Hands-on Computing with the ORANI-G Model: Introductory Simulation

This first session provides a rapid overview of the whole process of computing solutions for the ORANI-G model. You will be introduced to many files containing: model equations (TAB); model data (HAR); simulation details (CMF); and simulation results (SL4). ***All the different files and steps will be studied more carefully in later sessions -- do not worry if you do not understand everything straight away****. We hope that you can work through to Section 3.6 during this session. Sections 3.7 and later are optional, or might be completed some other time.*

In recent years, Brazil has enjoyed a remarkable growth in agricultural productivity. We simulate the long-run effects of such a change.

Questions are scattered through the instructions. ***Write down answers*** *to the questions onto the instruction sheet.*

1. Getting Started

1.1. Is GEMPACK installed ?

We assume that GEMPACK is already installed and that various GEMPACK icons (WinGEM, ViewHAR, etc) are visible on the desktop. Optionally, you could perform the test below to check if GEMPACK is installed properly.

1.1.1. Testing if GEMPACK is on your DOS path and is licensed properly

Click on the ***Start*** button in the bottom left hand side of the screen.
Click ***Run*** and enter CMD (COMMAND if you have Win98) then press OK -- a DOS box should open.
In the DOS box, type TABLO and press the enter key.
The TABLO program should start running [if not, the GEMPACK directory (usually C:\GP) is not on your path].
Press the enter key: you should see the message:

```
(Suffix '.tab' will be automatically appended.)
```

The following message means that TABLO cannot locate your GEMPACK licence [LICEN.GEM].

```
(ERROR RETURN FROM ROUTINE: TABLO )
(E-Licence information unavailable.)
```

Enter **Control-C** to exit TABLO. Then click top right "x" icon of DOS box to close it

1.2. Starting WinGEM

Click on the **WinGEM** icon to start WinGEM, the Windows version of GEMPACK. This should give a narrow menu across the top of the screen:

You will be working inside the WinGEM shell as much as possible. To see how GEMPACK for Windows is used, you will check the database used for the ORANI-G model and run a simulation.

1.3. Setting the working directory

On the PC,

- All the GEMPACK and Windows GEMPACK programs files are in the folder or directory called **C:\GP**. This directory is called the **GEMPACK directory**. You would not normally alter the programs and other files in the GEMPACK directory.[1]

[1] The GEMPACK programs are installed from the GEMPACK CD onto your computer at home. You must add the name of the GEMPACK directory to your DOS path so your computer can find the GEMPACK programs when you need to run them.

- The directory called **C:\GPWork** contains various working directories, corresponding to different economic models.

You will be working (editing files, running simulations, looking at results) in the **working directory** of the ORANI-G model, **C:\GPWork\ORANIG.**

When using WinGEM the first step is always to specify the location of the working directory. Choose:

File | Change both default directories

(By this notation we mean first click on ***File*** in the WinGEM menu. This will produce a drop-down menu. In the drop-down menu, click on the menu item

Change both default directories.)

In the file selection box that appears, choose drive **C:** then scroll down and *double*-click on the directory GPWORK. Next *double*-click on the subdirectory **ORANIG.** Check that the blue print above the directory box says C:\GPWORK\ORANIG**.** Click on the ***Ok*** button.

1.4. Viewing text files with TABmate

When working with files in GEMPACK, many of the files you work on and create are text files; so you need a text editor. You could use a word processor but then you would always have to remember to save the file as a text or ASCII file. There are two text editors supplied with GEMPACK, called GEMEdit and TABmate.

- GEMEdit is a simple black and white editor. Its one advantage is that you can have two files open on the screen and can look at both at once.
- TABmate is a general-purpose text editor, which allows you to open and work on several files at once. It is colourful and has several powerful features that you can use.

In this session we will use TABmate as our editor. To do this select in the WinGEM main menu,

Options | Change editor...

then select your editor ***Use TABmate*** You should only have to do this once, WinGEM should remember which editor you have chosen.

Now look at the TABLO Input file for the ORANI-G model. Select in the WinGEM menu

File | Edit file...

The Open box should list several files associated with the ORANI-G model. You will briefly look at the TABLO Input file since it is the starting point for the ORANI-G model. It contains the equations of the model in a form very like algebra. Select the TABLO Input file to edit:[2]

ORANIG.TAB

(If this file does not appear in the Open box and you have to change directories to find it, you have not set your working directory correctly.)

Various colours appear on the screen for different parts of the TAB file; for example, TABLO Keywords are in BLACK, comments are in royal blue and so on[3]. The first page consists of a several comments (in blue) describing recent changes to the model.

