Introduction to SFC Dynamic Models

Lecture F Empirical SFC Models (using *Bimets*)

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Download lectures' material from:

https://github.com/marcoverpas/Six_lectures_on_sfc_models

Schedule

A. Foundations of SFC Models for Economic Research
B. A Toy Model with State Money and Bills
C. A Toy Model with Bank Money and Fixed Capital
D. Multi-Country SFC Models
E. Ecological and Input-Output SFC Models
F. **Empirical SFC Models (using *Bimets*)**

Box 1 Steps for developing a SFC model

1. Identify sectors to be modelled (households, firms, etc.)
2. Create balance-sheet (BS) of the economy
3. Create transactions-flow matrix (TFM)
4. Write down identities from the TFM:
    i. Use columns to derive budget constraints
    ii. Use also rows with multiple entries
    iii. Identify buffer variables
5. Define behavioural equations and equilibrium conditions

Box 2 How to install *R* and run a toy model

a) Download and install *R* (free software)

b) Download and install *R-Studio Desktop* (free version)

c) Alternatively, use Posit Cloud (free online platform for *R* and *Python*)

d) Get familiar with *R* using the Cheat Sheet

e) Download toy models from my GitHub repository

f) Open the file and execute the entire code by clicking Source or run it line by line using Run

g) Check model variables (Data) and coefficients (Values) in the top-right pane, named Global Environment

h) Charts are displayed in the Plots tab in the bottom-right pane

i) Tables and Sankey diagrams are displayed in the Viewer tab in the bottom-right pane (note: always re-run the last coding block to visualise them)

Types of Empirical SFC models

- Empirical SFC Model**s** are SFC models whose coefficients are calibrated or estimated based on observed data. They are usually developed for studying national economies.

- There are two branches of Empirical SFC models:

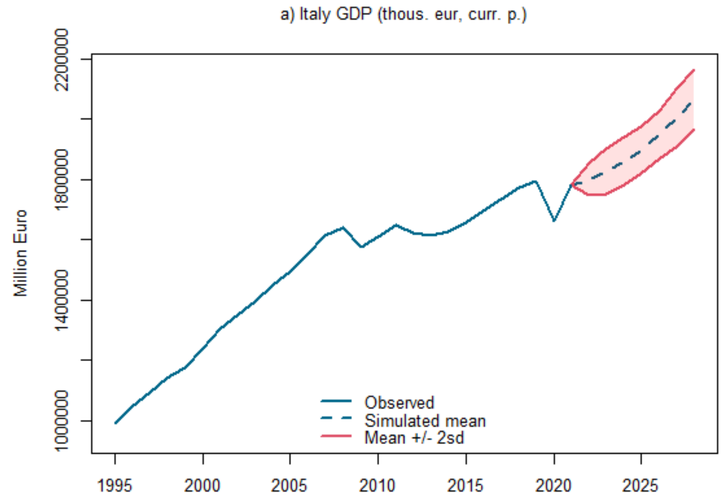
  - Type I or data-to-theory models: these models are tailored to the country-specific sectoral balance sheets and flow of funds statistics of the economy under investigation. They include early SFC models and the Levy model (Zezza 2019).

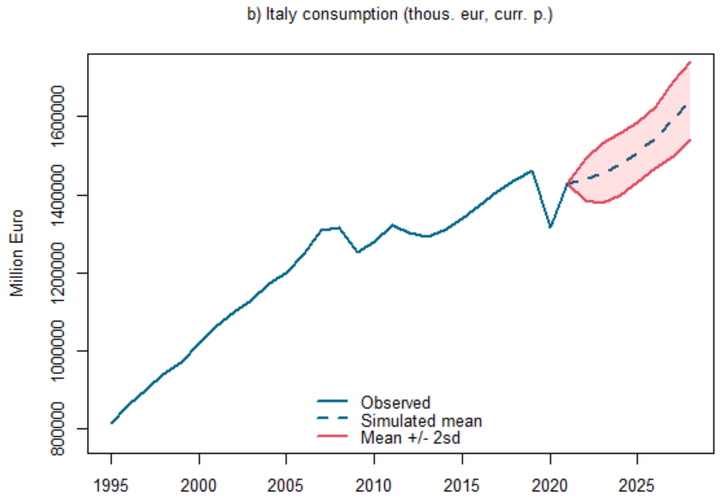
  - Type II or theory-to-data models: these models are developed based on a theoretical SFC model, and then data are collected and adequately reclassified to estimate the coefficients of the model (e.g. Canelli et al. 2022).

