

SFC Modelling: Euro Crisis and Perspectives

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Outline

- Relevance of the SFC approach
- The SFC principles
- Model closures
- Projections and policy scenarios
- The Euro crisis and the case of Greece



Relevance of Flow of Funds analysis

“The biggest financial crisis in a lifetime has shown how important it is to have a deep understanding of the financial balance sheets of the main sectors of the economy and the financial flows that take place between them.”

(From the Foreword in *A Flow-of-Funds Perspective on the Financial Crisis*, edited by Bernhard Winkler, Ad Van Riet, and Peter Bull, 2014)



Relevance of PK-SFC models

“Without neglecting the contributions from other traditions, the ‘accounting approach’ within ‘Post-Keynesian’ economics shared by Godley, Baker, Hudson, Keen and others seems to have been particularly predictively successful, and also the theoretically most developed”

(Bezemer, 2010)



Stock-flow-consistency principles



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General principles of SFC

1. Everything comes from somewhere and goes somewhere: no *black holes* (income for somebody is a payment from somebody else)
2. Debt for someone is a credit for someone else
3. Flows imply stocks: positive saving implies an increase in net wealth
4. Stocks feed back on flows: higher debt implies higher future interest payments; higher wealth allows for higher spending
5. In steady growth, stock/flow ratios converge, since stocks and flows grow at the same rate.



Simple accounting of a closed system

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.



Level of detail

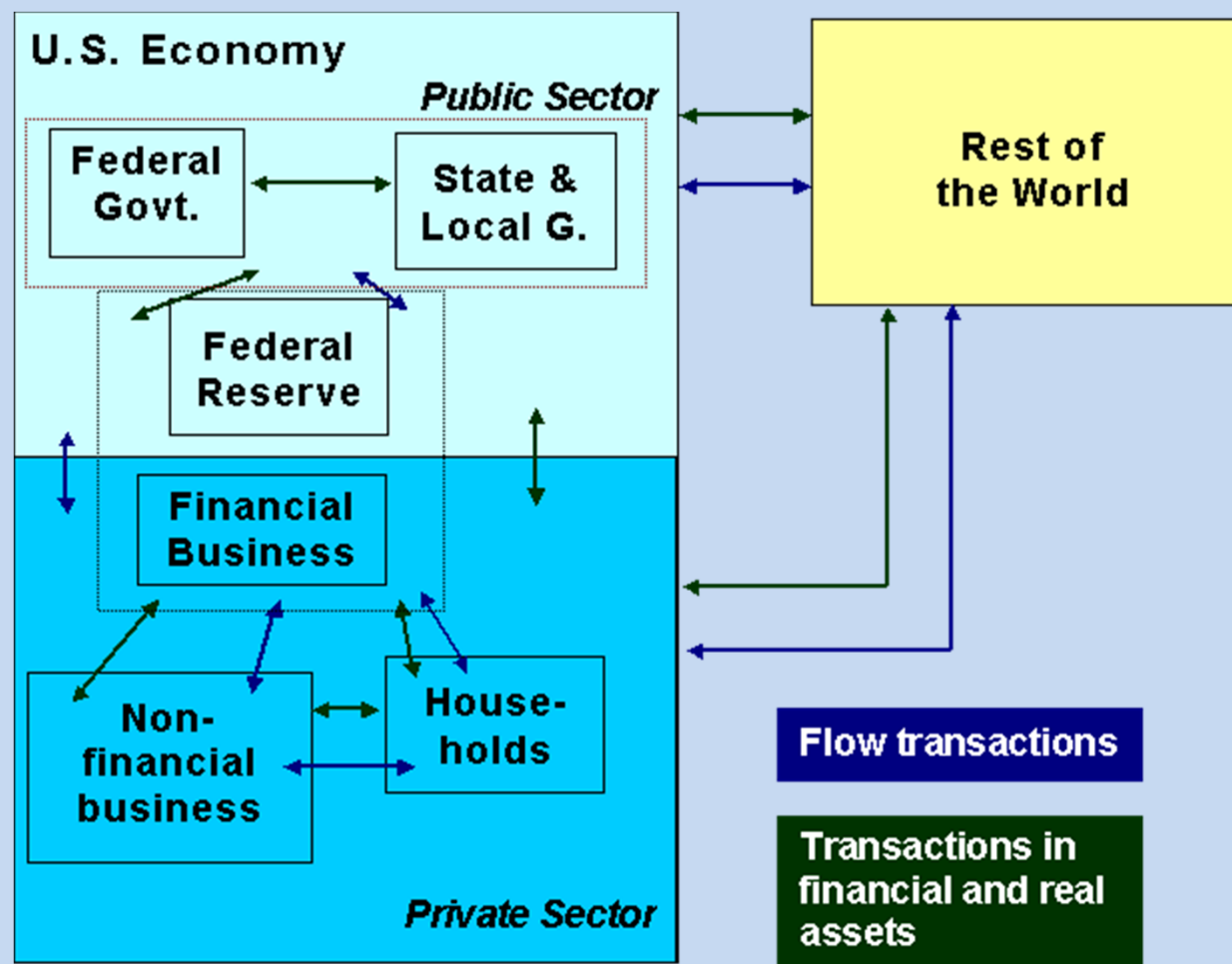
The level of detail we can reach is constrained by the availability of data.

Developed (and some developing) countries are now beginning to publish complete sector accounts for:

- Households (including NPISH)
- Non-financial corporations
- Financial corporations (including CB) [with possible details on Insurance companies, etc.]
- Government [with possible details on local government, etc.]
- Rest of the world



A top-down approach



Sector accounts

U.S.

- Integrated Macroeconomic Accounts (B.E.A.) – annual and quarterly
Integrating NIPA and Flow of Funds

Europe

- Sector accounts (Eurostat) - annual

Generally speaking...

- Accounts for the “real” variables are published by the National Statistical Office, while financial accounts (Flow of Funds, Revaluation accounts, Balance sheets) are published by the Central bank



The sequence of accounts

- › Production account (GDP)
- › Generation of income (Wages and profits)
- › Allocation of primary income (Property income etc.)
- › Secondary distribution of income (Interest payments, transfers)
- › Use of disposable income (consumption, saving)
- › Change in net worth (capital transfers)
- › Acquisition of non-financial assets (investment, NAFA)
- › Financial transactions (allocation of net saving, borrowing) [Flow of Funds]
- › Capital gains [Revaluation accounts]
- › Balance sheet



An example: the U.S.

Integrated Macroeconomic Accounts: Households



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A simple balance sheet

	Hous.	Non-fin. firms	Financial firms	Gov.	Rest of the world	Total
Real assets	+Kh	+Kf		+Kg		+K
Deposits	+D		-D			0
Loans	-Lh	-Lf	+L			0
Government debt	+Bh		+Bb	-B	+Bw	0
Equities	+pe*Eh	-pe*E	+pe*Eb		+pe*Ew	0
Foreign debt			+Fb		-F	0
Balance	-Vh	-Vf	-Vb	-Vg	-Vw	-K
Sum	0	0	0	0	0	0



Consistency principles...

- › Government debt is a credit of the private domestic sector and of the RoW
 - › When a large share of such debt is held domestically, writing off the debt implies a fall in domestic private financial wealth
 - › When such debt is a credit of foreign financial institutions, their balance sheets will be hit by «debt restructuring»



The implied SAM

	Prod.	Hous.	Non-fin.	Fin.l firms	Gov.	RoW	C/A	Total
Production		C			G	E	I	Q
Households	W		TRfh	TRbh	TRgh	TRwh		Yh
Non-fin.firms	Π			TRbf	TRgf	TRwf		Yf
Fin.firms		TRhb	TRfb		TRgb	TRwb		Yb
Government	Ti	TRhg	TRfg	TRbg		TRg		Yg
Rest of world	M	TRhw	TRfw	TRbw	TRgw			Yw
Capital acc.		Sh	Sf	Sb	Sg	Sw		S
Total	Q	Yh	Yf	Yb	Yg	Yw	I	



Consistency principles...