Scroll down a page and you will see statements describing the two files used by this model:

- the input file BASEDATA containing input-out data and elasticities.
- the output (new) file SUMMARY which contains summary and checking data calculated from BASEDATA[4]

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[2] There are many versions of the ORANI-G model. The four official versions are: ORANIG98, ORANIG01, ORANIG03, and ORANIG06 (last 2 digits are release years). In this course we use a special Brazilian version, ORANIGFR, together with Brazilian data.

[3] If this is not the case you can restore the default properties, (Select menu item Edit | Restore Default Properties) or you can change the screen properties by selecting Edit | Properties to set the font, the font size and various colours on the screen.

[4] BASEDATA and SUMMARY are 'logical' file names. When you run a simulation, you have to specify the name and location of corresponding actual files.

Place your cursor on the word BASEDATA and press the ***Gloss*** button (at top middle of the screen). If this gives a message saying "*no info available: run Check to generate*" at the bottom of the screen[5], click on the button marked ***TABLO Check*** (to left of *Gloss*) and then try ***Gloss*** again. This should show you all places in the TABLO Input file where the file BASEDATA is mentioned -- all the places where initial data is read from file[6]. Click on the line number at the start of the Gloss line and TABmate will take you to that line[7].

Return to the top of the file (Ctrl and Home goes to the top of the file, Ctrl and End to the bottom of the file) and ***Search | Find*** for the variable name **a1tot**. The first occurrences (in a comment) are not what we want, so do a Repeat Search ***(F3)*** until you find the line:

```
(all,i,IND)  a1tot(i)       # All input augmenting technical change #;
```

The "(all,i,IND)" means that a1tot is a vector variable with one value for each INDustry. Click on **a1tot** and press the ***Gloss*** button (at top middle of the screen). You can see that a1tot appears in 4 equations: the three demand equations E_x1_s, E_x1prim and E_x1oct, and the E_contGDPincE equation. Click on the red line number at left of equation E_x1_s and you should see:

```
Equation E_x1_s   # Demands for commodity composites #
 (all,c,COM)(all,i,IND)  x1_s(c,i) - [a1_s(c,i) + a1tot(i)] = x1tot(i);
```

Click on the = sign in the equation above and press the **Gloss** button to see a definition of each symbol that is used. The terms "(all,c,COM)(all,i,IND)" mean that Equation E_x1_s is actually a group or block of equations: there is one equation for each "commodity composite[8]" used by each industry. So if there were 33 commodities and 27 industries in the database there would be 891 (=33*27) separate equations. Each of the variables x1_s, a1_s, a1tot and x1tot is a percentage change: if x1tot("AgroPec") had value 5, that would mean that output of the AgroPec industry would be 5% greater than in the initial equilibrium described by the input data in the BASEDATA file. The "a" variables a1_s and a1tot are technological change variables, normally exogenous (values fixed outside the model). Suppose output were fixed (x1tot=0), a shock of 10% to a1tot("AgroPec") would mean that for each commodity c, the values of x1_s(c,"AgroPec") must also increase 10% to keep the equation balanced. If you looked at the other equations where a1tot appears, you would find that a shock of 10% to a1tot("AgroPec") would mean that 10% more of *all* inputs were needed to produce given AgroPec output [note: positive a1tot implies technical *regress*].

Press ESC or spacebar to close the Gloss window.

Exit from TABmate in the usual Windows way by ***File | Exit.*** (There are usually alternatives in terms of keystrokes instead of the mouse action. For example you can use keystrokes ***Alt*** followed by ***F*** followed by ***X*** in order to exit.)

2. Data for the ORANI-G model

2.1. Viewing the data directly using VIEWHAR

The input-output data used during this course for the ORANI-G model is contained in the data file BASEDATA.HAR. This is a *binary* file used in GEMPACK programs - called a Header Array (HAR) file - so we cannot just look at it in a text editor. Instead we will look at BASEDATA.HAR using a special viewing program, ViewHAR. Select from the main WinGEM menu:

HA Files | View VIEWHAR

The VIEWHAR window will appear. Click on

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[5] If the message disappears too fast for you to read, click on the line at the bottom of the screen and the message will reappear.

[6] You can click on any variable, coefficient or set and press the Gloss button to display a list of every statement in the file mentioning that symbol. For a variable, say, the first of these statements will usually furnish a definition. The remainder show how the variable is used. Line numbers accompany each statement; you can click on these to jump to that location in the TAB file. If you press Gloss when the cursor is not on a variable, coefficient or set, you get a different list showing the definition of each variable, coefficient or set mentioned in the current statement.

