Global CGE Modelling Course: ANARRES_t Exercises Mod G3

cgemod

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1. Introduction

The two exercises in this part of the ANARRES_t programme extend those done in Modules G1 and G2, but while those exercises concentrated on model and GAMS skills with some focus on analysing the results, these exercises focus heavily on 'interpreting model results' with minimal attention to the model and GAMS skills.

The first exercise in this part of the course, G3.1, uses the database, model and experiments you have developed in exercises G1.1 to G2.4. The second exercise in this part of the course, G3.2, uses the same model but requires you to change the database to a bigger database, and then analyse a competitiveness shock.

The two exercises are important steps in the development of your abilities to analyse the results from models and to interpret the results. The emphasis is on analyses and not just the reporting of the results. After each exercise, there is a project with questions based on the work in the exercise.

All the files needed for these exercises are already in the course library.

RESIST THE TEMPTATION TO EXPLORE THE CONTENTS OF THE LIBRARY; THAT WAY LIES CONFUSION. YOU GET TO SEE AND USE ALL THE FILES.

2. Ex G3.1 Interpreting Model Results I: Trade Policy

This exercise expands on the trade policy analysis you did as Project G2. You will analyse a Free Trade Agreement between the OECD and Africa with partial liberalisation in agriculture and different tax replacement options The model and experiment data files and the experiment and closure files are provided; so, you will need to link the relevant files together. The reason for not getting you to code the files is that the objective of this exercise is the interpretation of a **specific** set of results; by pre-coding the experiments we ensure that the desired results will be realised **if** the files are linked correctly.

Context of the Free Trade Agreement between OECD and Africa

1. Objective: full bilateral liberalisation of trade between OECD and Africa.
2. Restrictions: OECD seek to exclude liberalisation of agricultural trade but insist that if Africa wants the liberalisation of other trade Africa must reduce barriers on ALL trade with OECD.
3. Surplus labour: In Africa wages are assumed to be fixed and there is a surplus supply of unskilled labour.
4. Tax replacement: ALL regions must maintain fixed internal balances; regions prefer income tax (*TYH*) as the tax replacement instrument BUT Africa might have to use production taxes (*TX*).
5. Policy advice: Africa lacks policy analysis expertise and hence needs (impartial) advice on the implications of the free trade agreement.

Loading the Model Files

1. Create a new directory for this exercise `C:\cgemod\anar_t\anar_t31.`
2. Open GAMS Studio and select `File>New Project` , find the subdirectory `anar_t31` and create a new project – we suggest calling the project `anar_t31`.
3. In GAMS Studio press `F6` and in the Model Library Explorer then select the tab `Global CGE Course Library` and select and double click `anar_t3`, which is SeqNr: 03. This will add the files `anar_t.gms, anar_t_expt.gms, clean_anar.dat` and `anar_t_G3.zip` to your working directory. Unzip the file `anar_t_G3.zip` into the directory `C:\cgemod\anar_t\anar_t31`.
4.

5. The `anar_t.gms` model will now be displayed in the editor window and be listed in the Project Explorer as being in the project `anar_t31`.
6. If you right-click on the project name and select `Open Location`, you will see the files downloaded to the directory `C:\cgemod\anar_t\anar_t3`. There will be a ZIP file (`anar_t_G3.zip`) in the directory, this needs to be unzipped into the directory `C:\cgemod\anar_t\anar_t31`.
7. Check that the correct data files for this exercise are selected `SAMG_4_4_3_anar_t_8.gdx` and `data_4_4_3_anar_t_8_G2_1_sol.xlsx`.
8. We want to modify the elasticities used to conduct this FTA experiment.
9. The percentage changes in imports by trade partners following a change in tariffs depend, in part, on the elasticity of substitution between imports and domestic goods and the elasticity of substitution between imports from different source regions. One option is to use elasticities reported in the GTAP database; alternatively, you, the researcher, can assign the elasticities. In Excel, open the file, `data_4_4_3_anar_t_8_G2_1.xlsx` and review the tab "`controls`". Set the controls for Armington elasticities, "`armscal`" = 1 and the control for the CET elasticities, "`cetscal`" = 1. This means the values for the elasticities are assigned in the Excel workbook; examine the tabs "`comelastm`", "`comelastrm`", "`comelaste`", "`comelastre`" in the workbook.
10. To verify that the user assigned Armington and CET elasticities are used, in GAMS Studio open the file `anar_t.gms` (use `Open in a New Project` if the project has been closed) and run (`F10`) the model with `s=save` in the command line. Review the values for `rhoc, rhom, rhot, rhoe`. Verify that these values are consistent with the values in Excel.
11. Verify that the model has been solved correctly. Carry out the standard checks to ensure that the model ran correctly.
12. Use `Open in a New Project` and open the file `anar_t_expt.gms`.
13. Check that the correct data and experiment files for this experiment are selected `data_anar_t_expt_G3_1.xlsx` and `anar_t_expt_G3_1.inc`.
14. Run the model with `r=save` in the command line.