- › In a Social Accounting Matrix payments are recorded in the columns, and receipts in the rows. A natural way to arrange payments to ensure the #1 consistency principle
- › Separating (in the first row and column) payments related to production from other payments help identify GDP, and links from GDP to the determination of primary income
- › Separating payments on capital account allows to easily link payments in «real» markets to the Flow of funds (changes in real and financial assets – liabilities)



Financial balances

From the row and column of the capital account, we get

$$Sh + Sf + Sb + Sg + Sw = I$$

$$\{Sh + Sf\} + 0 - DEF - CA = I$$

Net acquisition of financial assets of the private domestic sector (NAFA)

$$NAFA = S - I = DEF + CA$$



The implied FoF matrix

	Hous.	Non-fin. firms	Financial firms	Gov.	Rest of the world	Total
Real assets	+I _h	+I _f		+I _g		+I
Deposits	+ΔD		-ΔD			0
Loans	-ΔL _h	-ΔL _f	+ΔL			0
Government debt	+ΔB _h		+ΔB _b	-ΔB	+ΔB _w	0
Equities	+pe*ΔE _h	-pe*ΔE	+pe*ΔE _b		+pe*ΔE _w	0
Foreign debt			+ΔF _b		-ΔF	0
Total	Sh	Sf	Sb	Sg	Sw	+I



Budget constraints

The Flow of Fund matrix gives the budget constraints for each sector. For households

$$Sh + \Delta Lh = +Ih + \Delta D + \Delta Bh + pe * \Delta Eh$$

While for firms

$$Sf + \Delta Lf + pe * \Delta E = If$$

And for the country as a whole

$$CA = +\Delta F - pe * \Delta Ew - \Delta Bw$$



The revaluation account

Any stock at current prices can be obtained from its previous value, plus the relevant flow, plus net capital gains arising from changes in the market price of the stock

$$pe_t * Eh_t = pe_{t-1} * Eh_{t-1} + pe_t * \Delta Eh_t + \Delta pe_t * Eh_{t-1}$$

The balance sheet for the economy at the end of the period can thus be obtained from the balance sheet of the previous period, adding flow of funds and net capital gains



The hidden equation

Notice that, in matrices like our SAM, the equality between investment and saving (i.e. the sum of values in the column and row of the capital account) is implied by the identities linking row totals to column totals for the other rows and columns.

When translating the matrix into a system of equations, it follows that one equation must be dropped, as it is implicitly defined by the others.

Checking that model simulation satisfies the «hidden equation» is one of the standard ways to ensure model consistency.



Model closures



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The use of accounting identities

When the accounting of our model is complete, we have a number of accounting identities which must hold (ex post) and can therefore be made explicit in a way which suits our needs.

For instance

$$\Delta L_f = I_f - S_f - p_e * \Delta E$$

We have used the identity from the FoF to state that the change in bank loans outstanding must equal the value of investment not financed by retained profits or sales of new equities.



The «choice» of exogenous variables

We can take as exogenous only those variables which are not affected by variables explained by our model. For instance, in a model of the Greek economy you can take as given the income of foreign tourists visiting Greece.

On the contrary, in a model for the U.S., taking as exogenous the level of income in the rest of the world will imply an error.



Quasi-identities

Some variables can be determined as quasi-identities. For instance, we can model interest payments made by the government as

$$\text{INTgh}_t = \text{rbh}_t * \text{Bh}_{t-1}$$

$$\text{INTgw}_t = \text{rbw}_t * \text{Bw}_{t-1}$$

Where implicit, ex-post interest rates rbh , rbw are computed from the ratio between the flow and the stock.

Since rbh and rbw will not be identical, and we may want to explain why they differ, quasi-identities usually do not reduce the number of unexplained variables in a model.



Choice of a theory for model closure

We add equations to the model to explain the remaining variables which need to be endogenous, according to our preferred theoretical approach.



Model specification (linearized)

$$y_1 = \rho_{12} \cdot y_2 + \dots + \rho_{1k} \cdot y_k + \beta_{11} \cdot x_1 + \dots + \beta_{1m} \cdot x_m + u_1$$

Structural form

$$\begin{bmatrix} 1 & \dots & \rho_{1k} \\ \dots & \dots & \dots \\ \rho_{k1} & \dots & 1 \end{bmatrix} \cdot \begin{bmatrix} y_1 \\ \dots \\ y_k \end{bmatrix} = \begin{bmatrix} \beta_{11} & \dots & \beta_{1m} \\ \dots & \dots & \dots \\ \beta_{m1} & \dots & \beta_{mm} \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ \dots \\ x_m \end{bmatrix} + \begin{bmatrix} u_1 \\ \dots \\ u_k \end{bmatrix}$$

Reduced form

$$\mathbf{Y} = \mathbf{\Omega}^{-1} \cdot \mathbf{B} \cdot \mathbf{X} + \mathbf{\Omega}^{-1} \cdot \mathbf{U}$$



Simultaneity

$$\begin{bmatrix} 1 & 0 & 0 \\ \rho_{21} & 1 & \rho_{23} \\ \rho_{31} & \rho_{32} & 1 \end{bmatrix} \cdot \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} \\ 0 & \beta_{22} & \beta_{23} & 0 \\ \beta_{41} & 0 & \beta_{34} & 0 \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}$$

y_1 is obtained only from exogenous variables,
while y_2 and y_3 are determined simultaneously



The Godley-Levy «New Cambridge» closure



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The *New Cambridge* approach

“The fact that money stocks and flows must satisfy accounting identities in individual budgets and in an economy as a whole provides a fundamental law of macroeconomics analogous to the principle of conservation of energy in physics”. (Godley and Cripps 1983)

No need for microfoundation

Example of lake and rivers



The *New Cambridge* hypothesis

- Private sector NAFA is stable relative to income
- Implications: an expansionary fiscal policy to achieve full employment will generate a CA deficit. Another instrument (exchange rate management?) should be used as well
- The New Cambridge hypothesis did not hold in the "short run", but...



