Ditto valued at cost
T = Tax flow
tau = The rate of indirect tax
UC = Unit wage costs
V,v = Wealth stock
VN,vn = Wealth excluding cash
WB = Wage bill
W = Wage rate
Y,y = GDP
ybar = Ditto valued at cost
YD,yd = Household disposable income
ZED, ZED1 = 1 or 0 These are variables to operate the logical function which imposes non-negativity (or other) constraints

REFERENCES

Baba, Y., Hendry, D.F. and Starr, R.M. 1992: The Demand for M1 in the USA, 1960-1988, *Review of Economic Studies* (1992) 59, 25-61.

Backus, Brainard, Smith and Tobin 1980: "A model of U.S. financial and non-financial economic behaviour" *JMCB* Vol 12.

Blinder A.S. and R.M.Solow 1973: "Does fiscal policy matter" *JPE* pp 319-337

Brainard W.C. and Tobin J. 1968: "Pitfalls in financial modelling" *AER* Vol.38 pp.98-154

Christ C. 1967 "A short run aggregate model of the interdependence and effects of monetary and fiscal policy" *AER* Vol 57 Papers and proceedings

Godley W. and Cripps T.F. 1983: *Macroeconomics* Fontana and OUP

Graziani A.: "Production, circulation et monnaie" Presses Universitaires de France

Hicks J.R. 1974: *The crisis in Keynesian economics* Jahnsson Lectures

Hicks J.R. 1989: *A market theory of money* Clarendon Press Oxford

Kregel J. 1995: Unpublished ? paper on Walrasian markets as pertaining to what actually went on in the Paris Bourse.

Malinvaud, E. 1977: *The theory of unemployment reconsidered.* Basil Blackwell.

Modigliani F. 1963: "The monetary mechanism and its interaction with real phenomena" *Review of economics and statistics* pp.79-107

Tobin J. 1969: "A general equilibrium approach to monetary theory" *JMCB* Feb 1969

Tobin J. 1982: "Money and finance in the macroeconomic process" *JMCB* Vol.14

Godley Seminar 9/12/96

Actually need some justification for persistent unemployment

- Stock of money exogeneity is the ~~critical~~ bête noire, since this this is necessary to get $\frac{M}{P}\downarrow$ as $P\uparrow$ → Aggreg DD is downward sloping in (y, P) space.
  - Crucial issue here is really the concept of the money "supply" as exogenous or at best interest rate responsive.

[This is characteristically neoclassical in that "M_S" is only price, not quantity, responsive — just as consumption, investment, etc → question is, how does quantity enter?

- In NC eco, ~~fixed~~ initial endowments (K, L, ~~H~~) lead to full utilization of these, via flexibility of prices, wages, int rates, ~~etc~~.
- It is the Walrasian underpinning of this which makes decision making "quantity independent", except in the case of imperfections]

→ Simplest possible framework within which Godley's approach can be distinguished should be private sector only (a' la Bernanke-Blinder?)

→ what are the characteristically different results of Wynne's approach?

→ what role does the endogeneity of money have in this difference? What about behavioral assumptions? About accounting relations?

→ what about the presumed unemployment of resources which makes demand effective

① Govt Sector is traditional

② Cons. Sector is traditional if we merge bills & bonds

③ Desired reserves = fixed fraction of total (checking & savings) deposits (eq 9), but this does not pose a quantity limit on loans because banks can hold bills & attract cash from HH's

→ Banks can supply any amount of loans, but it is the interest rate which allows them attract the ~~reserves~~ to support these loans.

① ~~[illegible]~~ liquidity preference as primary endog.-source of reserves, via cash holdings of public

② Moore adds on discount window, Fed Funds rate, if it is fixed cost.

③ Wray wants to add open mkt operations

④ Banks make no profits but businesses do, so $r_{BUS} > r_{BNK} = 0$

Godley on "Money, Fin. & Nat'l Income" 10/5/96

I General

1. wants to integrate endog. money (bank credit) into a macromodel

2. Basic model is 80 equations, too complex to analyze except via SIM. (3)

3. Three types of equations ←
   - accounting
   - behavioral
   - equil conditions

4. ~~Four~~ Four sectors ←
   - production
   - banks
   - HH
   - govt

5. Accounting framework provides the scaffolding

(i) overall ex ante flow of funds balance assumed, grouped by current and capital account items (6)

— Separate ex ante current + capital balances? Ex post is easy since it is definitional (i.e. given appropriate balance item)

(ii) Ex ante / ex post distinction is not always clear in this accounting schema. This is a difficulty with the form of the schema itself, since it is constructed for ex post variables, so that ~~the same~~ every variable (e.g. C, W, etc.) appears twice. But ex ante, $C^p_H \neq C^e_F$, $W^e_H \neq W^p_F$, etc. This invalidates an accounting approach, it seems to me.

