Minsky-Godley and the Levy Model

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Outline

- Integrating financial and real markets
- Main features of the stock-flow approach
- Financial balances
- Data sources & data problems
- Consistent dynamic accounting
- Model closures
- Econometric issues
- Projections and policy scenarios

Minsky and Godley

Common features between the approaches of Minsky and Godley will be covered in more detail by Marc Lavoie…

Both authors clearly emphasize the relationship between the financial sector and the real sector, how investment decisions may imply debt accumulation, and how “excessive” debt may trigger a crisis

Let's start with simple accounting…

A measure of the "economic" wealth of a closed system is given by the value of its real assets in an instant of time (a *stock* concept).

Financial assets are exactly matched by financial liabilities, and will not be part of net wealth.

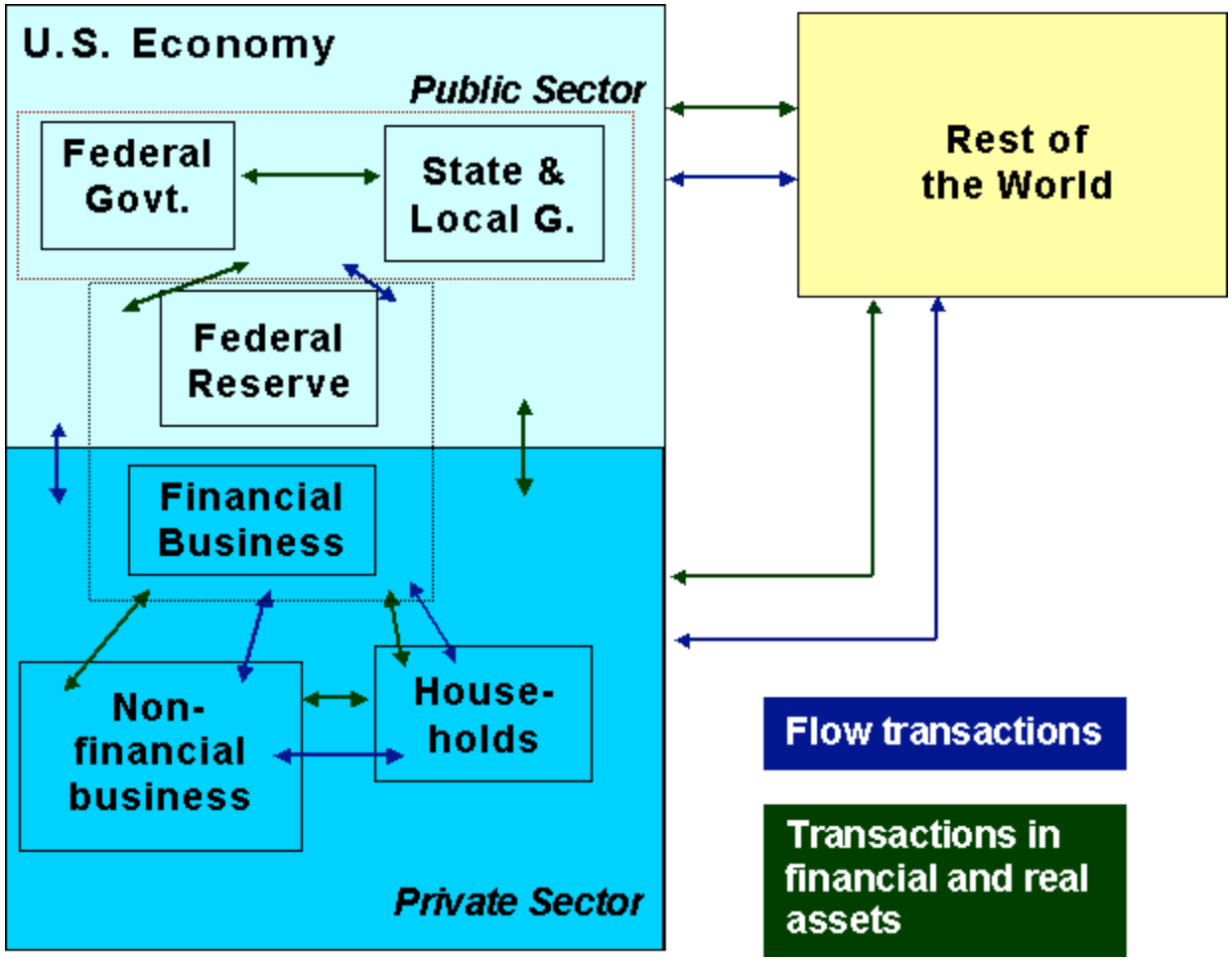
The evolution of real wealth through time will depend on investment (a *flow* concept)

In an open system

Financial assets/liabilities of the system which are financial liabilities/assets of someone outside the system will be relevant, since they may imply a redistribution of real assets (and income) in the future across systems.

