DEPLOYERS: An agent-based modeling tool for multi-country real-world data

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Author: Martin Jaraiz
Co-Authors: Ruth Pinacho

We present recent progress in the design and development of DEPLOYERS, an agent-based macroeconomics modeling (ABM) framework, capable to deploy and simulate a full economic system (individual workers, goods and services firms, government, central and private banks, financial market, external sectorsâ€¦) whose structure and activity analysis reproduce the desired calibration data, that can be, for example a SAM, or IOT or SUT.
Here we extend the previous work(*) to a multi-country version and show an example using data from a 36 countries, 64 sectors IOT. The simulation of each country runs on a separate thread (or CPU core) to simulate the activity of one step (month, week, or day) and then interacts (updates imports, exports, transfersâ€¦) with that countryâ€™s foreign partners and proceeds to the next step. This interaction can be chosen to be aggregated (a single row and column) or disaggregated (64 rows and columns) for each partner. A typical run simulates thousands of individuals and firms engaged in their monthly activity and then records the results, very much like a survey of the countryâ€™s economic system. This data can then be subjected to, for example, an Input-Output analysis to find out the sources of observed stylized effects as a function of time in the detailed and realistic modeling environment that can be easily implemented in an ABM framework.
As an example, a typical personal computer with 4 cores can run the simulation of Spain with France as disaggregated, and Germany, the US, and the Rest of World (RoW) as aggregated external sectors. These three countries are simulated each on a core. The computation time is approximately 2 to 4 times a simulation of only Spain plus the RoW (minutes or hours), because of the 64 external sectors rows and columns from France. Memory requirements are not a limiting factor. Thus, hardware with 36 cores can run a World simulation with the 36 countries plus the RoW, each interacting in detail with a few of its most active partners.
This development enables the use of the ABM approach as a tool for IOT analysis and policy making, that was hindered by the difficulty to initialize an economic system that could mimic the real one to be simulated. It also paves the way for unleashing the expected high performance of ABM models to deal with the complexities of current global macroeconomics, including other layers of interest like ecology, epidemiology, or social networks, among others.

(*) â€œAn agent-based modeling approach for real-world economic systems: calibration with a Social Accounting Matrix of Spainâ€•, 29th IIOA Conference in ALGHERO, Sardinia, Italy. (Abstract + Paper)