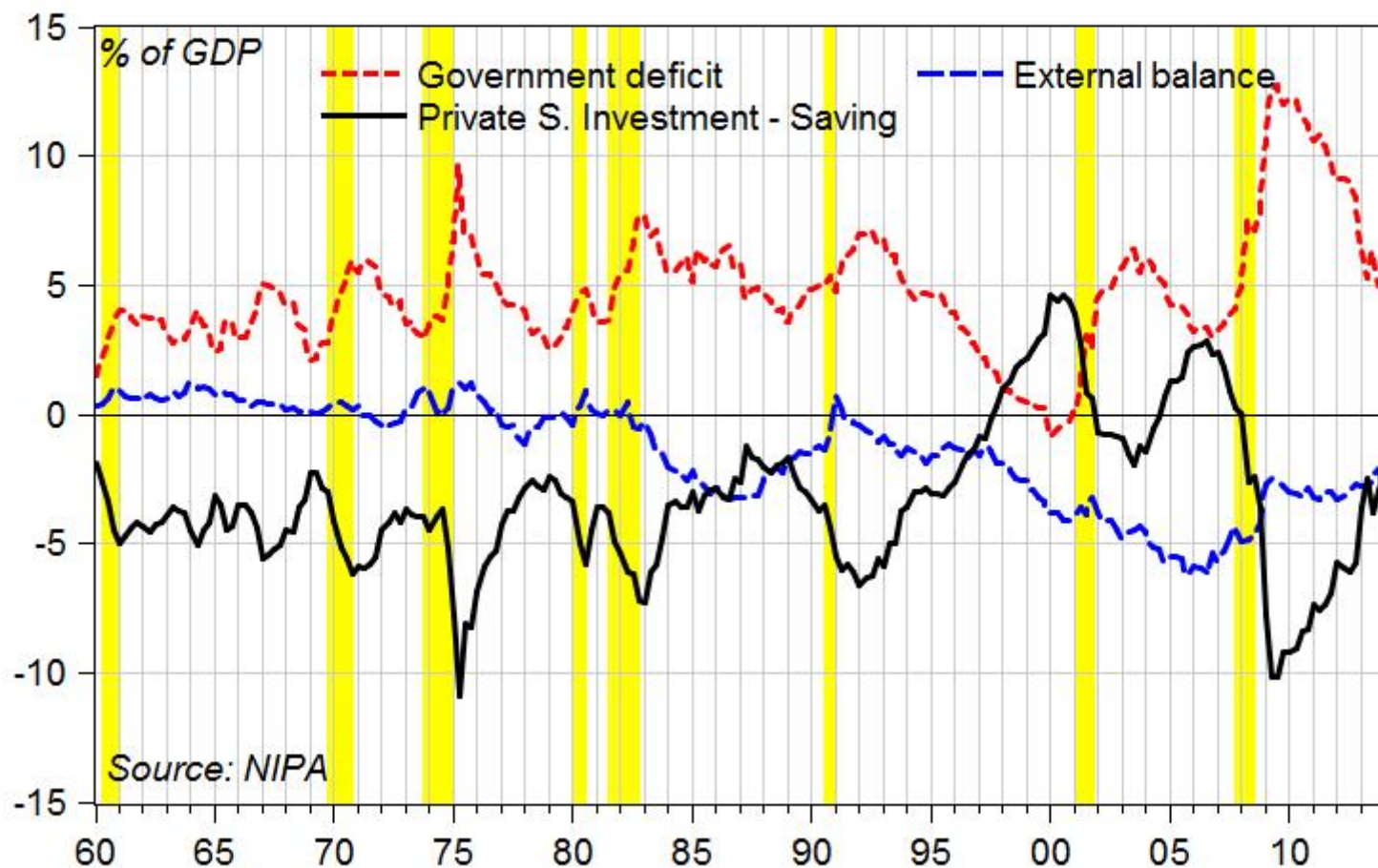
Financial balances

Possible configuration of financial balances

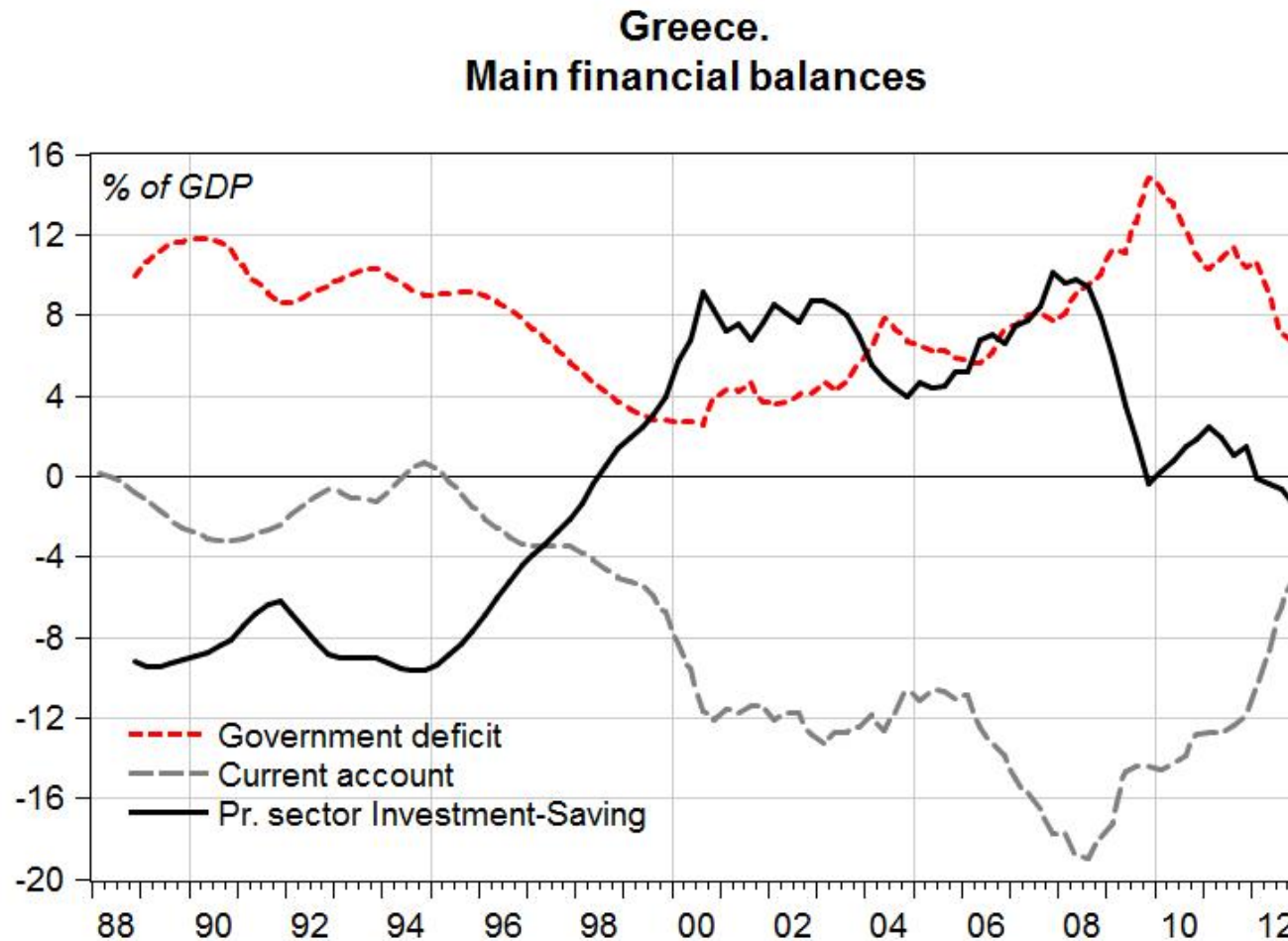
1. Balanced CA; government deficit $>$ private surplus [U.S. and other countries pre-1980s]
2. Balanced gov.budget; CA surplus $>$ private surplus [Germany]
3. Balanced gov. budget; private deficit $>$ CA deficit
4. CA deficit $>$ Gov deficit $\rightarrow$ Private sector deficit [U.S. post 1990; Greece]



U.S. Main Sector Balances



Greece: financial balances



Stock-flow norms

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

An empirical SF 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”)



Levy models - 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



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 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



Simulation strategy

- “Reasonable” values for the growth path in exogenous variables:
 - Government expenditure (from official sources)
 - World output, world inflation (IMF, ...)
 - Monetary policy (interest rates)
- Assumptions about variables influencing private expenditure:
 - Capital gains; etc.