(iii) Treatment of the bank sector is also more than mere accounting, since zero profit condition is assumed (for simplicity). But here, current account and capital account are separate ex ante constraints, since

more specifics: Three key features ←
- variable saving propensity (16) $[C = \alpha_1 y + \alpha_2 V_{-1}$
- new treatment of credit (1-4, 19-21)
- complete macro model with endog. credit incorporated

→ very hard to disentangle these

II

1. First objective is to show that bank credit is not supply-driven or supply-constrained. To this end, some mechanism of endogenous reserve creation must be demonstrated

— He relies on the fact that governments run deficits, part of which are financed by SH and by "bills" (liquid govt issued assets = T-bills) which can be used as secondary reserves by banks, and which therefore extend the loan capacity of banks

— But since secondary reserves can only be purchased with primary reserves (18), this does not change total reserves. He therefore also assumes that banks can change total reserves by attracting cash from HH's by raising the int. rate on deposits (r_m) {above bill rate: $r_m > r_b$ → HH's sell bills back to govt, put money in banks → bank reserves ↑

Assumes int rate on T-bills = const, so govt supplies them to any buyer. But banks can get bills by exchanging them for reserves (18), which by itself does not change total reserves. Hence they can raise total reserves by raising rate on (interest bearing) deposits 19-20 ←

Godley on "Money, Finance & Interest" 10/5/96

II <u>Specifics</u>

2. But all of this requires govt to run a deficit. Suppose instead $G - T = 0$, $\Delta D_G = 0$. Then what happens here?

– If there is an existing stock of bills, at a fixed r_b, then banks can still ~~extract~~ attract reserves by raising $r_m > \bar{r}_b$, and HH's as a whole can sell bills back to govt (only if the govt buys them back (to keep $r_b = \bar{r}_b$)) & get cash & put it into interest-bearing deposits (M_3) – So a govt deficit is not necessary since open-market operations to keep $r_b = \bar{r}_b$ are sufficient –

– ~~If~~ What if we abstract from the govt sector altogether? Then there can be no tradeoff between primary & secondary reserves for banks, and no tradeoff between "primary" ($M_1 + M_3$) and "secondary" (bills) for private NF sector. So the story as told here does not work, & the model appears to revert~~s~~ back ~~to~~ to a "quantity-constrained" credit system.

~~th~~ But in fact this is not so, because a rise in the deposit rate will still attract cash into the banks, insofar as private sector holds cash outside of banks → basic theme of paper with Jamee

[In a cashless world, reserves will still be needed, but this endogenous source will be eliminated — so govt or foreign sources will then be required to endogeneize]

3. The above tells us that if we strip the model of the govt sector, then the banking sector reverts back to a reserve-constrained system. ~~But as presently formulated, we cannot Show this, because model only responds to bills level ($r_m \uparrow$ as bills $\to 0$) via equation 61. What should go there is some statement of the reserve/deposit ratio, which falls as loans increase, because reserves do not change or even fall as private sector holds cash, + deposits ↑ as loans ↑ -~~

e.g. $\Delta r_m \gtrless 0$ as $R/D \gtrless \rho^*$ → which is our story!

4. Policy implications of ~~his~~ our model (pp. 22–)

why bother with bills at all? This holds equally well for bonds (as is the standard case) which makes it clearer & simpler

① Banks make the loans demanded of them

② To cover loans they attract new reserves by raising r_m (int rate on int. bearing deposits)

– This induces HH's to sell off some bonds, which the govt itself buys in order to keep price of bonds (int. rate on bonds) constant

– So it is the passive open-mkt policy of the govt which provides the extra ΔH which in turn is deposited in the banks & so raises reserves

– As r_m rises, given a fixed markup by banks, r_L rises also (Moore). The zero profit condition is a special case of this.

He assumes required reserves $RR = \mu \cdot$ Deposits, so if RS = actual reserves = const, Excess Reserves $ER \equiv RS - RR$ decline as loans create deposits

9/17 96

Wynne:

James & I were very taken with your presentation. We talked about it ~~all~~ most of the way back to NY, until exhaustion took over. I'm sorry I had to leave so soon, but between the meeting with Dimitri (which was essential) and a ~~[illegible]~~ required dept. meeting with New Students at 8:00 tonight, I was somewhat rushed.

As we understood it, your primary focus was on the endogeneity of bank credit. This in turn rests on the ~~principle~~ recognition that bank credit is not constrained by ~~the~~ some officially given ~~availability~~ quantity of reserves, because ~~such~~ the quantity of these reserves can always be augmented by the actions of the bank itself. ~~Basically,~~

- Basically ~~the rates of the~~ individual banks can always attract deposits to themselves, & hence bolster their own reserves, by raising the interest rate on deposits
- For the banking sector as a whole, this will only increase reserves if it attracts cash into banks — which it will because a higher deposit rate of interest makes holding cash less attractive.
- On this basis alone, banks can increase their loan capacity by raising deposit rates to attract more cash. Given some connection

between loan interest rates & deposit rates (e.g. some markup on bank costs ~~bank profits = 0~~), including a zero markup as a special case), thus also implies a rising loan int. rate as loan supply increases

It seems to me that this is sufficient to establish your main claim: that bank credit need not be ~~is not~~ quantity (i.e. reserve) constrained

~~The reason for a govt sector~~, from this point, the effect of a govt deficit on the interest rate depends on how it affects:

a) ~~bank~~ liquidity (reserve assets), ~~through~~ ~~by issue of liqu~~ and hence the banks loan capacity (loan supply)

b) the demand for loans, through its impact on output (Y) and loans (in your case through the link between output, inventories, & loans)

Consider two polar cases, beginning from G-T=0

① Govt runs a deficit, which it finances entirely ~~with~~ by printing money (we don't need "bills" here, as you will see).

- Some of this goes directly to HH's (as wages of new govt workers) and rest goes initially to business (for new goods & services purchased by government). Except for the amounts held directly as cash, the ~~bulk~~ goes into deposits: thus raises the reserves & loan capacity of banks [illegible]

3

- On the other hand, G-T directly stimulates the economy & raises Y, INV, & thus L_D.