We can model the accounting of the system with a top-down approach, according to the required level of detail.

A top-down approach



Representing flows with a SAM

Table 1. Social Accounting Matrix									
	Prod.	**Hous.**	**Firms**	**Banks**	**C. Bank**	**Govt**	**Rest of world**	**Capital Account**	**Total**
1. Production	*IO*	*C*				*G*	*EX*	*ΔK +ΔH +ΔI*	*Y*
2. Households	*WB*		*FD*	*iM +Fb*		*iBh*	*WB*w		*Yh*
3. Firms	*FTd*						*FT*w		*FT*
4. Banks		*iMo*	*iL*			*iBb*			*Yb*
5. Central Bank				*iA*		*iBc*			*Yc*
7. Government	*Ti*	*Td*	*Tf*		*Fc*				*Yg*
8. Rest of the world	*IM*								*Yw*
8. Capital Account		*Sh*	*FU*	*FUb*	*0*	*Sg*	*-BP*		*SAV*
TOTAL	*Y*	*Yh*	*FT*	*Yb*	*Yc*	*Yg*	*Yw*	*ΔK +ΔH +ΔI*	

Flow of funds

Table 2. Flow of funds matrix							
	Househ.	**Firms**	**Banks**	**C. Bank**	**Govt**	**Rest of world**	**Total**
1. HP money	$+\Delta HPh$		$+\Delta HPb$	$-\Delta HP$		$+\Delta HPw$	*0*
2. CB advances			$-\Delta A$	$+\Delta A$			*0*
3. Bank deposits	$+\Delta D$		$-\Delta D$				*0*
4. Bank loans	$-\Delta Mo$	$-\Delta L$	$+\Delta Mo+\Delta L$				*0*
5. Govt. bills	$+\Delta Bh$		$+\Delta Bb$	$+\Delta Bcb$	$-\Delta B$	$+\Delta Bw$	*0*
6. Equities	$+\Delta EQh$	$-\Delta EQ$				$+\Delta EQw$	*0*
7. Foreign L.			$+\Delta FL$			$-\Delta FL$	*0*
8. Real assets	$+\Delta H$	$+\Delta K$					$+\Delta K +\Delta H$
TOTAL	*+Sh*	*+FU*	*+FUb*	*0*	*+Sg*	*-BP*	

From flow of funds to stocks

Finally, each stock **S** evolves according to an identity:

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

Where **F** is the corresponding flow, and **CG** measures capital gains, which are applicable if the stock has a market price.

Stock-flow links

1. Stocks evolve through time on the basis of investment and saving decisions, as well as decisions on portfolio management, fiscal policy, monetary policy, exchange rate policy
2. Stocks influence income in future periods (interest payments, etc.)
3. Stocks may be relevant in flow decisions (household saving/consumption relative to wealth, etc.)

General features of the SFC approach

1. The model is dynamic, and the position of the system in a given period is crucially affected by its previous historical path;
2. The model is consistent, in that every monetary flow is recorded as a payment for one sector and a receipt for another sector. In addition to flow consistency, every relevant stock - of real or financial assets - is linked to a corresponding flow. For instance, the net stock of assets for the household sector changes its value in a given period through household saving and capital gains;
3. The financial system is explicitly represented;
4. Adherence to SNA standards helps going from the theoretical model to applied models

Main features of the SFC-PK approach

5. Prices do not necessarily clear markets. At any moment in time, the stock of an asset may differ from its “desired” level. Quantity adjustments towards “desired” or “equilibrium” levels for model variables require some buffers.
6. The long-run growth path is obtained from the sequence of short-run adjustments
7. The explicit representation of the financial system allows for the analysis of models a la Minsky, or for investigating “financialization” etc.

We claim that the SFC-PK approach can help reconcile different heterodox approaches.