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 official institutions
- 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



The Euro crisis and the case of Greece



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Why the euro

- The common currency was proposed as the easiest first step towards stronger ties in Europe. Others steps should have followed, but the process stopped
- Economists and politicians were aware, at the time, that a common currency with no fiscal unification would have implied problems (no conditions for an optimal currency area)



Costs and benefits

- Costs
 - No devaluation/revaluation
 - No independent monetary policy
 - Limits to fiscal policy
- Benefits
 - Reduction in transaction costs
 - No exchange rate risks
 - Lower cost of borrowing (?)



The rules of the euro

- Independent ECB, with only inflation targeting. No transfer is allowed through monetary policy (in principle)
- Constraints on fiscal policy
 - 3% limit on gov deficit; 60% limit on gov. debt
- Inadequate funds for helping convergence

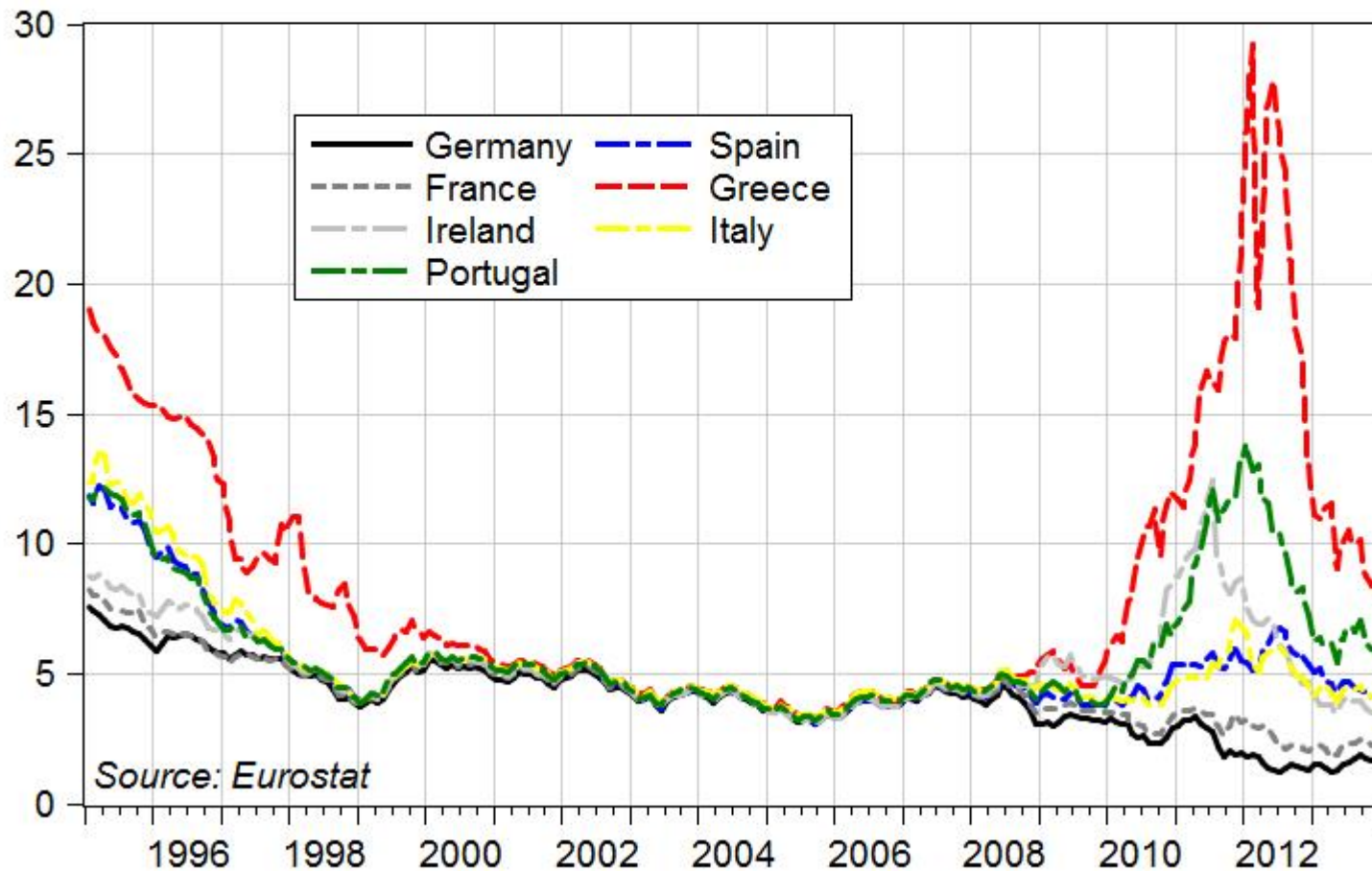


The ideology behind the euro

- Markets can self-adjust
- No need for anti-cyclical fiscal policy
- Inflation is a monetary phenomenon
- No transfers