- The net effect can be $i_L \gtrless 0$ and by implication, $i_D \gtrless 0$

So, it is entirely possible to have G ↑ and i_L, i_D ↓ — as you show in your simulation

On the other hand, suppose a (new) govt deficit is entirely financed by bonds. Then

(i) to attract new customers, $i_B \uparrow$ initially

(ii) ~~[illegible]~~ total bank deposits are unchanged, since deposits of bond buyers ↓ as they acquire bonds, while those of ~~the~~ govt workers & businesses selling to the govt rise as the money borrowed to finance govt deficit is spent
$\longrightarrow$ Loan capacity = L_S is unchanged

(iii) But the new G-T raises Y, INV, L_D as before $\longrightarrow i_L \uparrow$

(iv) ~~[illegible]~~ $\longrightarrow$ Demand for Deposits ↑ $\rightarrow i_D \uparrow$

So ~~in~~ this case, i_L, i_D both rise

→ hence if there is a mixed case, Δi_L, Δi_D are indeterminate

This leads to a direct comparison with your bare bones model: what ~~is~~ accounts for $i \downarrow$ as $G \uparrow$

In your case, G-T financed by both bills & bonds, of which only the ~~other~~ former increase bank liquidity directly

is the particular ~~result~~ coefficient drawn?

I have been working on these issues for over 10 yrs. ~~In~~ 1987(?) I published a paper on a nonlinear dynamical exposition of debt-growth dynamics - There, instead of using it as discipline, I use $\Delta\left(\frac{Debt}{Y}\right)$ ...

Confidential
& Preliminary.

FIRST DRAFT

A SIMPLE MODEL OF THE WHOLE WORLD WITH FREE TRADE, FREE CAPITAL MOVEMENTS AND FLOATING EXCHANGE RATES[1]

Wynne Godley
The Jerome Levy Institute
July 26 1996

This paper presents what must surely be the simplest possible model of an open economy "world" with fully coherent accounting. It considers two economies which together comprise the whole universe in the sense that all the exports of one turn up as imports of the other and vice versa, all transactions in foreign assets by one have exact counterparts in the foreign transactions of the other, and all interest payments across the exchanges made by each country turn up as receipts by the other. The model treats fiscal and monetary policy, wage inflation and expectations in both countries as exogenous and generates production, trade, the balance of payments, stocks of financial assets, inflation and the exchange rate as endogenous.

AN ACCOUNTING SYSTEM WITH NO BLACK HOLES

Table 1 below shows the balance sheets of the two countries which make up this "world". The two columns on the left hand side shows the assets and liabilities of one country, which may as well be called "Sterling", the two on the right show the same thing for "Dollar". Both governments are assumed to issue two liabilities, each being denominated in its own currency in the form of money (H, H\$) and interest bearing bills of which the nominal value does not change.

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[1] I am grateful to Ken Coutts for helpful discussions

Table 1 **Balance Sheet**

	H'lds	Govt.		H'lds$	Govt. $	
Money	+H	-H		+H$	-H$	0
	+B££	(-B££				0
£ Bonds		(				
		(-B$£s	.xr	+B$£d		0
				(+B$$	-B$$	0
$ Bonds				(		
	+B£$d		.xr	(	-B£$s	0
	V	-DG	.xr	V$	-DG$	0

In this table V, V$ describes wealth and DG, DG$ the stock of government debt. The first currency symbol in each B character refers to the country for which the instrument is an asset, the second to the country whose government issues it as a liability. It will be obvious that the items which are common to both countries (in the form of assets or liabilities), each measured in the currency of the country concerned, are related by the exchange rate. Households are assumed not to hold foreign currency but are free to buy and sell domestic or foreign bills as they wish. The corresponding transactions matrix describing current price flows is shown in Table 2 below.

Table 2 Flow Matrix for Two Economy Model

only firms import

	H'lds	Firms	Govt		H'lds$	Firms$	Govt$	
1) Exports		+X		.xr		-IM$		0
2) Imports		-IM		.xr		+X$		0
3) Govt.		+G	-G			+G$	-G$	0
4) Cons.	-C	+C			-C$	+C$		0
5) GDP	+Y	-Y			+Y$	-Y$		0
6) Taxes	-T		+T		-T$		+T$	0
7) Interest on: £ bonds held£ ($$,$$)	$+r.B££_{-1}$		$-r.B££_{-1}$		$+r\$.B\$\$_{-1}$		$-r\$.B\$\$_{-1}$	0
8) £ bonds held $			$-r.B\$£s_{-1}$	.xr	$+r.B\$£s_{-1}.xr$			0
9) $ bonds held £	$+r\$.B£\$s_{-1}.xr\$$			.xr			$-r\$.B£\$s_{-1}$	0
Changes in:								
10) money	-ΔH		+ΔH		-ΔH$		+ΔH$	0
11) £ bonds held £ ($$,$$)	-ΔB££		+ΔB££		-ΔB$$		+ΔB$$	0
12) $ bonds held £								
a)	-ΔB£$d)						+ΔB£$s	0
b)	)			.xr				
c)	$+\Delta xr\$.B£\$s_{-1}$)							
13) £ bonds held $								
a)					(-ΔB$£d			
b)			+ΔB$£s	.xr	(			0
c)					($+\Delta xr.B\$£s_{-1}$			
	0	0	0		0	0	0	0

As with Table 1, the left hand section of the table describes the flow transactions of Sterling all measured in sterling, the right hand section describes Dollar transactions all measured in dollars. There are six entries common to both countries, those shown in rows 1, 2, 8, 9, 12b (= 12a + 12c) and 13b (= 13a + 13c). To get equivalence between the common flows, the entries in the Sterling's accounts (as in the balance sheet table) must be multiplied by the £ exchange rate (xr). Note that to preserve symmetry in the exposition we also use a $ exchange rate (xr$) defined as the reciprocal of the £ rate.