15. Check that the results have been written out to the directory `6_results/interp1`.
16. Verify that the described shocks and closures have been implemented: open `anar_t_reslevel.gdx` and check `resTM, resTYHADJ, res TXADJ` and `resWF`.

Alternative Elasticities

These experiments could have run easily with other elasticities.

1. Rather than use assigned elasticities, you can use the elasticity values that are aggregated from the GTAP database. In Studio open the file `anar_t.gdx` and review `ELASTMG(c,r)` and `ELASTRMG(c,r)` – these are the Armington elasticities aggregated from the GTAP database. (These data are also in the file `samg_4_4_3_anar_t_8.gdx`, see the parameters `esubd2` and `esubm2`).
2. The values for the elasticities for Armington CES over regions (see `ELASTRMG(c,r)`) are high. One option is to scale them. In the file `data_4_4_3_anar_t_8_12_1.xlsx` open the sheet "`controls`". To turn on the GTAP elasticities set `armelast = 2` and scale the GTAP elasticities by setting `armscal = 2`.
3. Note that this would require rerunning the model `anar_t.gms` to pass the revised elasticities to the model. Save the Excel file and rerun the model `anar_t.gms` with `s=save` in the command line. Verify that the intended elasticity values have been loaded into the model.

Analysis of a Free Trade Agreement between OECD and Africa

To analyse the FTA between the OECD and Africa, answer the following:

1. What are the implications for Africa and the OECD?
2. What are the implications of the OECD not liberalizing agriculture?
3. What are the implications for Africa of not being able to use income taxes, TYH, as a tax replacement instrument?
4. What causes the welfare effects experienced by Africa?
5. What additional simulations would you recommend?

Project G3.1

Compile your results as tables or graphs in a Word document, a maximum of 6 pages including tables and graphs, with your analysis of a Free Trade Agreement between the OECD and Africa.

3. Ex G3.2 Interpreting Model Results II: Competitiveness Shock

For this exercise (G3.2) we will use a different aggregation of the GTAP database to consider a different policy shock – competitiveness changes by selected activities in selected regions. The model and experiment data files and the experiment and closure files are provided; so you will need to link the relevant files together. The reason for not getting you to code the files is that the objective of this exercise is the interpretation of specific set of results; by pre-coding the experiments we ensure that the desired results will be realised.

Loading the Model Files

This element of the exercise concentrates on setting up the version of the model that will be used for this series of exercises and testing that it is running correctly. Recall that all the equations, variables, and parameters in the model are indexed over sets; here we change the elements of the sets to be consistent with the SAMS for the new data aggregation.

1. Create a new directory for this exercise `C:\cgemod\anar_t\anar_t32.`
2. Copy the entire contents of sub directory `anar_t31` and paste them into the sub directory `anar_t32`. (You could have continued to work in anar_t31, but this ensures that you do not 'corrupt'/lose any the work you did for exercise G3.1).
3. Choose File>Open in New Project and select the file `anar_t.gms` that is in the sub directory `C:\cgemod\anar_t\anar_t32.`
4. The `anar_t.gms` model will now be displayed in the editor window and be listed in the Project Explorer as being in the project `anar_t32`.
5. In the file `anar_t.gms` make sure that any experiment files that are INCLUDED are commented out. Also, be sure the analysis file is commented out.
6. Check that the correct data files for this exercise are selected `samg_6_5_6_anar_t_8`.gdx and `data_6_5_6_anar_t_8.xlsx`.
7. In GAMS Studio open the file `anar_t.gms` and run (`F10`) the model with `s=save` in the command line. Review the values of `rhoc, rhom, rhot, rhoe.` Verify that these values are consistent with the values in the Excel file.
8. Verify that the model has been solved correctly. Carry out the standard checks to ensure that the model ran correctly.

Running the Competitiveness Shock Experiment

Once the model has been set up with new sets and data and tested to ensure it ran correctly, we can move on to implementing the experiment.

1. Use `Open in a New Project` and open the file `anar_t_expt.gms`.
2. Check that the correct data and experiment files for this experiment are selected `data_anar_t_expt_G3_2.xlsx` and `anar_t_expt_13_2.inc`.
3. Run the model with `r=save` in the command line.
4. Check that the results have been written out to the directory `6_results\interp2`.
5. Verify that the described shocks and closures have been implemented: open `anar_t_reslevel.gdx` and check `resTM, resTYHADJ, res TXADJ` and `resWF`.

Questions/Challenges

Your task is to explain the results you generated and the differences in the effects of the same competitiveness shock in two different regions. Here are three questions to get you started.

1. What happens to production in each activity in the region in which there is a productivity shock?
2. What happens to factor returns?
3. Why does a productivity shock in Australia/New Zealand have effects that are different from a productivity shock (of the same magnitude) in North America?

Project G3.2

Compile your results as tables or graphs in a Word document with your analysis of productivity shocks in two different regions.

NOTE: It is your task to **EXPLAIN** the results **NOT** just report the results. Your answers should **explain** why the same apparent productivity shock in Australia/New Zealand has different effects to the same shock in North America.