A theoretical SAM

Table 1. Social Accounting Matrix									
	Prod.	**Hous. Top 5%**	**Hous. B.95%**	**Firms**	**Banks**	**C. Bank**	**Govt**	**Capital Account**	**Total**
1. Production		*+p·C1*	*+p·C2*				*p·G*	*p·ΔK + pb·ΔH*	*p·Y*
2. Households (top 5%)	*+WB1*		*+Rents*	*+FD*	*+iM1 +Fb*		*+iBh*		*+Yh1*
3. Households (bottom 95%)	*+WB2*				*+iM2*				*+Yh2*
4. Firms	*+FT*								*+FT*
5. Banks			*+iMo*	*+iL*			*+iBb*		*+Yb*
6. Central Bank					*+iA*		*+iBc*		*+Yc*
7. Government	*+Ti*	*+Td1*	*+Td2*	*+Tf*		*+Fc*			*+Yg*
8. Capital Account		*+Sh1*	*+Sh2*	*+FU*	*0*	*0*	*+Sg*		*+SAV*
TOTAL	*+p·Y*	*+Yh1*	*+Yh2*	*+FT*	*+Yb*	*+Yc*	*+Yg*	*p·ΔK + pb·ΔH*	

The Levy model

Background

Godley started to develop what is now the Levy model around 1992. It was based on annual data, with a simplified structure, in the “New Cambridge” tradition.

Later, quarterly data were used to increase the ability of the model to incorporate new information, and the model was refined and expanded, introducing more robust econometric techniques.

Accounting requirements

In principle, a detailed description of the system of accounts of the economy – with no “black holes” – requires that we track all monetary transactions from one sector to another.

Again, the construction of the flow of funds requires tracks of which sector is borrowing against any increase in credit.

However, in practice what is usually published is only the marginal distribution of the transfer matrix and of the flow of funds.

Data sources

The B.E.A. and the Fed publish detailed estimates of flows, flow of funds, capital gains and stocks for all sectors in the economy. In this respect, the system of statistics is more reliable than for many other developed countries.

However, usually only marginal distribution of transfers, or flow of funds, are available. As an example, we know how many equities have been issued by the corporate sector in one year, but we do not know which sector has acquired them.

Levy Model – S.A.M.

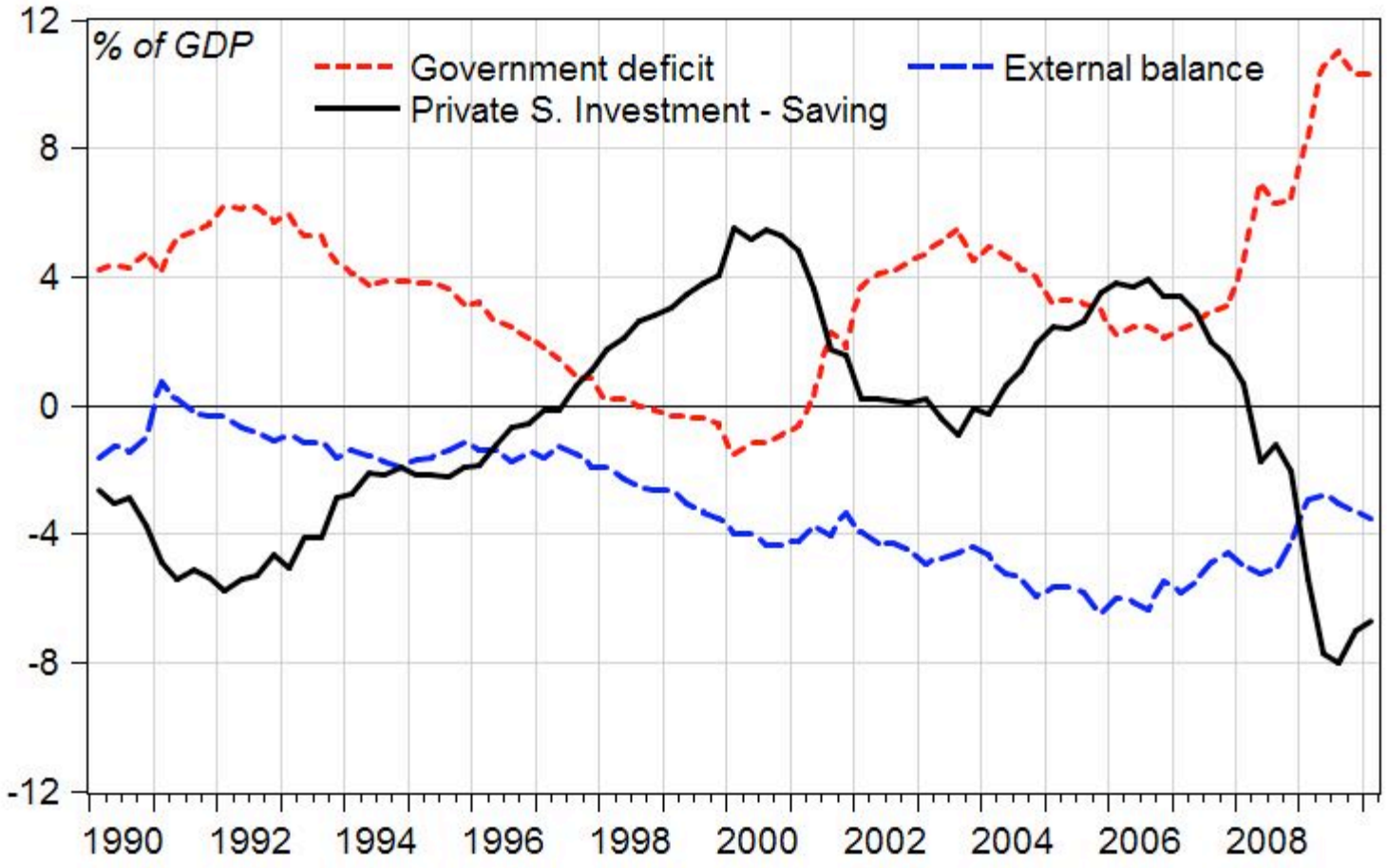
	Production	Private sector	Government	Rest of the World	Capital Account	Total
1. Production		Private expenditure	Government expenditure	Exports		Aggregate demand
2. Private sector	Wages		Govt. transfers to private s.	Net income payments		Private s. Income
3. Government	Net indirect taxes and s.c.	Direct taxes and s.c.				Govt. receipts
4. Rest of the World	Imports	Private s. net transfers to RoW	Govt. net transfers to RoW			Payments to RoW
7. Capital Account		Net Acq. of Fin. Assets	Govt. surplus	-BoP		0
TOTAL	Value of output	Private s. income	Govt. outlays	Receipts from RoW	0	