This is because offsetting flows are part of overall balance → can still have imbalance covered by debt, etc.

It is a feature of Table 2 which may surprise for an instant that neither country has (or needs) a column describing its current balance of payments. However the coherence enforced by double entry accounting ensures that total flows into each country must always exactly equal outflows. Thus trade flows (lines 1 and 2) plus flows of interest payments each way (lines 8 and 9) make up the balance of payments on current account which is, in turn, exactly equal to the sum of transactions in capital assets described by 12b for Dollar (12a + 12c for Sterling) plus 13a and 13c for Sterling (13b for Dollar).

The top section of the table gives, for each country, the standard components of the national income except that the drastic simplification has been made, purely in order to keep the exposition as simple as it possibly can be, that there is no investment in fixed or working capital - an assumption which carries the implication (which I would normally find highly objectionable) that production instantaneously matches demand.

The middle section of Table 2 describes transfer payments. Line 6 straightforwardly describes tax flows, assumed all to be paid by the household sector. All interest flows are described as a nominal rate of interest (r or r$) multiplied by the relevant stock of bills at the beginning of the period. And the whole expression must then be multiplied by the exchange rate to translate the flow in one country into the same flow measured in own currency by the other country.

The lower third of the table describes transactions in asset stocks. These accounting relationships are most easily understood by reference to the balance sheets in Table 1.

The change in Sterling's holding of Dollar bills (B£\$d) measured in sterling is made up of the flow transaction $\Delta B\$\pounds s.xr$ and a capital gain $\Delta xr.B\$\pounds s_{-1}$; analogously, the change in Dollar residents' holdings of sterling bills is made up of $\Delta B\pounds\$s.xr\$$ plus $\Delta xr\$.B\pounds\$s_{-1}$. Hence to generate the appropriate flow transaction in the "household" columns of Table 2, the capital gain must be deducted from the change in the value of the stock of foreign bonds (measured in own currency) as a result of exchange rate changes.

The model presented in this paper comprises four sub-models which can be considered separately as well as together. There is a model of asset demands and supplies which, though best thought of as part of a fully interdependent system, focusses on the proximate determinants of the exchange rate. There is a model of trade flows at both constant and current prices. There is a model describing the determination of output, income and wealth. And there is a model of costs, prices and the distribution of income. In the text which immediately follows only the equations which are necessary for comprehension of the narrative are written down. However the model as a whole has been successfully subjected to numerical simulation and the full equation system necessary to do this is attached as an appendix to this paper[2].

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[2] Numerical simulation checks the accountancy and stability of the model. In addition, some people may find the full model written out in the form used by the computer a useful aid to comprehension since each equation has to have one endogenous variable attributed to it and this may give some guidance with regard to the main lines of causality.

SUB-MODEL DESCRIBING ASSET EQUILIBRIUM AND EXCHANGE RATE DETERMINATION

The double entry accounting illustrated in the tables above imposes logical consistency but also forces one to ensure that any entry makes behavioural sense in each context in which it appears. For this reason, attached to every symbol describing assets or liabilities (not just those relating to those held across the border) there will be either _s or _d which in a sense denote respectively "supply" and "demand"[3]. Thus every liability of each government appears in the model as the "supply" of an asset; and every asset held by the household sector appears as a "demand". These epithets will be used consistently but will not always be quite appropriate semantically. For supposing, for instance, that a change in expectations were to cause households to exchange money for bonds, it would be more appropriate to describe this as households supplying money and demanding bonds rather than demanding each in new quantities.

To convey the central message of this paper I am going to use an even simpler balance sheet than that in Table 1 by assuming that bills are the only financial liability issued by the government; as we are postulating a world with static expectations and instantaneous production, it is a legitimate simplifying assumption at this stage that money itself is not required. Any reader disturbed by the idea of an echange rate without "money" may think of my "bills" as being interest earning deposits which may be ecahnged for goods or for foreign currency deposits.

The final line of Table 1 (which is unmodified in the simplified version which follows) contains a statement of fundamental importance - it says that wealth less government debt in one country is identically equal to wealth less government debt

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[3] At this point I am making a trivial change in notation compared with Table 1; the final letter of internationally held assets has turned into a subscript.

in the other country when each residual is expressed in a common currency. The intuition is a simple one - that the net stock of foreign assets held by residents in one country ($B\pounds\$$ less $B\$\pounds$) must always be identically equal, when expressed in a common currency, to the net stock of foreign liabilities owed by the other; the gap between wealth and government debt has, for each country, to be equal to net foreign wealth or debt[4].

Take the final line of Table 1 as equation 1) of the sub-model.