Eurozone. Long-term interest rates

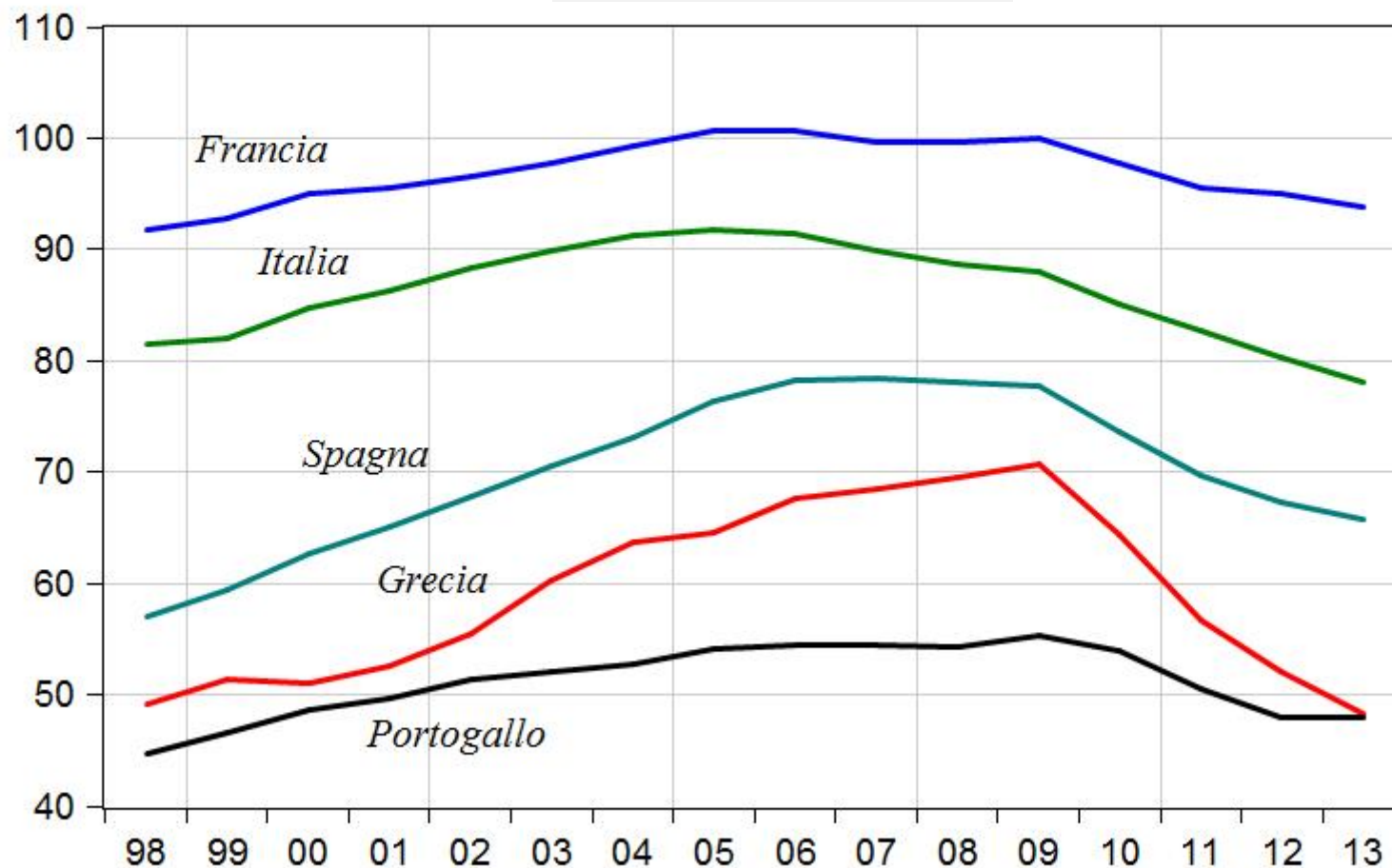


The early years of the euro

- Convergence of interest rates
- Low growth in Germany, faster growth in the periphery
- Labor market reforms in Germany, higher inflation in the periphery -> lower real interest rates



GDP per capita (Germany = 100)

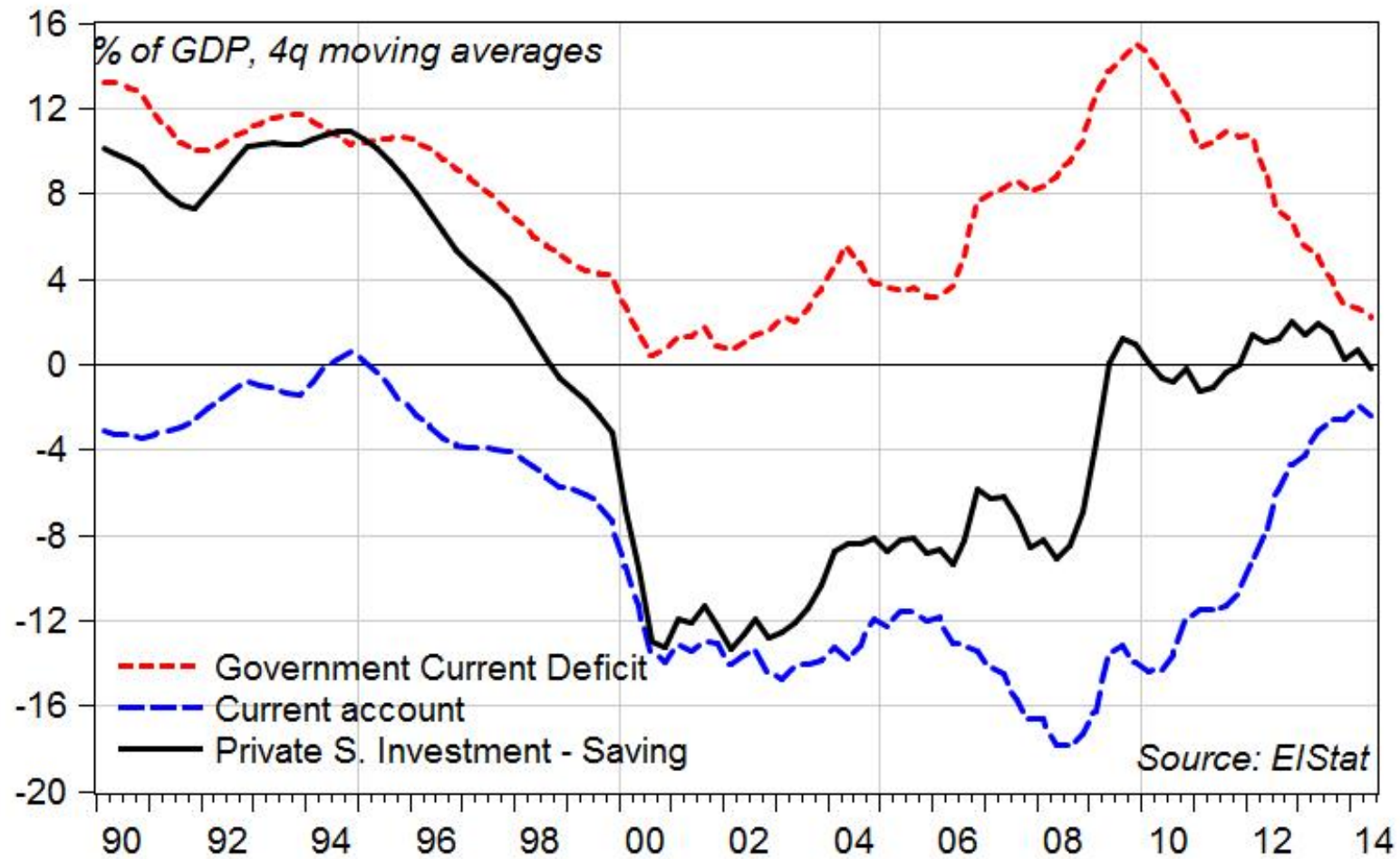


CA imbalances

- When domestic demand grows faster than foreign demand, imports grow faster than exports
- Same happens when domestic inflation is higher than for competitors
- With floating exchange rates, the currency would devalue. With fixed exchange rates (or a common currency) foreign debt piles up



