Adjusting household savings rates in the METRO Model databse

The savings rate adjustment program, METRO_SADJ.gms, allows users to adjust the savings rates in the model database to specific rates, like those found in secondary sources. Calibrating to a new rate requires adjusting the social accounting matrices (SAMs) of each region such that the rates inherent in the SAM are equivalent to the target level. This is done by running an experiment using the target rate as the shocks and a closure setup designed to minimize changes to a region's GDP. Initially, the model is solved one region at a time with the variables linked with other regions held fixed (imports from and remittances to the other regions, as well as the other regions exchange rates and household incomes). This initial presolve is used to find the optimal starting point for when the model solves all regions at once. After the optimal starting point is found, the model is solved for all regions with a set of closures to minimize GDP changes. Specifically, the government income and expenditure are assumed fixed and the internal balance remains flexible. The regional savings rates, which is the combination of the government and household savings and income is fixed. Lastly, exchange rates are assumed fixed and a region's trade balance are allowed to vary. The output of the adjustment program is a new model database.

To better control how the SAMs changes as a results of calibrating the savings rates, users may set targets for the government balance as share of GDP and income tax rates. The target for the government balance share of GDP prevents the household savings rate adjustments to be fully carried by adjustments in government savings. The target income tax rate is not strictly necessary, but is included in the program to adjust them when they are found to be incorrect. This also provides a template for adjustments of other parameters that the user may wish to adjust. All three may be calibrated at once or in susbsequent model simulations. It is recommend that users examine the resulting database to ensure that the adjustments made in the callibration are reasonable.

Box 1. Quick Start Instructions

1. Using the model interface to calibrate the analysis file
2. Check the savings rate [SHH] and determine which regions require adjustment
3. Compile targets into the input excel file (s_f_r_SADJ.xlsx)
4. Modify METRO_SADJ.gms
   a. Update the name and location of the file with target rates (s_f_r_SADJ.xlsx)
   b. Set the global variable ResFile with the name of new, adjusted, analysis file
   c. (optional) select which of the three target rates to calibrate
   d. (optional) change number of steps for model solves
5. Using the GAMSIDE (or the more recent GAMS Studio, or calling gams.exe from the command line), run METRO_SADJ.gms using the parameters file (g00) produced in step 1 as the restart file.

1. Inputs of the savings rate adjustment program

The calibration program requires four elements: the analysis database; the parameters file (g00) saved after calibration; target rates; and the GAMS program METRO_SADJ.gms.

Users are familiar with the first two elements as the database and the parameter file are used when running a model simulation. It is recommended that, in the initial calibration of the analysis database, no modules be turned on, no unemployemt used, and the model closures are set to default.

Targets rates

- s_star(r) household savings rate (%)
- g_star(r) government balance as a percentage of GDP (%)
- dt_star(r) direct income tax rate (%)

The household savings rates is the primary target for this exercise. At a minimum, the user should compile information of household savings rate for each region requiring adjustment. However, targeting all three rates helps to control the adjustments of the SAM by calibrating the change in household savings rate, government balance, and income tax rate to data that in theory should be aligned with each other.

The rates should be compiled into one excel file that will be called by the gams code. It is recommended that the input excel file containing the target rates is saved in the "database" folder of the project. The file should follow METRO's naming convention: s_f_r_SAMADJ.xlsx. Note that a template is provided in the folder "Template_projects\Other" of the METRO model version 3.

Input excel file: s_f_r_SAMADJ.xlsx

The excel file contains two worksheets:

- Worksheet: "Layout" used by GAMS to read in the rates on worksheet "set_data".
- Worksheet: "set_data" contains the regions to adjust and the target rates.

The worksheet "set_data" is where users will input the target rates.

- Column a: set of regions requiring savings rate adjustment (refreg)
- Columns c and d: regions (refreg) and target house holdsavings rate (%)
- Columns f and g: regions (refreg) and target goverment balance share of GDP (%)
- Columns I and j: regions (refreg) and income tax rate (%)

Tip: enter rates as percentages. For example, enter 10 for a rate of 10%.

2. GAMS code

The GAMS code that adjusts the savings rate is found in the "Model" folder. In order to adjust the savings rates, users will run METRO_SADJ.gms using the GAMSIDE (or the more recent GAMS Studio, or calling gams.exe from the command line) with the parameters file created during the initial calibration step as the restart file.

TiP: In the initial calibration ensure, that no modules are turned on, no unemployemt is used, and the model closures are set to default.

The GAMS code is composed of one main file and several include files, three of which are used only for the savings rate calibration. The three are listed below.

- METRO_SADJ.gms (main file)
- METRO_SADJ_presolve.inc (called by the main file and not part of standard model. The include file solves the model with the new targets one region at a time).
- METRO_reassignGUI_SADJ.inc (called by the main file and creates the result parameter which is then used to create the new SAM)

User action

Users will only make changes in the main GAMS file (METRO_SADJ.gms). To adapt the code for a particular project, the user will:

1. Update the global variable "ResFile" on line 10. "ResFile" is the name of the new SAM gdx file. This new file will be saved in the "dataset" directoy.
2. Update the location of the name and location of the excel file that contain the target rates (Figure 1).
3. (Optional) Users may also change the number of steps if the shocks are too large and the model does not solve. The global variable "smallsteps" found on line 77 is where the users may set the number of steps (See Figure 2).

The program is set up to calibrate the three target rates at once. However, to help the model solve, the user may choose to calibrate one set of rates at time. This is done by commenting out the appropriate targets in the section "implement shocks" found on line 90 (See Figure 2).

Also note that if you do not have target rates for the government balance ratio and income tax rate, then base levels are assumed.