1) $V = (V\$ - DG\$) - DG$

We next have two asset demand functions for each country. For Sterling

2) $B\pounds\pounds\_d = V.(\lambda 00 + \lambda 01.rb - \lambda 02.rb\$)$

3) $B\pounds\$\_d = V.(\lambda 10 - \lambda 11.rb + \lambda 12.rb\$)$

while for Dollar

4) $B\$\$\_d = V\$.(\lambda\$00 + \lambda\$01.rb - \lambda\$02.rb\$)$

5) $B\$\pounds\_d = V\$.(\lambda\$10 - \lambda\$11.rb + \lambda\$12.rb\$)$

For each country the Brainard and Tobin constraints are assumed to hold - viz. the sum of the constants is equal to one and the sum of coefficients reading vertically is zero. These equations, in a world of static expectations, are saying very conventionally that households choose to allocate their financial wealth between domestic and foreign bills according to rates of return on the two assets. But where is the exchange rate? Recall from the balance sheet table that, while supplies are

---

[4] If there were tangible capital in the model this should be deducted from wealth as well

denominated in the currency of the issuing country, the demands are denominated in the currency of the holder of the asset. The argument of this paper will be that, faced with a choice of assets with rates of return attached to them, there will always be an exchange rate at which all supplies will be willingly held whatever the rates of interest may be.

The assumption that there is clean floating implies that each government passively matches the asset allocation choice of the public in both countries. But (what may be termed) the <u>effective</u> supply of Dollar assets to Sterling residents must be

6) B£$_s = B£$_d.xr

while the effective supply of Sterling assets to Dollar residents is

7) B$£_s = B$£_d/xr

Each country's government budget constraint (expressed here in terms of stock variables) now implies a determinate supply of bills to domestic holders.

8) B££_s = DG - B$£_s

9) B$$_s = DG$ - B£$_s

To complete the model there are two equilibrium conditions of which one is redundant under Walras's Law.

10) B££_d = B££_s

11) B$$_d = B$$_s

We now have ten unknowns and ten independent equations. Conditional on values for any three out of V\$, DG, DG\$ and V, we can solve for all asset demands and supplies and also for the exchange rate itself. Before going any further, it is emphasised that all the stock variables treated as exogenous in this sub-model will be endogenised when the model as a whole is deployed.

An analytic solution to this sub-model is easy to obtain. Holding interest rates constant, the shares of domestically issued bills in the total wealth stock can be written

12) $B££\_d = \alpha.V$

13) $B\$\$\_d = \beta.V\$$

Treating V\$, V and DG\$ as exogenous, the exchange rate is given by

14) $(DG\$ - V\$).xr^2 + (1-\alpha)V.xr - (1-\beta)V\$ = 0$

an expression which generates a unique positive value for the exchange rate corresponding to all plausible values for the exogenous variables. The function is obviously increasing in α and decreasing in β, so a rise in the sterling rate of interest generates a once for all rise in the sterling rate of exchange.

The component parts of this model are so highly interdependent that an intuitive summary is hard to devise. The model is saying that there will always some rate of exchange which will make Sterling residents buy whatever is the effective supply of Dollar securities to them while simultaneously matching Dollar residents' demand for Sterling bills to the effective supply of these. And that same rate of exchange is also the one which translates the financing requirement of both governments into a supply of assets to domestic residents (obviously denominated in own currency) plus an effective supply of assets to foreigners.

Take an example. Starting from a position of stationary equilibrium, suppose that Sterling households wish to increase the proportion of foreign assets in their portfolio and that everything else is unchanged. Well, Dollar wealth and its allocation between foreign and domestic assets will be unchanged in the new equilibrium; and the supply of Dollar assets measured in dollars is (therefore) unchanged as well. But, as we are supposing interest rates to be unchanged, the composition of Sterling residents' portfolios will change as the ratios of the constants in equations 2) and 3). The disparity between the two countries is exactly eliminated if the exchange rate changes by just the amount which revalues existing holdings by Sterling holders to conform with the newly desired share. And that exchange rate is (obviously) just the one which will simultaneously increase the effective supply of Dollar bills to Sterling holders. The example is a particularly simple one.

Suppose next that starting from stationary equilibrium the Sterling rate of interest rises. The wealth and budget deficits in each country are, by assumption, unchanged; however, the increased Sterling interest rate increases the demand for sterling bills, though by different amounts, in each country causing a one off rise in the Sterling exchange rate. The reduced demand from residents of both countries for dollar assets implies a corresponding reduction in the effective supply of Dollar assets and there will always be a single exchange rate which just brings all this about.

I want to postpone further discussion of these results because everything so far turns on the highly artificial assumption that DG,DG$ and V$ are all exogenous

TRADE

The trade flows, measured at constant prices, are assumed to be determined, very conventionally, by price and income elasticities. Noting that lower case flows denote constant prices, while capital letters denote current prices.

15) $\ln(x) = \varepsilon_0 - \varepsilon_1.\ln(pm\$/py\$) + \varepsilon_2.\ln(y\$)$

16) $\ln(im) = \eta_0 - \eta_1 \ (pm/py) + \eta_2 \ln(y)$

17) $x\$ = im$

18) $im\$ = x$

All volumes are measured in base year prices and the exchange rate is assumed, for convenience, to be equal to one in the base year. In these equations x, im are exports and imports by country £, while x$, im$ describe the same thing for country $. The two GDPs are y and y$. The pre-fix p denotes prices - py for GDP, px for exports and so on.

19) $px\$ = pm.xr$

20) $pm\$ = px.xr$

The prices of exports and imports move in response to changes in exchange rates, modified by changes in domestic prices.

