




# *Nested Functions Exercises 3*



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## *Outline*

- Introduction
- smod\_t2.gms with different data
  - Adjust model data load
  - Rerun previous experiment
- smod\_t3.gms
  - Assign equations
  - Check
  - Rerun previous experiment
  - Compare results
- Change nesting structure in smod\_t3.gms
  - Data
  - Rerun previous experiment
- Comparing Results



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 ***Course Library & Working Directory***

- All the files for these exercises are already in your course library
  - C:\cgemod\cgemod\_lib\pract\_lib
- Create a New Project (File>New Project)
  - C:\cgemod\pract\smod\smodt3
- The library index file in Model Library Explorer
  - Practical CGE Library
  - Item 12 will be used

**Create a new directory smodt3, i.e.,  
cgemod\pract\smod\smodt3** 

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***smod\_t2 with different data***



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## *Data*

Well-designed models should be able to run with different data when

- Behavioural relationships are **unchanged**
- SAM structure is **unchanged**

**Review smod\_t\_mod06\_t3.xlsx**  
Same SAM structure as in *smod\_mod06\_t2.xlsx*

|    |                        |
|----|------------------------|
| 10 | commodities/activities |
| 5  | ‘natural’ factors      |
| 2  | households             |
| 5  | Tax instruments        |

**ALL elasticity values are ‘place holders’** 

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## *Change Data for smod\_t2*

1. Open *smod\_t2.gms* in Studio
2. In the file *smod\_t2.gms* open the file *smod\_t2\_load.inc* (use Ctrl+click on the \$INCLUDE statement)
3. Change the \$GDXXRW instruction to load the data file *smod\_t\_mod06\_t3.xlsx*
4. Run the programme (F10) and check the model is running correctly

The ability to change data used by a ‘standard’ model is valuable

- When making changes to behaviour in a model starting with an aggregated SAM is useful
- Sometimes a model can be used for different SAMs

**Do NOT change data to match a model** 

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## *Experiment*

### Trade policy experiment from Module O5

**Experiment File**

1. Use the file `smod_t2_exp2.inc` used with `smod_t2`,
2. Make any necessary changes to the code for saving results
  - i. Extend the set `scal` to include the additional scalar results and extend the results reported in `levSCAL` and `pcSCAL`.
  - ii. Declare parameters results for the new variables, i.e., `lev**` and `pc**`, and assign values to these parameters.
3. Add the instruction `gdx=[unique file name]` in the command line
4. Now run the programme (F10) with the same experiment file used for the `smod_t2` exercises.
5. Review the results

For each experiment add the instruction `gdx=****` in the command line, where `****` identifies different experiments.

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## *Equation Coding for smod\_t3.gms*



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## ***smod\_t3.gms coding***

- Complete data file provided
- All sets declared and assigned
- All parameters declared and assigned
- All variables declared and initial values assigned
- All equations declared

**Your tasks**

1. Assign equations
2. Revise model definition
3. Revise factor clearing
4. Run trade policy experiment
5. Compare results

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## ***Data***

**Review smod\_t\_mod06\_t3b.xlsx**

Same SAM structure as in  
*smod\_mod06\_t2.xlsx and smod\_t\_mod06\_t3.xlsx*

1. What mapping sets are declared?
2. What parameters are declared?
3. How many commodities, activities, factor and households are declared and assigned?

**ALL elasticity values are ‘place holders’**

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## Using \$STOP

**GAMS Configuration:** set to produce *smod\*\*\*.gdx* and *smod\*\*\*.ref* files with *F10*

**Progress One ‘Baby’ Step at a Time**

- Use **\$stop** to set end of code run

Step 1:

|  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Data Entry</li> <li>• Data adjustments and scaling</li> <li>• Data Diagnostics</li> <li>• Additional set assignments</li> <li>• Parameter assignments</li> <li>• Variable initialisation</li> </ul> | <p><b>Checks for</b></p> <ul style="list-style-type: none"> <li>• syntax errors</li> <li>• data errors</li> <li>• (some) coding errors</li> </ul> |
|--|---|

Gets to starting point for model coding 

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## Equation Assignment – smod\_t3

Equations needed are already declared

Transform the algebraic expressions, in the *smod\_t* technical document (Appendix 3), into GAMS code.