Levy Model - stocks

In the Levy model we chose to work with stocks obtained cumulating flows.

- Government debt
- Net financial assets abroad
  - Financial assets abroad
  - Financial liabilities with R.o.W.
  - Direct investment
- Private sector financial wealth is obtained as the sum of other sectors net liabilities

U.S. Main Sector Balances



How to read the balances

$$NAFA = (Sh - Ir) + (P - Ik - In) = GD + BP$$

Balances are derived from income less expenditure. An increase in expenditure over income will boost aggregate demand, and move the corresponding balance towards positive territory.

Therefore, it is not the *level* of financial balances which matter for understanding growth (a given level of output can be obtained with different combination of balances), but their *movements*

Growth regimes – investment

$$(Sh - Ir) + (P - Ik - In) = GD + BP$$

Financial balances are compatible with different growth rates of output. For example, an increase in domestic investment which leads to an increase in profits may leave financial balances unchanged, while increasing the growth rate. (However, in this case we expect an increase in household saving, a reduction in government deficit and a reduction in BP, so the increase in profits should not match the addition to investment)

Investment-led growth is compatible – at least in principle – with financial balances close to zero.

Growth regimes – exports

$$(Sh - Ir) + (P - Ik - In) = GD + BP$$

Exports-led growth (BP > 0) implies a level of domestic saving larger than investment (or a government surplus) or – to put it differently – the willingness to increase the amount of credits vs the rest of the world.

While export-led growth is certainly sustainable for the country depending on it, it implies that at least another country is running an external deficit, which will generate instability.

Financial balances and financial fragility

The level of a financial balance, relative to income, measures the net increase in asset/liabilities of that sector.

A negative financial balance (an increase in net liabilities) implies that the financial fragility for that sector is increasing.

A negative financial balance which is above the GDP growth rate will imply, if maintained, an explosive level of debt.

Debt and deficit

$$Debt = Debt(-1) + GD \{ + capital\ gains\}$$

$$D/Y = D(-1)/[Y(-1)*(1+g)] + GD/Y$$
$$d = d(-1)/(1+g) + gd$$
$$\Delta d = d(-1)*[-g/(1+g)] + gd$$

Assume d = 100%; g = 5%: if gd > 4,8% the debt/output ratio will be growing. For d = 50%, the debt/output ratio will grow when gd > 2.4% etc.

Financial balances relative to GDP can be roughly compared to the GDP growth rate, to see if the underlying stock of assets/debt is growing

Relation among balances

Attempts have been made to analyze causal links among financial balances.