21) $$. \ln(px) = \rho_0 + \rho_1.\ln(py\$) + (1 - \rho_1).\ln(py) - \rho_1.\ln(xr)$$

22) $$\ln(pm) = \upsilon_0 + \upsilon_1 \ln(py) + (1 - \upsilon_1).\ln(py\$) - \upsilon_1.\ln(xr)$$

These equations are, I believe, 100% conventional. The constraint which makes the coefficient on own price equal to the complement of the exchange rate ensures that, given foreign prices, a devaluation of X% combined with a domestic price rise of X% will change import prices by 10%. And if the behaviour of the two countries is symmetrical, the price of foreign GDP must enter as well, with a symmetrical constraint, so that a rise of X% in GDP prices in both countries, given the exchange rate, also yields an X% rise in import prices.

Finally the four identities which generate the values of trade flows in own currency are

23) $X = x.px$

24) $IM = im.pm$

25) $X\$ = x\$.px\$$

26) $IM\$ = im\$.pm\$$

[I may stand back at this point and discuss the economics and empirics of this system, particularly as equations very similar to these may actually be estimated for the US and UK. It may be noted that, as the economies of the rich countries become increasingly intertwined, on devaluation the (own currency) price of exports tends to rise nearly as much as the price of imports - that is, there is very little change in the terms of trade. This has two important consequences. The relevant "Marshall Lerner" condition for devaluation to improve the trade balance is no longer unity, but the elasticity of the terms of trade with respect to the devaluation. (Thus if there were no change in the terms of trade at all the condition for an improvement in the trade balance would be that the sum of the elasticities is positive). The second point is that if there is little or no change in the terms of trade on devaluation it is possible that devaluation can occur with very small consequences for inflation or for real wages. There is considerable evidence, both from the US and UK data that this is how things now actually are.]

INCOME DETERMINATION

Real GDP is assumed to be generated instantaneously by real expenditure

27) $y = c + g + x - im$

28) $y\$ = c\$ + g\$ + x\$ - im\$$

where c and g are respectively real consumption and government expenditure

Defining disposable income to include capital gains, and after adjusting all stock and flow variables for consumer prices, we adopt a definition of real disposable income such that

29) $yd = c + \Delta v$

30) $yd\$ = c\$ + \Delta v\$$

Consumption is assumed to be a function of expected real disposable income and opening wealth stocks in a manner consistent with standard theory. In the mechanical model of this paper perfect foresight is assumed.

31) $c = \gamma_1 . yd + \gamma_2 . v_{-1}$

Equation 31), using 29) may alternatively be written as a wealth adjustment function

31a) $\Delta v = \gamma_2(\gamma_3 . yd - v_{-1})$

where $\gamma_3 = \dfrac{1 - \gamma_1}{\gamma_2}$

Equation 31) governs the dynamics of the model as a whole ensuring (ceteris paribus) that a full stationary state will eventually be reached, where all real stocks and flows are unchanging. The ratio of wealth to disposable income would be

32) $v = \gamma 3.yd$

Similar equations could be written for the Dollar country.

CÖSTS, PRICES AND THE DISTRIBUTION OF INCOME

It has been assumed, with strong empirical but weak theoretical justification, that the average price of all sales at home and abroad (ps) is determined (in each country) as a mark-up on a weighted average of unit labour costs (ULC) and import prices.

33) $ps = (1 + \sigma).(\omega.ULC + (1 - \omega).pm)$

Equation 33) taken in conjunction with the trade price equations may be used to infer the price of domestically sold goods and services (ps)

34) $ps = (S - X)/(s - x)$

Nominal wage rates and labour productivity are assumed to be fixed.

The extent to which devaluation of the currency affects domestic prices and hence real wages depends, according to this model, crucially on the responses of the prices of exports and imports. If there is very little change in the terms of trade, with export and import prices both rising by roughly the same amount (as appears to have been happening in recent years both in the UK and in the USA) then equations 33) and 34) imply that there is not very much effect on domestic prices; what is gained on export profits is more or less given away again (this system of equations implies) as profits are squeezed by higher import prices. I note again that while the economic theory underlying this model of the determination of prices and income distribution is shadowy, it has the great merit of conforming reasonably well with the experience of recent years which have seen very big changes in exchange rates which seem to have had little effect either on domestic inflation or on the share of profits in the national income.

HOW THE MODEL WORKS

Ignoring some accounting equations, we now have enough relationships to generate sequential solutions to the model as a whole conditional on initial conditions, together with assumptions about fiscal and monetary policy - real government expenditure, tax and interest rates in both countries. That is, it generates a sequence for the exchange rate and, for both countries, output, the national income and its distribution, trade and the balance of payments, real wages, employment and inflation. It will be obvious that those parts of the model which are the main focus of interest, namely the determination of the exchange rate and the balance of trade and payments, have been more fully articulated in this paper than the other parts.

At the heart of the model resides the process already described in some detail whereby the exchange rate is determined. But in the full model each country's stocks of wealth and government debt are generated endogenously and within the severe limitations of the model's simplifying assumptions, we now have a fully articulated account of the mutual interaction between the exchange rate and the outcome for the balance of trade and payments as well as output etc.