Tricky parts

- use of LHS and RHS \$ control at different levels of the production nest
- use of \$ control in parameter calibration

‘new’ variables already initialised 

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## Some Questions

- Why are the sets  $ff(sac)$  and  $f(ff)$  necessary? Note the following
  - What is the difference between the members of  $fag$  and  $f$ ?
  - Factor incomes ( $YF$ ) are only received for natural factors,  $f$ . Why?
  - Do the aggregate factors, members of  $fag$ , have ‘real world’ identities? If not, what are their roles in the system?
- What are the roles of the \$ controls on equations for  $QVAFOC(ff,a)$  and  $FDPRODFN(ff,a)$  and  $FDFOC(ff,ffp,a)$  (mapping sets run TO FROM)
  - $map\_va\_ff(ff,a)$
  - $map\_fagg\_ff(ff,ffp,a)$
- What are the roles of the RHS \$ controls in  $QVAPRODN(a)$ ,  $QVAFOC(ff,a)$  and  $FDPRODFN(ff,a)$  and  $FDFOC(ff,ffp,a)$ 
  - $map\_va\_ff(ff,a)$  and  $map\_fagg\_ff(ff,ffp,a)$
  - $deltava(ffp,a)$  and  $deltafd(ff,ff,a)$
- Why are the following statements that fix variable values needed
  - $FD.FX(f,a)\$(NOT\ SAM(f,a)) = 0.0 ;$
  - $WF.FX(ff)\$fag(ff) = WF0(ff) * CPI.L ;$

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## Model Definition & Closure Conditions

### Defining the Model

The new equations need to be added to the model definition. This has been done for you in the template.

**The model closure file – `smod_t3_cl_base.inc` – updated**

- Compare this closure file with the closure file `smod_t2_cl_base.inc`
- Explain why the changes are needed

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## *Check the Model*

1. Check the data in the model are the intended data.
2. Check that the value for VAR WALRAS is zero.
3. Check that the basic prices (PE, PD, PM) are equal to one.
4. Check that all entries in ASAM1CHK are equal to zero
5. Check that all entries in ASAM2CHK are equal to one
6. Check the LHS values.
7. Numéraire check.

**Only after these checks have been passed  
should you move on to using the model.**

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## *A Simple Experiment*



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## *Experiment*

Trade policy experiment from Module O5

**Experiment File**

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  - ii. Declare parameters results for the new variables, i.e., *lev\*\** and *pc\*\**, and assign values to these parameters.
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## *Comparing Results*



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## Comparing Results

Comparison of `smod_t2.gms` with `smod_t3.gms`

### Comparison of the Results

1. To compare the results across the 2 different assumptions about factor market clearing, use the GDX MERGE utility. Open the file `compare.gms` and save it as `compare**.gms`.
2. Edit the call statement to refer to the gdx files generate by each run of the model.
3. Run `compare**.gms` (make sure `compare**.gms` is the Main File before running the model). Review the merged file, `MERGE.GDX`.

**Analyse the results**

Emphasise explanation not simple reporting of the results.

1. Factor demands (*FD*)
2. Factor prices (*WF* and *WFDIST*) and factor incomes (*YH*)
3. Value added (*QVA*) and intermediate inputs (*QINT*)
4. Production structure (*QX* and *QXC*)
5. Domestic quantities (*QD* and *QQ*)
6. Household incomes (*YH*) consumption (*HEXP* & *QCD*) & welfare (*EV*)
7. etc.



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## Changing the Production Nest



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## Possible Three Level Production Nest

**Two types of capital**

- ‘Fixed’ capital
- ‘Flexible’ capital

Elasticity –  $\sigma_{31}$

  

**Two types of labour**

- ‘Skilled’ labour
- ‘Unskilled’ labour

Elasticity –  $\sigma_{32}$

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## Tasks

- Extend the sets *ff* and *fag* to include aggregate labour
  - Make changes in an Excel file
  - Extend the set *sac*
- Modify the maps that control the nesting
  - *map\_va\_ff(ff,a)*
  - *map\_fagg\_ff(ff,ff,a)*
- Checks (use *\$stop?*)
  - data intended are being loaded
  - parameters are correctly assigned
  - model runs correctly
- Run the experiment (different model)
- Compare the results across different models with the same data

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## *Comparing Results*



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## *Comparing Results*

`smod_t2.gms` with variants of `smod_t3.gms`

### Comparison of the Results

1. To compare the results across the 2 different assumptions about factor market clearing, use the GDX MERGE utility. Open the file `compare.gms` and save it as `compare**.gms`.
2. Edit the call statement to refer to the gdx files generate by each run of the model.
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### Analyse the results

Emphasise explanation not simple reporting of the results.

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*The End*

Nested Functions Exercises 2



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