Greece. Main Sector Balances Net of transfers on capital account

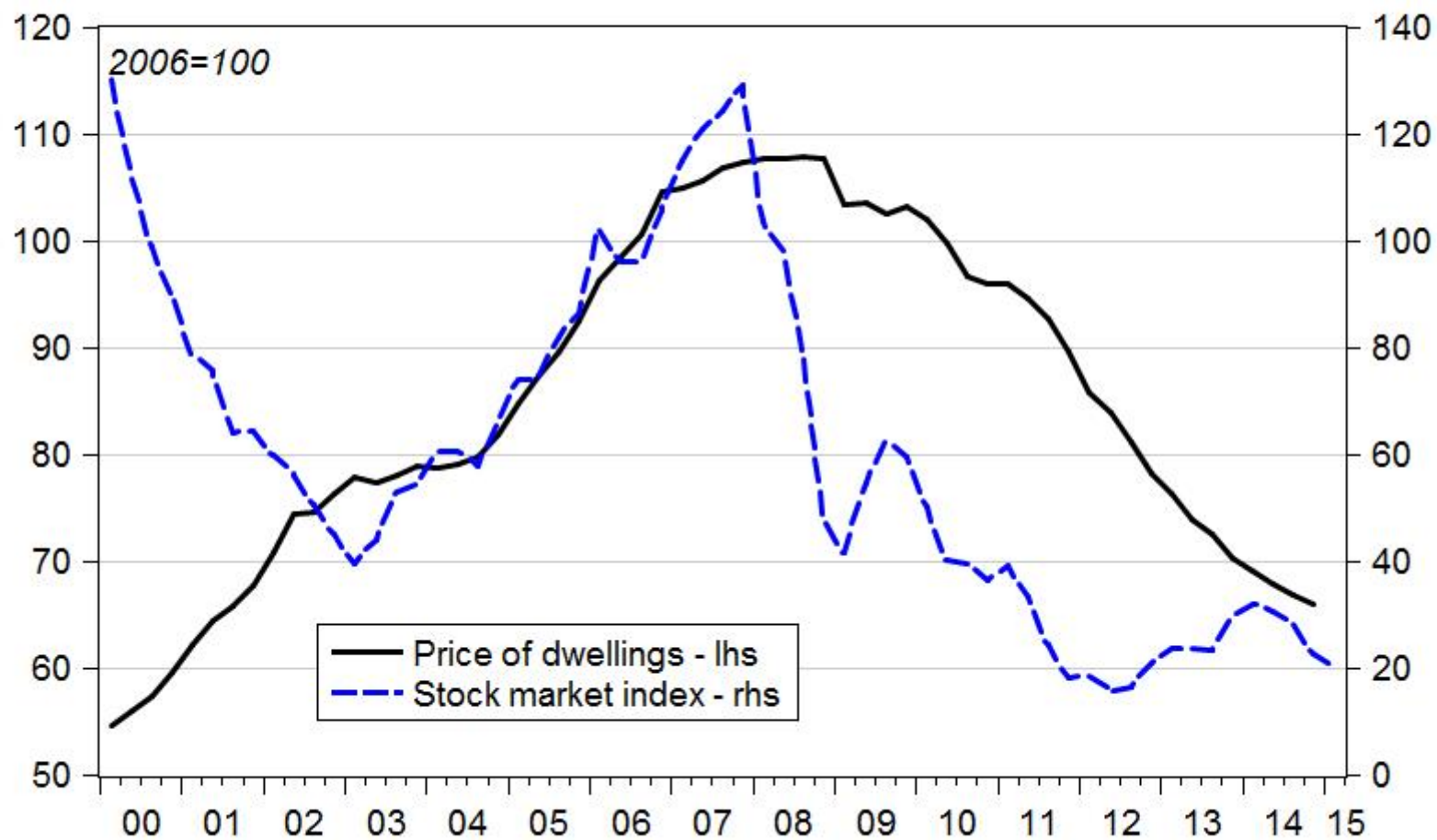


The sequence of events

- 2006-2007: U.S. housing market crisis
- Sep 2008: Lehman Brothers bankruptcy
 - Stock market crash in Greece
 - Value of equities of financial institutions falls by over 60%
 - Interest rate on gov debt start rising
- Oct 2009: New Papandreou government
 - Second stock market crash
- Apr 2010: insolvency on Greek bonds



Greece. Asset prices



The sequence of events #2

- Feb 2010: Papandreou unveils austerity plan
- Apr 2010: gov debt downgraded
- May 2010: bailout package
- Jul 2011: second bailout; “haircut” (selective default)
- Nov 2011: Papandreou resigns
- Jun 2012: Samaras coalition government

austerity measures were implemented even more effectively in 2013



The mainstream interpretation

- Fiscal profligacy: pensions and public sector wages are too high
- Corruption; inefficiency of public sector
- Tax evasion
- Labor market rigidity
- Product market rigidity

[same story in Italy]



The Troika recipe

- Fiscal austerity
 - Cut government spending
 - Cut pensions and the welfare state
 - Increase taxes
 - Increase efficiency in collecting taxes
- Labor market austerity
- Deregulation
- Privatization



The theory behind the Troika recipe

- A high public debt is detrimental for growth (Reinhart-Rogoff)
- Fiscal multipliers are zero, or negative (expansionary austerity – Alesina; Giavazzi; Pagano; ...)
- If the problem is a large CA deficit, a recession will cure it. Temporarily
- As we will show, the Troika plan was successful in minimizing losses to foreign creditors