The model is consistent with Dornbusch's overshooting model, at least in spirit, because it is saying that the exchange rate is determined instantaneously by demand and supply in asset markets. However it is considerably richer because the asset allocation aspirations, not just of one country, but (in principle) of all participating countries, are brought into contention. Moreover it is not being assumed that, having "overshot", the exchange rate will move along an equilibrium path governed by uncovered interest parity considerations. For as long as there is an imbalance in either country's budget balance or for as long as wealth aspirations in either country are out of kilter with real income flows (that is, under all normal circumstances) the exchange rate will be equilibriating ever-changing asset demands and supplies. It is only by accident that uncovered interest parity will hold.

POINTING TO SOME CONCLUSIONS

So long as we continue to assume that nominal wage rates are exogenous and fixed this model is stable subject to extremely weak conditions - that the coefficients of the consumption function lie between zero and one.

The full (stationary) steady state of the model has two properties. First as, by assumption, neither stocks nor flows are changing, the level of output must be

$$35) \qquad y = \left(\frac{g \; + \; r.B\_s_{-1}}{\theta} \right)$$

$$36) \qquad y\$ = \left(\frac{g\$ \; + \; r\$.B\$\_s_{-1}}{\theta\$} \right)$$

where B and B$ are the total bill issue of the relevant government. These two equations provide the conditions, well-known in the literature since Christ (1968), for zero change in government debt.

But it also has to be the case that the balance of payments on current account must be zero in the full steady state. As long as the current balance is non-zero the structure of wealth must be changing; so if everything else is given, there must then be a further change in the rate of exchange such that the ~~trade~~ current account balance moves towards zero. The full steady state will thus only be achieved when the budget and the current account are both balanced.

The model at this point is saying, rather to the author's surprise, that <u>each</u> government can choose any output it likes and that the exchange rate, if allowed to float, will move to a level which will generate a zero current account at that level of output. But this magic result should be treated with very great caution. For one thing the result may turn critically on the assumption that nominal wages do not respond at all when the currency is depreciated. There is another important caveat. While changes in the exchange rate, if it is allowed to float, guarantees in principle that net foreign debt does not explode, there is nothing to prevent net wealth moving from a positive to a negative number. If one government aims at too high a level of output, people in both countries may become progressively less willing to hold the assets of that country. The exchange rate may then collapse, probably in a vicious interaction with wage inflation.

THE WHOLE MODEL AS READ BY THE COMPUTER

N, N$ means employment, assumed to move proportionately with real output. Indulgence is craved for the unsightly appearance of these equations made worse by the fact that the computer programme cannot read Greek. The variables should tally with the text but the coefficients are different - hopefully self-explanatory. The equations have been renumbered.

```
1)  ln(x)=chi0-chi1*ln(pm$/py$)+chi2*ln(y$)
2)  ln(im)=ups0-ups1*ln(pm/py)+ups2*ln(y)
3)  ln(px)=eps0+eps*ln(py$)+(1-eps)*ln(py)-eps*ln(xr)
4)  ln(pm)=rho0+rho*ln(py)+(1-rho)*ln(py$)-rho*ln(xr)
5)  x$=im
6)  im$=x
7)  px$=pm*xr
8)  pm$=px*xr
9)  X=x*px
10) IM=im*pm
11) X$=x$*px$
12) IM$=im$*pm$

13) ln(N)=beta0+beta1*ln(y)
14) ln(N$)=beta0+beta1*ln(y$)

15) B££d=V*(lam10+lam11*r-lam12*r$)
16) B£$d=V*(lam20-lam21*r+lam22*r$)
17) B$$d=V$*(lam$10+lam$11*r$-lam$12*r)
18) B$£d=V$*(lam$20-lam$21*r$+lam$22*r)
19) B$£s=B$£s(-1)+G+r*B££s(-1)+r*B$£s(-1)-T-dif(B££s)-dif(Hs)
20) B$$s=B$$s(-1)+G$+r$*B$$s(-1)+r$*B£$s(-1)-T$-dif(B£$s)-dif(H$s)
21) B£$s=B£$d*xr
22) xr=B$£d/B$£s
23) xr$=1/xr
24) B££s=B££d

25) ps=(1+lam)*(W*N+IM)/s
26) s=c+g+x
27) DS=S-X
28) ds=c+g
29) pds=(S-X)/(s-x)
30) S=s*ps
31) Y=S-IM
32) y=s-im
33) Yd=(Y+r*B££d(-1)+r$*xr$*B£$s(-1))*(1-theta)+dif(xr$)*B£$s(-1)
34) py=Y/y
35) C=c*pds
```

```
36)  G=g*pds
37)  yd=Yd/pds-v(-1)*dif(pds)/pds
38)  v=V/pds
39)  V=V(-1)+Yd-C
40)  Hs=Hd
41)  Hd=V-B££d-B£$d

42)  c=a1*yd+a2*v(-1)
43)  T=theta*(Y+r*B££d(-1)+r$*xr$*B£$s(-1))

44)  ps$=(1+lam$)*(W$*N$+IM$)/s$
45)  s$=cc+g$+x$
46)  DS$=S$-X$
47)  ds$=cc+g$
48)  pds$=(S$-X$)/(s$-x$)
49)  S$=s$*ps$
50)  Y$=S$-IM$
51)  y$=s$-im$
52)  Yd$=(Y$+r$*B$$d+r*xr*B$£s(-1))*(1-theta$)+dif(xr)*B$£s(-1)
53)  py$=Y$/y$
54)  C$=c$*pds$
55)  G$=g$*pds$
56)  yd$=Yd$/pds$-v$(-1)*dif(pds$)/pds$
57)  v$=V$/pds$
58)  V$=V$(-1)+Yd$-C$
59)  H$s=H$d
60)  H$d=V$-B$$d-B$£d

C$=a$1*yd$+a$2*v$(-1)
T$=theta$*(Y$+r$*B$$d(-1)+r*xr*B$£s(-1))
```

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19 September 1996

Mr. Wynne Godley
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Cambridge CB2 1ST
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Dear Wynne,

I see that it has taken me three and a half months to respond to your letter and paper. Well, one over par!