[7] You can return to your original place as follows: At bottom left, the Location Indicator panel shows current line and column numbers. Click there and a window appears, listing lines that you jumped to or from. The most recently visited line appears at the top. You can click on any of these lines to jump there.

[8] An example of a "commodity composite" might be QuimicDivers used by the AgroPec industry. The QuimicDivers is potentially a mixture of local and imported chemicals, so we call it a "dom/imp composite".

File | Open Header Array file

and open the file BASEDATA.HAR in directory C:\GPWORK\ORANIG on drive C:

This will open the file BASEDATA.HAR and show its contents on the Contents screen[9].

Each of the rows corresponds to a different array of data on the file. Look at the column under the heading **Name** to see what these arrays are:

	Header	Type	Dimension	Coeff	Total	Name
1	COM	1C	33 length 12			Set COM commodities
2	IND	1C	27 length 12			Set IND industries
3	OCC	1C	1 length 12			Set OCC occupations
4	MAR	1C	1 length 12			Set MAR margin commodities
5	1BAS	RE	COM*SRC*IND	V1BAS	1055600.6	Fluxo Intermediario Basico
6	2BAS	RE	COM*SRC*IND	V2BAS	219105.7	Fluxo de Invest. Basico

The first item, COM, is the list of commodities in this database. The array is of type 1C which means an array of strings. Double click on COM to see the commodity names.

To return to the Contents Screen, double-click on any cell [or click on ***Contents*** in the VIEWHAR menu].

Have a look at item 8, 4BAS, showing exports of each commodity. Double-click on the 4BAS row to look at the numbers. Values in this file are measured in millions of 2001 Reais. Would you say Agriculture and Food exports were are as large as non-food Manufacturing exports?

Double-click on any cell to return to the Contents Screen, then double-click on item 22 (header 1CAP), which shows the values of capital rentals in each industry. Note down below the following database value -- you will need to know it later:

- V1CAP("AgroPec") =

Double-click on any cell to return to the Contents Screen, then double-click on item 7, 3BAS to see the numbers. The panel at the bottom of ViewHAR tells you that you are seeing household consumption, split according to commodity (COM) and SRC (domestic or imported). What is the single largest category of household expenditure?

ViewHAR for shares

ViewHAR can present numbers as shares. To see Row shares, look at the box in the top left hand corner beside the green and yellow bands. Click on the arrow beside this box and choose ***Row*** . You should see shares that add to 1 across each row. The shares show the proportion of domestically-produced or imported goods for household use of each commodity.

Try ***Col*** to calculate column shares, and ***Matrix.*** What share of household spending goes on *GasoAlcool*?

Close VIEWHAR in the normal Windows way ***File | Exit.***

3. Simulating the long-run effect of improved agricultural productivity

In this section you will implement the ORANI-G model and use it to simulate the short-run effects of reduced productivity in AgroPec.

3.1. Overview of the process

From the WinGEM menu at the top of the screen choose ***Simulation.*** In the drop-down menu the choices are

TABLO Implement
Compile & Link

[9] BASEDATA.HAR is the actual file corresponding to the logical file BASEDATA mentioned in ORANIG.TAB.

TABmate Implement
Run TG Program
GEMSIM Solve
SAGEM Johansen Solve
GEMPIE Print
View Solution (ViewSOL)
AnalyseGE

The items from this menu you will be using in this simulation are

TABLO Implement
GEMSIM Solve
View Solution (ViewSOL)

TABLO, GEMSIM and ViewSOL are the names of programs which carry out the three steps of a simulation :

- Step 1 - Implement the model with TABLO
- Step 2 - Solve the equations of the model with GEMSIM
- Step 3 - View the results with ViewSOL

WinGEM will guide you through these steps and indicate what to do next.

3.2. Step 1 - Implementing the ORANI-G model using TABLO.

As we saw previously, the TABLO Input file (which contains the theory of the ORANI-G model) is called **ORANIG.TAB**. Choose

Simulation | TABLO Implement

A window for TABLO will appear. Click the Options menu item at the top of this TABLO window and select "Run from STI file". Then click on the ***Select*** button to select the name of the STI file, ORANIG.STI. The STI (stored input) file contains some instructions which TABLO needs to implement the model. By "implement" we mean convert the TABLO Input file into binary computer files which are used by the simulation program GEMSIM in the next step. These files are referred to as Auxiliary files (or sometimes as the GEMSIM Statement and Table files) and in this case, are called ORANIG.GSS and ORANIG.GST[10].

Click on the ***Run*** button. TABLO runs in a DOS box[11] and when completed returns you to the TABLO window with the names of files it has created: the Information file ORANIG.INF and the Log file GPXX.LOG. Briefly look at both of these files by clicking the ***View*** buttons beside them.