Figure 1. METRO_SADJ.gms user action required

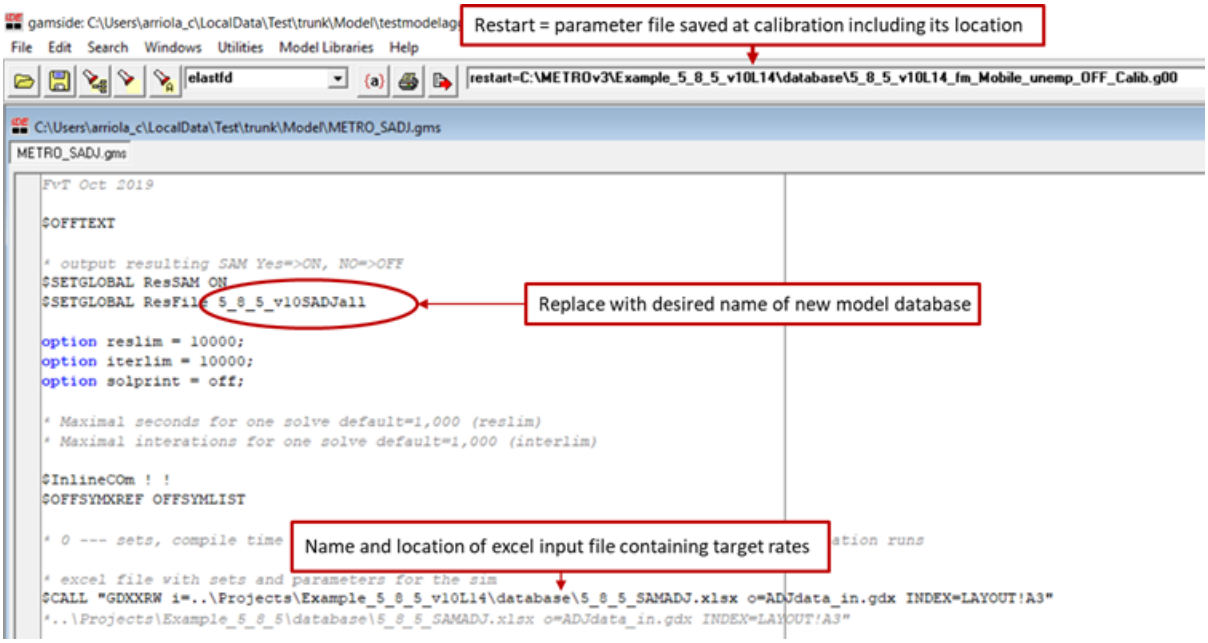
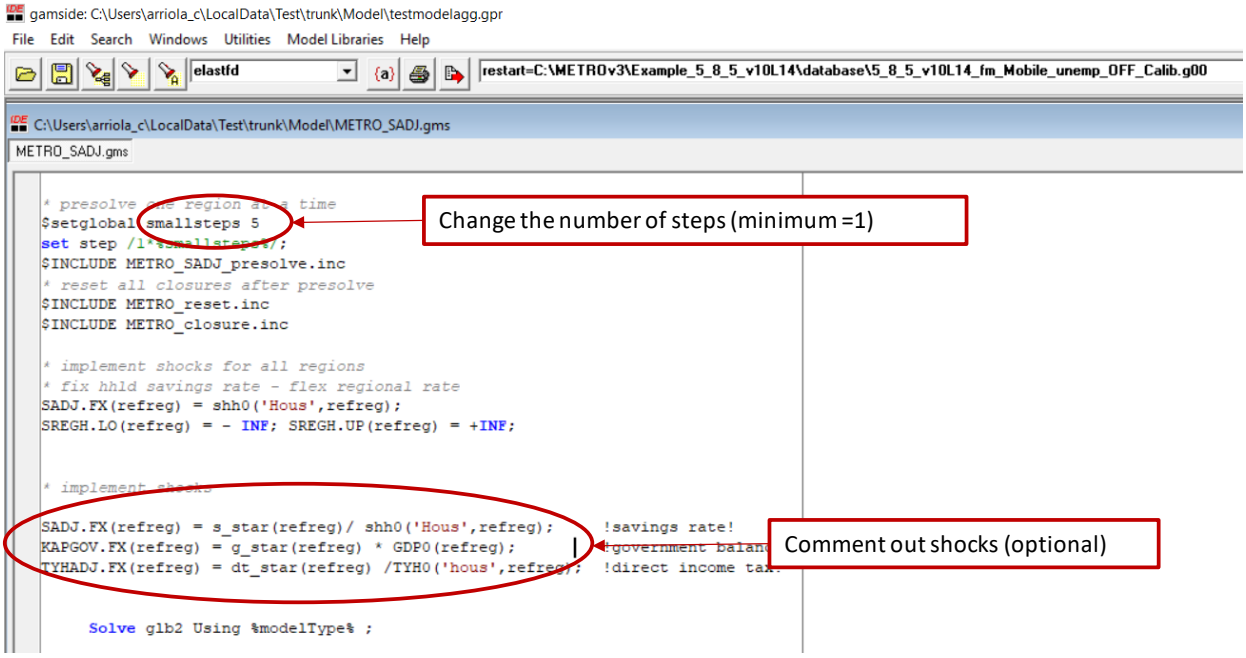


Figure 2. METRO_SADJ.gms optional settings



3. Output

After the METRO_SADJ.gms program completes, a new database will be written to the "database" directory of the project. The name of the file will be the "Resfile" name the user entered in the GAMS code and endding with "_SAM" (Figure 3). This database can now be used as the database input of the model calibration.

Figure 3. Example 5_8_5_v10L14 project with output database from METRO_SADJ.gms