Let me take the easy parts first. Yes indeed, I am a dissident with respect to "natural rate" theory, and for a long time I may have been the only "respectable" dissident. The whole thing struck me as having next to no theoretical foundation and only the flimsiest econometric support. But it was so dominant that I would say OK, let's accept the accelerationist model just for the sake of argument, and then do my little Keynesian thing from there. The natural-rate model is still what nearly everyone believes, but it is getting a little tattered around the edges, owing mainly to US experience in the last 18 months or so. I was very interested in the simulation result you mention on p. 23, but you are too cryptic. I am still not sure exactly what regression you fit to the simulation output; I hope the next version will be clearer.

It would be nice if you could do something sensible with the Levy Institute. I have stayed away from it completely because it seems so determinedly "post-Keynesian" or whatever the appropriate designation, and whenever I find myself in the company of suchlike I know I am in for lengthy unproductive theology, listening with one-quarter of my mind and wishing I were elsewhere with the other three-quarters. It would be much better if the energy were directed to something constructive, like building and using a model.

I don't think my opinions about the way the banking system and the credit market function are worth very much, because it is not a question I have studied. For what it is worth, I favor the idea that loans are needed to finance trade, and that therefore the credit market can play an active role in short-term macrodynamics. So I am comfortable with the general approach in your paper. There must be something to the Schumpeterian stuff about the key role of bank (or other) credit in permitting new enterprises to get access to real resources that have not been provided in advance. What did worry me in reading your draft was the presumption that banks have a free hand in setting the rate of interest on loans, as if the demand for loans had no relation to the rate charged. Did you mean that? The issue of "credit rationing" is not a big deal from this point of view; lenders can deal with excess demand by raising rates or by tightening other conditions borrowers must meet. You made banks sound too autonomous, I thought, but I really don't know much about this.

The introduction to your paper struck me as too polemical, but maybe the device of imputing idiocy to one's opponents is just a Cambridge tradition. Mainstream macroeconomists are not fools (or rather the fools represent the same proportion of them as of other schools of thought). One has to suppose that they neglect the finance process because they think it is passive or has temporary or minor effects. They may be wrong--there are mainstream macroeconomists like Ben Bernanke and Joe Stiglitz who take the opposite view--but it should be possible just to cite evidence that they are wrong.

I had only a couple of comments on the accounting framework, but they may reflect ignorance. On p.8, at the top, I don't understand why only wage costs have to be allowed for. There is fixed investment and those costs must be recovered, even in a closed economy. If those costs are reduced to labor costs at earlier periods, interest costs will still appear. Should the first plus on the RHS of (4) be a minus? At the top of p.9, I don't know what has happened to depreciation, evidently part of gross profit, but surely not appropriable while leaving the firm intact? I've already commented on the matter of resolving costs into wage costs. I don't understand (6) because opening inventories seem to have disappeared. Something must be going on that I miss.

As a matter of exposition, I think every equation like (19) on p.12 should have a reminder that not every Greek letter represents a constant. Now we come to the macroeconomics. Equations (28)-(30) are pretty old-fashioned; they go back to Metzler, I guess. Today one would allow for some genuine decisions relating to prices, financing costs, etc. The rule described in (31) is much simpler and weaker than what I normally think of as adaptive expectations. I would describe (31) as static expectations, and therefore as primitive. On p.15, (33) does not describe constant productivity. (34) and (35) are, like the inventory model, extraordinarily simplistic for a model that pays such attention to credit. Then I have further confusions. I don't see how (38) fits in with (34)-(35). If you mean that the latter determine real investment, and firms price so as to create retained earnings just enough to pay for the investment, then again it strikes me as simplistic. And then (39) is a further mystery. What happens if equity issues are so big that the LHS of (42) is negative? And (43) only makes things worse by simplifying still further. In a story that attributes importance to the financial process, you seem to deal with the determination and financing of fixed investment in a wholly mechanical way, as if firms hardly think about it.

I would say about (46) on p.16 what I said about (31). And I guess (62), p.20, is where banks are given all this freedom to set loan rates, without having to think of customers. By the way, you pay very little attention to the liability side of banks' balance sheets. There used to be a lot of talk here about "liability management" and it led to trouble. Is there no such thing? And finally, at the bottom of p.21, I would think that the stability of this or that parameter is an empirical matter. There is no harm in looking for stable parameters as long as one keeps an open mind.

I've already said that you shouldn't take all these comments seriously, at least not the ones about accounting and banking. I did have the overall impression that you are being very sophisticated about the parts of the story that interest you, and then are content to take the easy way out in the parts of the story that interest me. But the credibility of the simulation outcomes depends on the whole model.

Best wishes,

Bob

Robert M. Solow

OCT 07 '96 06:20PM LEVY ECONOMICS INST. P.1

The Jerome Levy Economics Institute
of Bard College

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your letter. Let us speak
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W