The “New Cambridge” approach claimed that the private sector balance was stable – relative to GDP – so that any change in the government balance would be mirrored in the external balance.

Blecker (2009) has questioned this result using a VAR (!), but his methodology is flawed.

Van Treeck and others (2010) suggest a notion of “ex-ante” or “desired” financial balances. While this is relevant for the public sector, and perhaps the external sector, it is questionable for the private sector (household + business) as a whole.

Godley's strategy

In the Levy model, and in the "New Cambridge", the hypothesis which was adopted was that private expenditure reacts to income and the opening stock of financial wealth.

For given values of the (estimated) parameters, this implies convergence to a stable ratio of net financial wealth to income.

It is not easy to justify this relationship on the basis of some behavior at the micro level.

At the macro level, however, this result will hold under standard assumptions:

- Households adjusting their expenditure to income and wealth;

- Firms adjusting investment to a desired capital/output ratio

Stock-flow norms

In a model where stocks feed back on flows, a stable growth path is achieved only when stock-flow ratios are stable, and stocks and flows grow at the same rate.

An empirical SF model, such as the Levy model, can therefore be used to analyze the deviations from the steady-growth path.

Parameters in the model help understand if (and when) stock-flow norms are shifting.

There is no strong mechanism which gets the model (or the economy!) quickly back to the steady-growth path: unbalances can last for long periods, usually implying accumulation of debt for at least one sector.

It is difficult – maybe impossible – to incorporate a turning point into the model (to formalize when debt becomes “excessive”)

The short and the medium term

There is no qualitative difference in SF models, both theoretical and empirical, between the short run and the medium/long term.

Growth is achieved through a sequence of short run adjustments which do not necessarily imply “equilibrium”.

SF models cannot therefore be analyzed with simple, “IS-LM like” diagrams, in the short term.

However, we can build diagrams to evaluate different positions in the stable growth path under alternative assumptions about parameters, policy etc.

Signals for projecting the recession

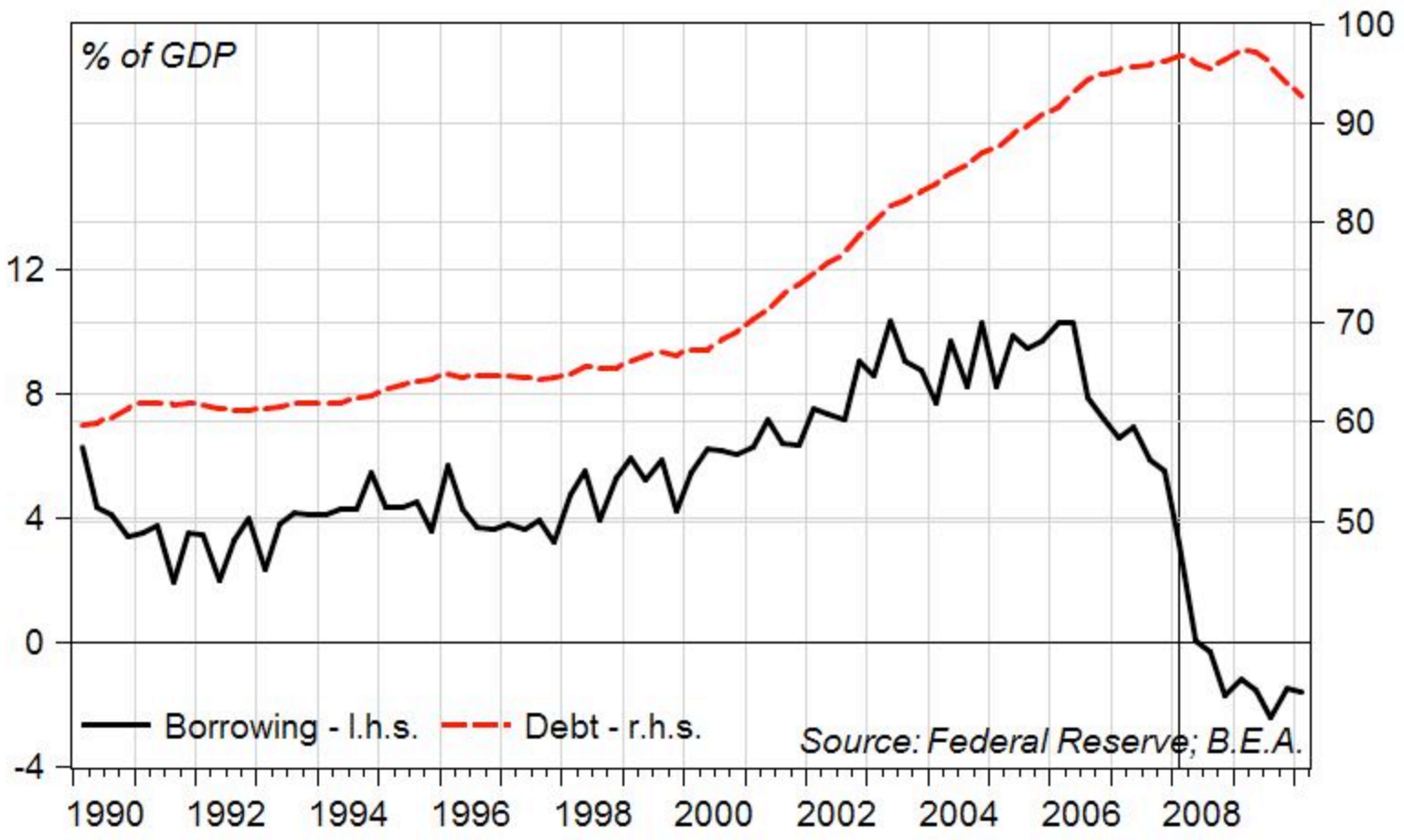
Godley started to warn about a recession in the U.S. in his “Seven unsustainable processes”, in 1999.