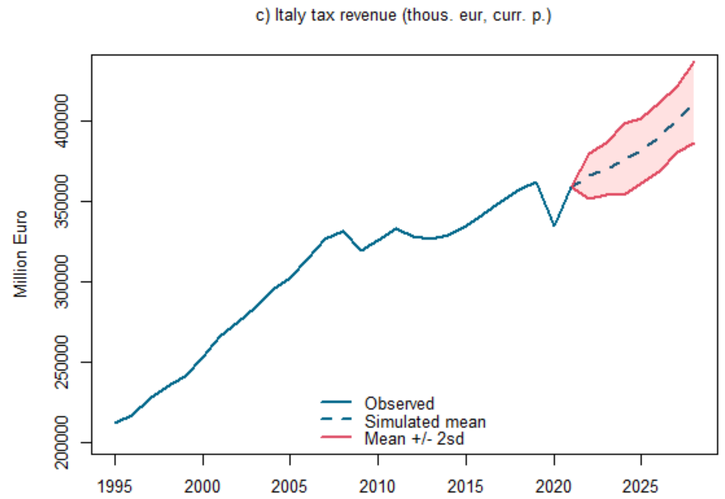
The *Bimets* package for *R*

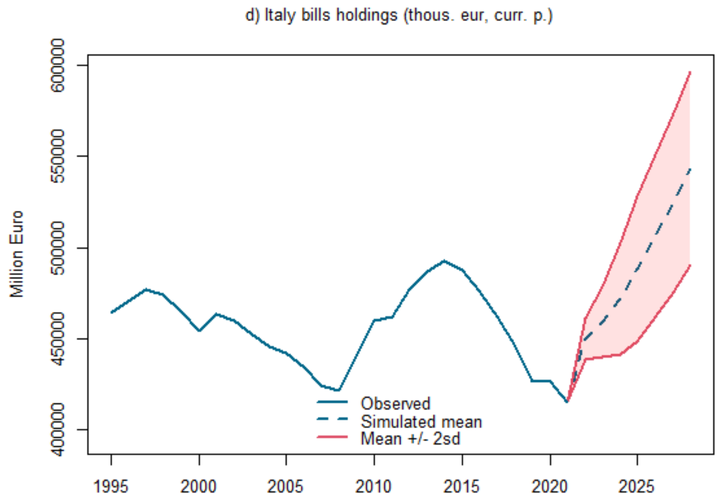
- Bimets is a software framework for *R*, designed for time series analysis and econometric modelling (here is the reference manual).
- It allows creating and manipulating time series, specifying simultaneous equation models, and performing model estimation, structural stability analysis, deterministic and stochastic simulation and forecasting, and optimal control.
- It can be conveniently used to develop, estimate and simulate empirical SFC models, especially Type II models.

Example: turning PC into an empirical model









Box 3 Steps to create an empirical SFC

a) Download and install Bimets (free) using Packages / Install / bimets

b) Recall library in *R* (*Rstudio*): library(bimets)

c) Download and reclassify data in a consistent way (create BS and TFM) (here)

d) Define model equations and load data into the model (here)

e) Create tables (here) and Sankey diagram (here)

f) Run the model:

   i. Create in-sample predictions to verify model fit. Two options: unadjusted and adjusted (here).

   ii. Create and use out-of-sample predictions as baseline scenario. Two options: deterministic and stochastic (here)

g) Create alternative scenarios to be compared with the baseline using adjustment list (here)

Useful web resources for SFC modellers

Authors	Description	Link
Alessandro Bramucci	**Interactive Macro** - Website collecting a series of simulators programmed in R and Shiny of some famous macroeconomic textbook models.	Link
Alessandro Caiani	**JMAB** - Simulation tool designed (with Antoine Godin) for AB-SFC macroeconomic modeling.	Link
Yannis Dafermos	**DEFINE** - Ecological stock-flow consistent model that analyses the interactions between the ecosystem, the financial system and the macroeconomy (developed with Maria Nikolaidi and Giorgos Galanis).	Link
Michal Gamrot	**Godley package** - R package for simulating SFC (stock-flow consistent) models.	Link
Antoine Godin	**SFC codes** - R and Python codes collected from seminars and lectures.	Link
Andrea Luciani	**Bimets package** - R package developed with the aim to ease time series analysis and to build up a framework that facilitates the definition, estimation, and simulation of simultaneous equation models.	Link
Joao Macalos	**SFCR package** - R package providing an intuitive and tidy way to estimate stock-flow consistent models.	Link
Jo Michell	**SFC codes** - R and Python codes collected from seminars and lectures.	Link
Franz Prante and Karsten Kohler	**DIY Macroeconomic Model Simulation** - Platform providing an open source code repository and online script for macroeconomic model simulation.	Link
Marco Veronese Passarella (marxianomics)	**SFC codes** - R, Python, Matlab and EViews codes collected from papers, seminars and lectures.	Link
Marco Veronese Passarella (GitHub)	**SFC codes** - R, Python, Matlab and EViews codes collected from papers, seminars and lectures.	Link
Gennaro Zezza	**sfc.models.net** - Repository containing original EViews (and Excel) codes that replicate experiments from Godley and Lavoie's "Monetary Economics", and additional (R and EViews) codes from the SFC literature.	Link

Selected references

KEY READINGS

- W. Godley and M. Lavoie (2007). *Monetary Economics. An Integrated Approach to Credit, Money, Income, Production and Wealth*. Palgrave Macmillan, chapters 1, 2, 3, 4, 7.

ADDITIONAL READINGS

- W. Godley (1999). Seven Unsustainable Processes. *Levy Institute Strategic Analysis*, January 1999.
- C.H. Dos Santos (2006). Keynesian Theorising During Hard Times: Stock-Flow Consistent Models as an Unexplored 'Frontier' of Keynesian Macroeconomics. *Cambridge Journal of Economics*, 30 (4), 541-565.
- M. Nikiforos and G. Zezza (2017). Stock-Flow Consistent macroeconomic Models: A Survey. *Journal of Economic Surveys*, 31 (5), 1204-1239.
- Emilio Carnevali, Matteo Deleidi, Riccardo Pariboni, Marco Veronese Passarella (2019). Stock-Flow Consistent Dynamic Models: Features, Limitations and Developments. In: Philip Arestis, Malcolm Sawyer (eds.): *Frontiers of Heterodox Macroeconomics*, Palgrave Macmillan, 2019, pp. 223-276.

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Thanks

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