Figure 4. Greece. Labor cost indexes

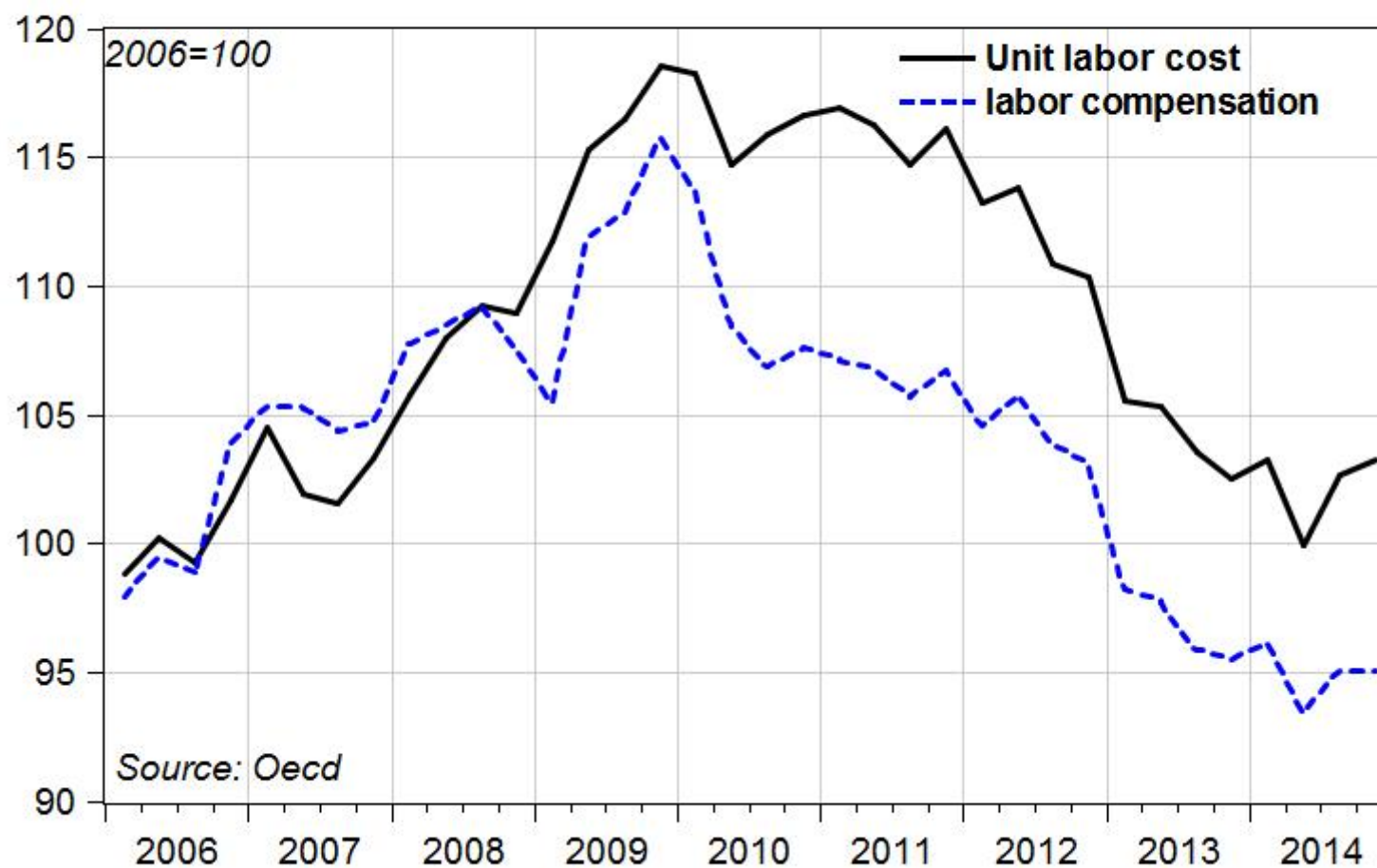


Figure 1. Greece. GDP

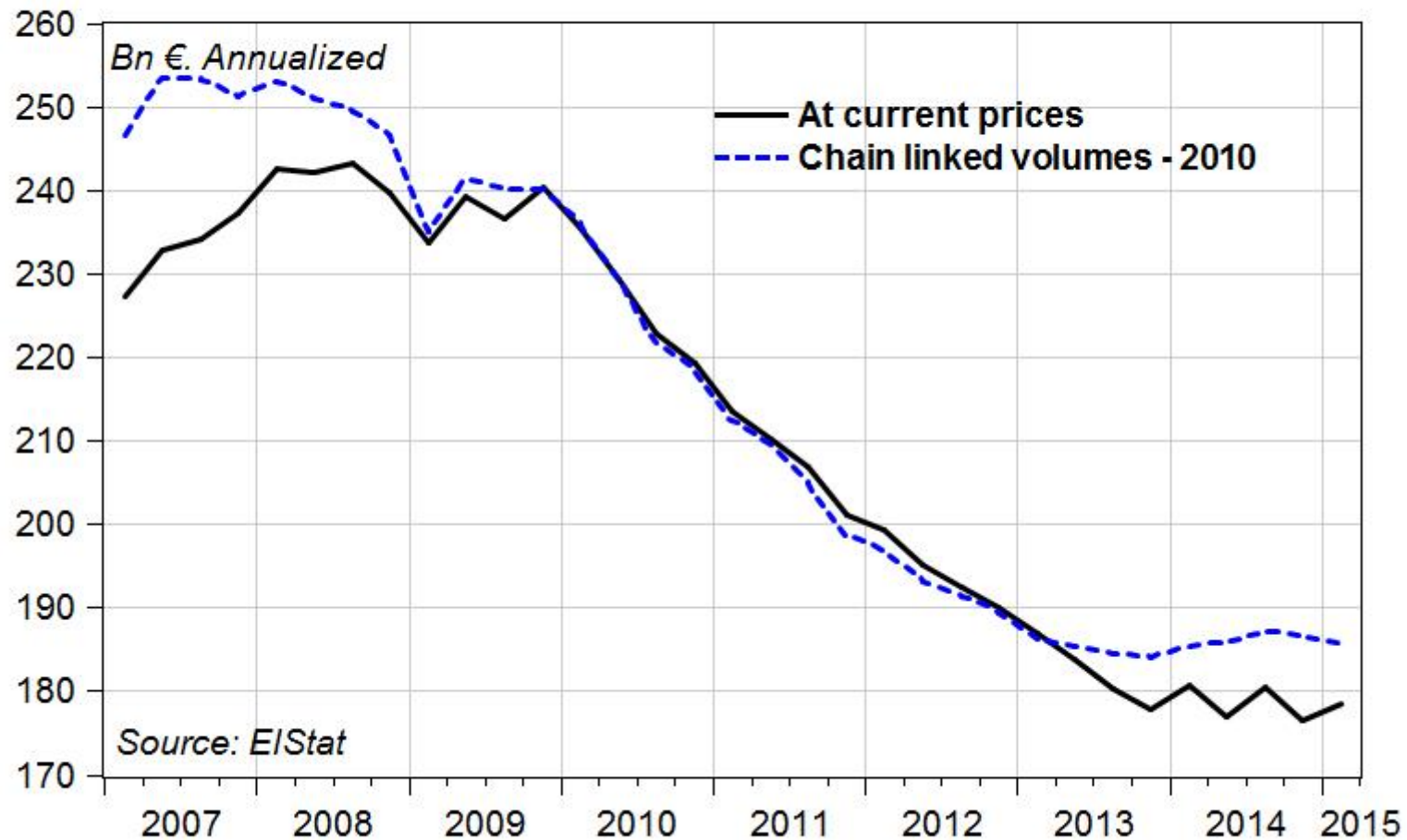
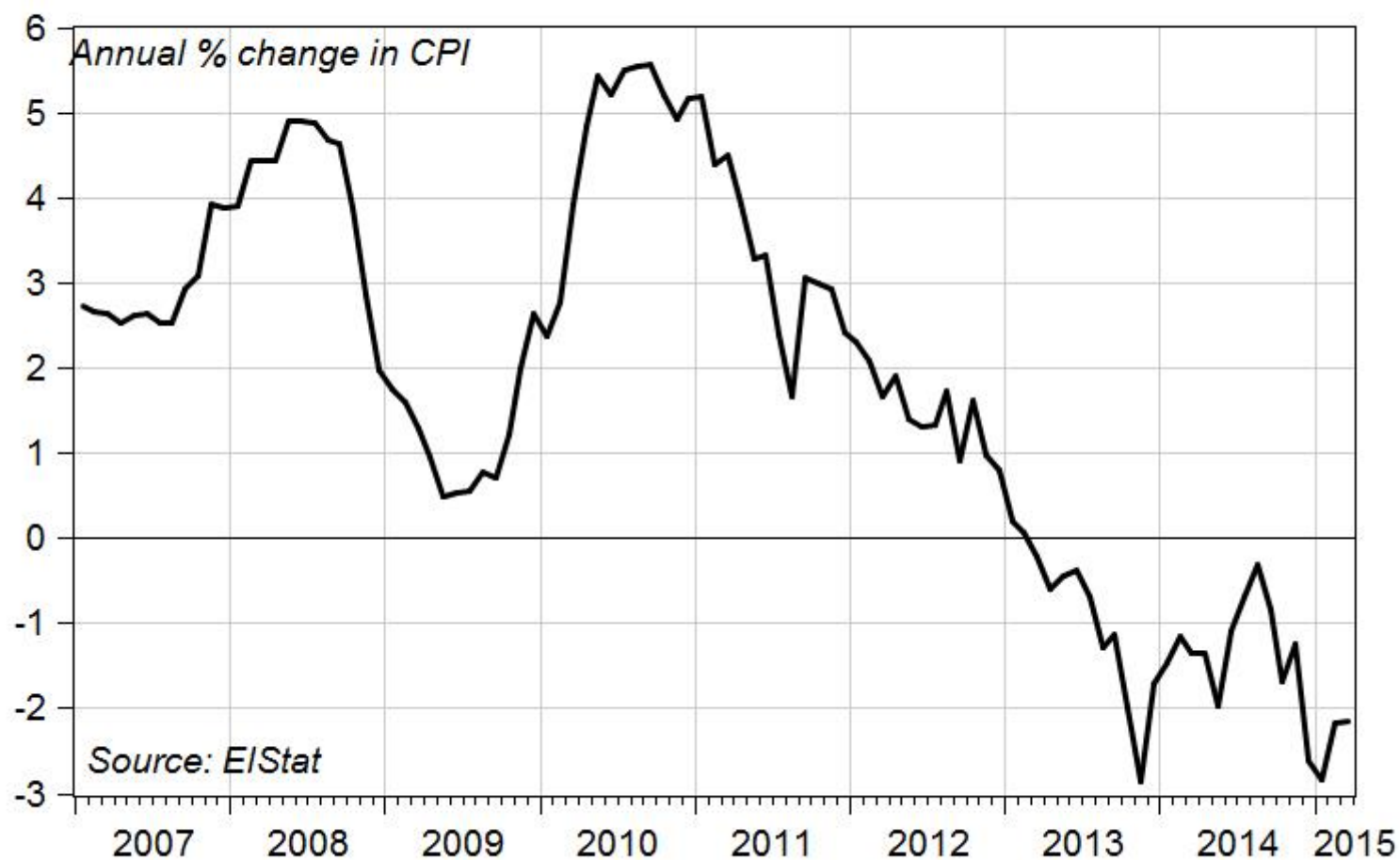