At the time there was still euphoria for “new economy” growth and “the end of the business cycle”.

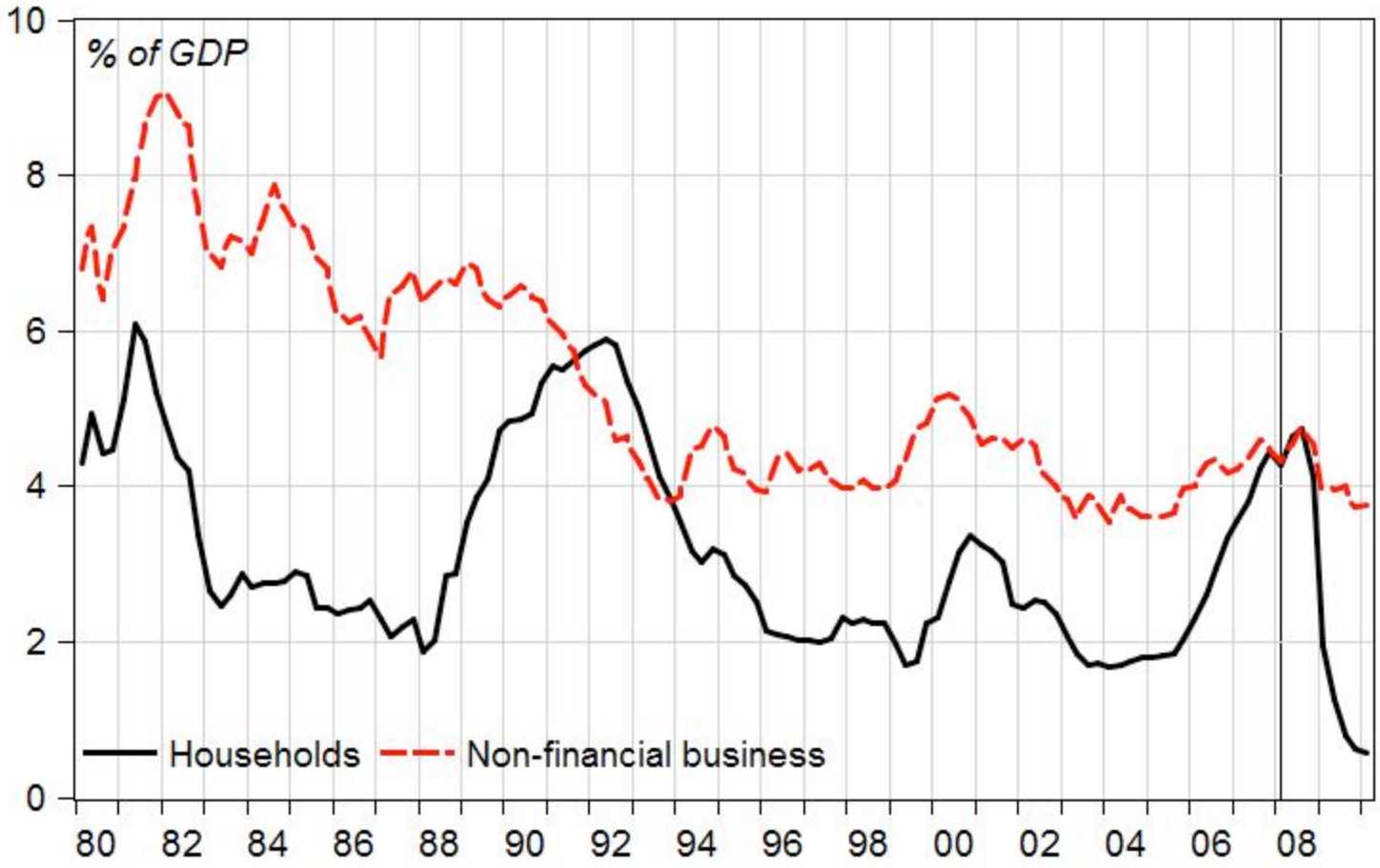
He claimed that debt/income ratios could not deviate from their long-run stable norm for too long.

