OG-IDN: Interpreting Output

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Some reminders about OG-Core/OG-IDN

- Quantities in the model are in units of real GDP, not in local currency units
  - Recall the calibration - we match quantities as fractions of GDP, not in rupiah
- This is a structural model, capturing individual and firm behavior and aggregating from there
  - It is not an econometric forecasting model

The Lucas Critique

The Lucas Critique: past empirical results are not necessarily informative about future behavior because conditions and policy change.

- The LC is why economists like to use “structural models”, where parameters of model “primitives” can be calibrated/estimated separately from other parameters (e.g., policy parameters)
- With structural models, one can more accurately simulate counterfactuals (e.g., what would happen to labor supply with a basic income?)

Robert E. Lucas (1937-2023)

Basic output

With any model run, two output files are saved:

1. `SS_vars.pkl`: a Python dictionary of stead-state output
2. `TPI_vars.pkl`: a Python dictionary of transition path output

Recall, the `*.pkl` is a "pickle" file, which saves a Python object and needs to be opened in Python

Necessary because data objects have different shapes, but there are some utilities to save (at least parts) of the output to more general formats (and could always dump to JSON)

Transition Path Outputs

There are 3 types of variables saved from the transition path solution:

- Macro time series (length T): GDP, Investment, Aggregate Consumption, Gov't Revenue, Pension Outlays, ...
- Household-level data (mostly: $T \times S \times J$): consumption, savings, labor supply, tax liability...
  - There is also household consumption data by consumption good. This has dimension $T \times S \times J \times I$.
- Industry-level data ($T \times S \times M$)

Figures

- OG-Core has a number of functions to plot output in `ogcore.output_plots`:
  - `plot_aggregates`: plot time series of macro variables
  - `plot_industry_aggregates`: plot time series of industry aggregates
  - `plot_gdp_ratio`: plot time series of macro variables as percentages of GDP
  - `ability_bar`: bar plot of changes by skill type
  - ...
  - `plot_all`: Produces a bunch of commonly used plots and saves the to a specified directory

Tables

- OG-Core has a number of functions to plot output in `ogcore.output_tables`:
  - `macro_table`: Table of macro variables over given model periods
  - `ineq_table`, `gini_table`: Tables summarizing inequality measures
  - `dynamic_revenue_decomposition`: Decomposition of how revenue changes due to rate changes, microeconomic behavior, macro feedback

To CSV format

- `ogcore.tp_output_dump_table`:
  - Creates a table with all the macro time series from the transition path solution
  - Can output as CSV, Excel, or other formats
- Any of the tables from `ogcore.output_tables`
  - e.g., `macro_table`
  - Can also save as Excel, Markdown, TEX

Model Units

- Economists know that only *relative prices* matter
- In OG-Core, everything is normalized to one of the output goods (called the *numeraire* good)
  - If a single production sector, the normalization is a unit of GDP
- Being a *real* model, OG-Core/IDN quantities are given in the units of the numeraire good
- Warning: Don't just use model quantities straight away!

Percentage Changes

- Probably the most common way we interpret output from OG-Core is through *percentage changes*
- That is, we simulation a baseline situation and the counterfactual and find the percentage difference between the two:

$$\%\Delta = \frac{Y_{\text{counterfactual}} - Y_{\text{baseline}}}{Y_{\text{baseline}}}$$

- NOTE: coming from our backgrounds in public finance, we often call these two simulations the “baseline” and “reform”

Percentage Changes to Levels

Computing these percentage changes also gives you a nice way to return back to levels:

- Take your best economic forecasting model and look at the economics forecast given future policy
- A apply the percentage changes from your simulations to this baseline forecast to get a counterfacutal forecast:

$$Y^{IDR}_{\text{counterfactual}} = Y^{IDR}_{\text{forecast}} \times \%\Delta$$

Stationarization

- Recall that OG-Core allows for long run growth – both from technological progress as well as population growth
- But to solve the model, it must be *stationarized* (i.e., this growth must be taken out)
- Thus, model units, taken straight away, do not account for this underlying growth
- If the baseline and reform have the same population dynamics and assumptions about underlying growth, this is not a problem when computing percentage changes