Figure 5. Greece. Inflation



The consequences of the Troika plan

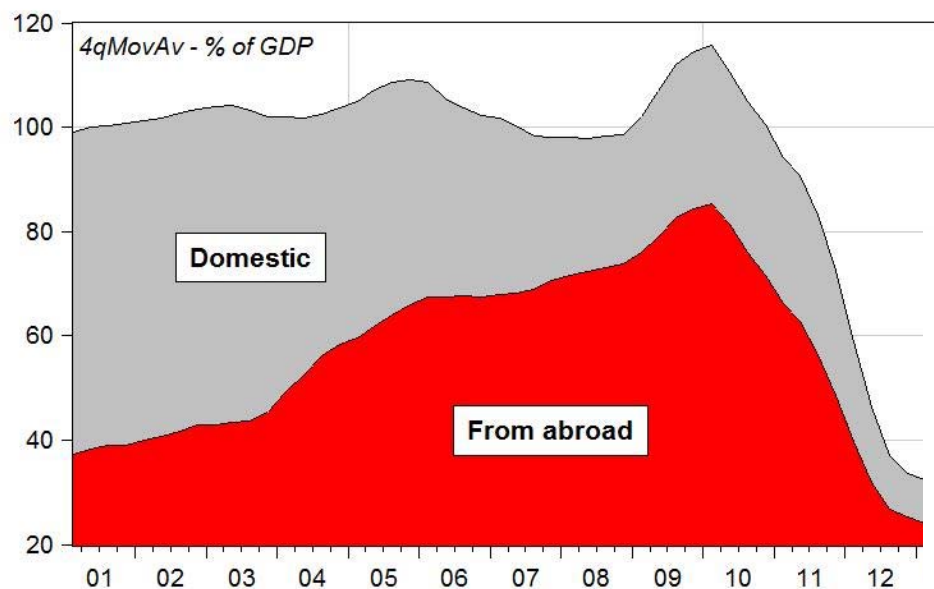
The long recession has brought unemployment to unprecedented levels.

This has implied a dramatic decline in nominal wages. Prices have followed more slowly, implying a fall in real wages, and a small improvement in price competitiveness.

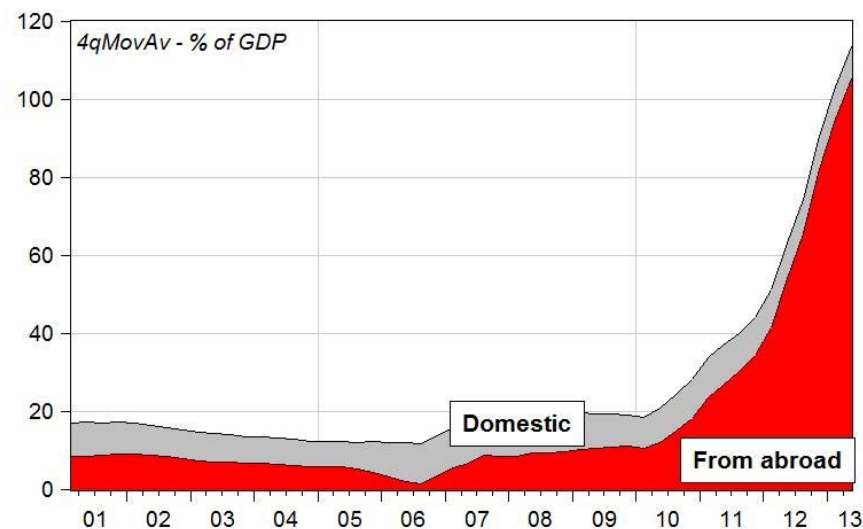


«Helping» the Greeks

Greece. General government gross debt
Long term securities



Greece. General government gross debt
Long term loans



«Helping» the Greeks #2

When Papandreou went to power, he could have chosen to exit the euro, and convert all existing obligations under Greek law in a new drachma.

This would have caused capital losses to foreign creditors, by the extent of the devaluation of the drachma against the euro.

Nowadays the value of public debt under Greek law is negligible



«Helping» the Greeks #3

	2010	2011	2012	2013	2014	Σ
Δ Long term loans from abroad	24.3	30.0	110.0	30.8	5.6	200.8
Decrease in foreign holding of government securities	19.9	24.4	44.3	8.0	7.8	104.5
Gov acquisition of equities issued by the domestic financial sector	0.2	0.9	0.0	19.0	0.0	20.2
Capital account transfers	3.7	3.8	8.6	23.4	1.9	41.4
Interes payments	13.2	15.1	9.7	7.3	7.0	52.3
DIFFERENCE	-12.7	-14.2	47.3	-26.9	-11.1	-17.7



The sequence of events #3

- As fiscal austerity levels off, and prices in the tourism sector decline, the economy starts a modest recovery in 2014
- The timing of elections is set to put Syriza in (more) trouble with payment deadlines
- With long and fruitless negotiations, uncertainty grows and liquidity dries up
- Tsipras calls for a referendum, hoping to gain more negotiating power. He gets the opposite result
- Tsipras surrenders



What next?

With no change in policies, and adopting the new memorandum, we estimate that the government will probably fail its primary balance target this year, but may reach it in the next two years.

The cost will be a further drop in output (about 5% over two years) and a further increase in unemployment.

This is already taking into account a moderate increase in tourism in 2015.



The alternatives

1. Changing the rules of the Eurozone
2. Gr€xit
3. Geuro
4. Fiscal certificates



Gr€xit - pros

Exiting the euro restores the ability to devalue the currency, making exports more attractive and imports more expensive.

Restores the ability to manage monetary and fiscal policy



Gr€xit...

However, our estimates of price elasticities for trade give low values. This implies that a devalued drachma will take time to generate a large enough increase in exports.

Tourism has increased, but lower prices are only part of the reason, if at all.

The introduction of a new currency will also take time, and require external finance.

It would obviously imply defaulting on the existing foreign debt (Target2 will stay).



A parallel currency?

Proposal for introducing a parallel currency have been flourishing in the last year!

- Convertibility?
- A currency backed by... (gold; reserves; future CA revenue; future tax revenues; nothing...)
- How much currency to inject?
- A currency for which transactions?
- Re-denomination of existing financial assets?
- What fiscal/monetary policy will follow?



Our Geuro proposal

- Convert part of public wages and pensions from euro to Geuro
- Increase wages and pension using Geuro
- Use Geuro to finance an Employment of Last Restort program
- Convert government debt obligations to domestic financial sector to Geuro
- Accept Geuro in payment of taxes, up to a given percentage



An alternative: FCCs

- Fiscal Credit Certificates would entitle the owner to a discount on future taxes
- Increase public expenditure using FCCs, along the lines of the Geuro proposal
- Recipients of FCCs are expected to sell them at a discount to get liquidity
- The success of the program depends on the size of the discount



Would such alternatives work?

- Our simulations show that a Geuro plan of an appropriate size would not generate a CA deficit, would immediately reduce unemployment and would make it feasible for the government to achieve primary surpluses in Euro (against a deficit in Geuro)
- But consequences on Geuro-inflation are impossible to predict



Stock-flow lab

- In the lab we will show how to build a simple stock-flow-consistent model from the very beginning.
We will use Open Office (www.openoffice.org) for calibrating the initial matrices. (You may use Excel for the same purpose)
- We will use Eviews (www.eviews.com) for model simulation.
- Recently, Antoine Godin has released a first package for solving SFC models in R (www.r-project.org; <http://www.antoinegodin.eu/sfc>)



Resources

- <http://sfc-models.net>
a web site designed for discussing SFC models and share ideas, models, software programs ...
- <https://www.facebook.com/groups/864213403637227/>
Stock-flow Consistent modeling
- <http://ius.unicas.it/ATutor>
Course on “Introduction to macroeconomic models” (needs updating!)