While this is true, it is more difficult to foresee the *timing* of the downturn. In our view, the timing was linked to a flow-flow norm (the ratio of debt service to income) rather than a stock-flow norm

Households Borrowing and Debt



Debt Burden


% of GDP
10
8
6
4
2
0
Households
Non-financial business
80
82
84
86
88
90
92
94
96
98
00
02
04
06
08

Levy model – econometrics

Godley was skeptical about econometrics.

He believed that a model with a properly developed SF accounting would imply growth path which did not depend crucially on econometric techniques.

He had strong beliefs about the values of crucial model elasticities (say, the response of trade to relative prices) and would dismiss econometric results which were at odds with his prior beliefs. His beliefs, anyway, came out of extensive analysis of the economy through model simulation: long-run multipliers emerging from simulating a SF model depend in a non-linear way from parameters in single equations.

When the model is used in dynamic simulation, errors will cumulate, and feedbacks from stocks to flows may easily imply large deviations of simulated variables from actual data.

The result is that a good econometric estimate for a single equation, obtained through fashionable econometric techniques, may not be the optimal choice when inserted into a SF model.

Levy model – estimation strategy

Our estimation strategy is based on ECMs whenever possible, keeping in mind that the model is not meant to provide short-term forecasts.

Special attention is given to:

- Weak exogeneity of regressors (IV or 2sls estimates when needed)
- Parameter stability (structural breaks)

Private sector expenditure

Our crucial equation is the private sector expenditure function, which – under a standard assumption in *new Cambridge* models *a* la Godley – implies a long-run stock-flow norm.

$$PX_t = c_0 + c_1 YD_t + c_2 FA_{t-1} + Z_t$$

Where Z is a vector of stationary variables which influence the propensity to spend out of income

Levy model – capital gains etc

More specifically, Z includes:

- The “real” price of equities (S&P 500 index, deflated by p)
- The “real” price of housing (median price of existing homes, deflated by p)
- Household borrowing (change in the stock of household debt, deflated by p)
- Business borrowing (change in the stock of business debt, deflated by p)

Missing links…

- The Levy model is still incomplete, from a SFC point of view, since:
  - private sector debt is still exogenous
  - changes in the market price of real assets (housing) and in the stock market are relevant for private expenditure, but they are not explicitly modeled
- Domestic inflation is not modeled yet (although inflation accounting is adopted)
- No role for the (functional and personal) distribution of income

Our research agenda

- Although some features of U.S. growth since the 1990s are well captured by the current model, it is worth exploring if a model with separate treatment of household and business will change significantly our results, against the current “New Cambridge” approach
- We are therefore developing the model with a separate treatment for consumption, residential investment, non-residential investment, and inventories
- We plan to obtain a simple representation of financial flows (loans, mortgages, etc.) coherent with the new settings

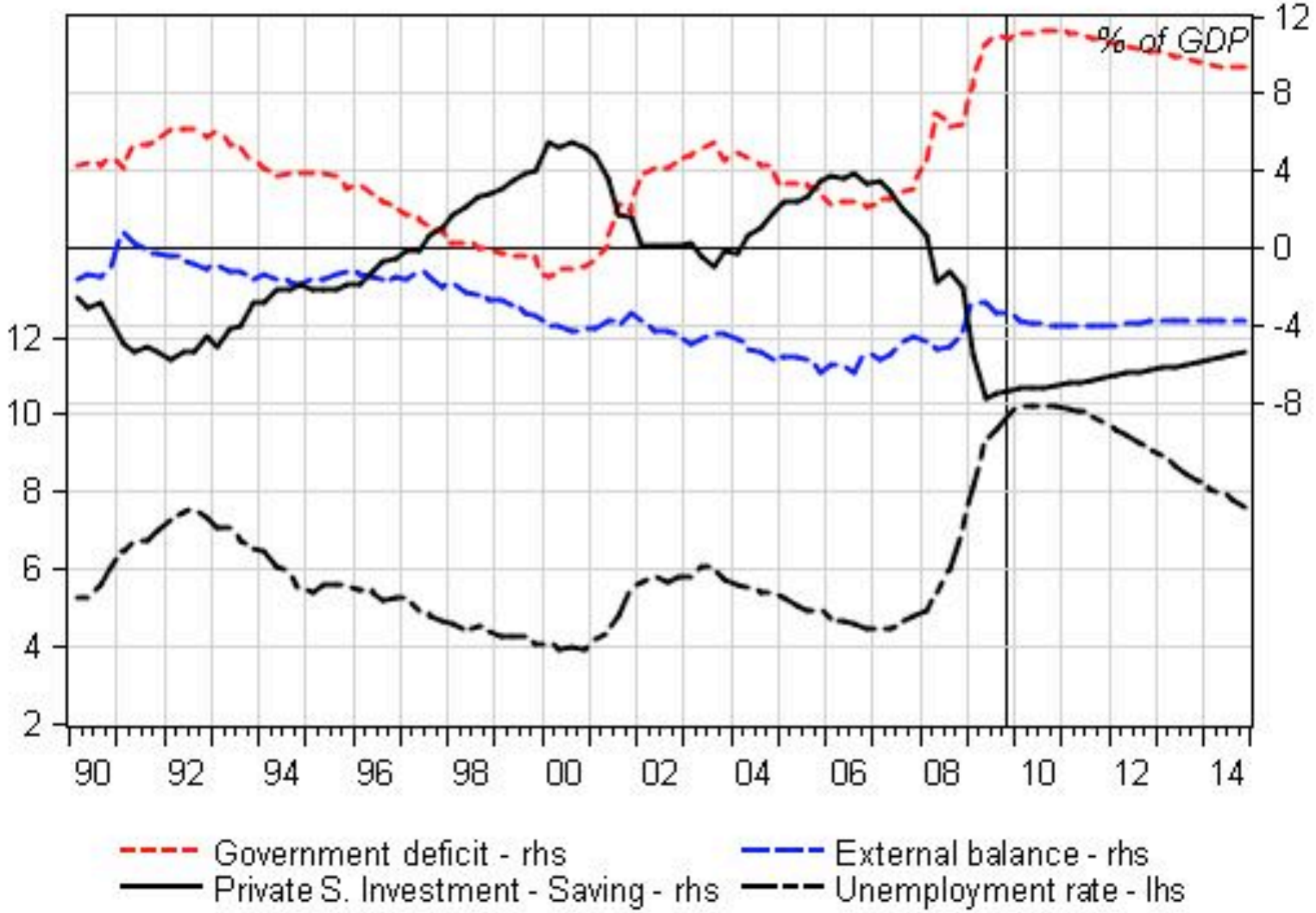
Our simulation strategy

- "Reasonable" values for the growth path in exogenous variables:
  - Government expenditure (CBO)
  - World output, world inflation (IMF, …)
  - Monetary policy (interest rates)
- Assumptions about variables influencing private expenditure:
  - Capital gains in the stock market and the housing market

Implications

- A simulation strategy we often use is to let the model compute the amount of borrowing the private sector needs, in order for the economy to reach the growth path projected by CBO or other commentators
- We next use the model to derive the growth path of output, and unemployment, under "more reasonable" assumptions about borrowing
- We finally evaluate the effects of policies on our "more reasonable" scenario

Figure 5. U.S. Main Sector Balances and Unemployment
Prolonged fiscal stimulus



Conclusions

SFC models are a powerful tool to study how shocks affect the economy in the medium run.

They can be used, in principle, to test competing theories in a consistent framework.

The relevance of SFC models, against flow models, increases when the debt/income ratio of at least one sector in the economy is growing in size. For instance, global imbalances are stimulating several contributions on multi-country SFC models.

Materials

Those interested in more details on how to build a model (in Eviews) can register at

http://ius.unicas.it/ATutor

Asking to get access to my course materials on “Introduction to macroeconometric models”