The Information file ORANIG.INF gives information about the TABLO Input file such as whether there are any syntax or semantic errors found by TABLO when it was checking the TABLO Input file. Error messages in the INF file are flagged by the characters '%%'. Search the file for %% to see if there are any errors (hopefully none). (There are some '%%' during condensation saying

```
%% Check above coefficient will never be zero.
```

but you can ignore these %% messages.)

Go to the top of the INF file and search for `INPUT CHECK SUMMARY` to see how many syntax errors and semantic problems there are (if any). Go to the end of the INF file to see what actions GEMSIM can carry out with the GEMSIM Statement and Table files produced in this run of `TABLO`.

Look briefly at the top of the LOG file. It should say the time and date when the log file was created. What GEMPACK Release was used? When you run TABLO in WinGEM, there is no output to the screen as it runs. Instead all, the screen output produced by TABLO goes to the LOG file. If there is some problem in running TABLO, consult both the LOG file and the INF file to find out what went wrong. Since this is a working model, no errors should occur provided you remember to run TABLO using the STI file ORANIG.STI.

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[10] Section 3.6 below gives an overview of the several files that are used at various stages.
[11] The TABLO DOS box might briefly appear as an icon on the Windows task bar which is normally at the bottom of the screen.

When you have looked at these two files, close TABmate and click on the ***Go to GEMSIM*** button at the bottom of the TABLO window to go on to the next step in running a simulation: Step 2 - GEMSIM Solve.

3.3. Step 2 - Solve the equations of the model using GEMSIM.

The *Go To GEMSIM* button takes you to the GEMSIM window.

(Alternatively you can start this window by choosing *Simulation* | *GEMSIM Solve* from WinGEM's main menu.)

First ***Select*** a Command file called FIRSTSIM.CMF.

Look at this Command file in the text editor by clicking the ***Edit*** button. Command (or CMF) files are used to specify the details of a simulation. The main bits of information in this CMF file are:

- the model to use, in the line: auxiliary files = ORANIG;
- the solution method: Euler 3 4 5
- the actual file names, BASEDATA.HAR and SUMMARY.HAR, that correspond to the logical file names, BASEDATA and SUMMARY, which are mentioned in the TAB file. By default, the solution file is named after the CMF file -- so in this case the solution will be stored in file FIRSTSIM.SL4.
- the closure, or list of exogenous variables. The model can determine the value of most *but not all* variables. Some variables must be held fixed (or shocked) by the modeller. These are called *exogenous*. The choice of *which* variables are to be exogenous varies between simulations. In this simulation, industry real rates of return to capital (variable **fgret**) are held exogenous, while capital stocks are free to adjust – this identifies the simulation as long-run.
- the shocks are at the end of the file. In this simulation we shock the variable **a1tot** to decrease by 10% for the agricultural industry, **AgroPec**. **a1tot** is a measure of overall technical efficiency -- the -10% means either that with inputs held constant output will be 10% more, or that 10% less inputs will be needed to produce the original output[12]. These shocks are used to simulate the increase in agricultural productivity.

Use ***File | Exit*** to return from TABmate to the GEMSIM window.

Click on ***Run*** to run GEMSIM with the Command file FIRSTSIM.CMF. The simulation could take a few minutes to run. Do not touch the keyboard or mouse during this time. While you wait, study the overview of GEMPACK in Section 3.6 below.

Eventually, the *Accuracy Summary* window should appear [it is headed "via WinGEM Whole simulation"]. You should see that nearly all the results are accurate to 5 or 6 significant figures[13]. The accuracy is indicated by two smiling faces (click on the key to see the range of facial expressions). Click OK to close the Accuracy Summary.

If there is an error, view the Log file.

If GEMSIM produces the Solution file, several new buttons will appear. There is no point in trying to look at the Solution file in the text editor because it is a binary file, not a text file. Instead, look at the Solution file using the Windows program ViewSOL.

3.4. Step 3 - View simulation results using ViewSOL

First click on the button ***Go to ViewSOL.*** The Contents screen shows the names of the variables. To see the values of a variable, double-click on its name. To return to the Contents screen, double-click on any number (or select ***Contents*** in the ViewSOL menu).

Start by double clicking on the first Contents row: **Macros** (Macros are scalar variables or variables with just one component.) You should see a list of macro variables and the value of their changes. You can click on the variable names -- a description will appear at the bottom of ViewSOL . Use the decimal places combo box at top right to set the number of decimal places to 2.

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[12] You can remind yourself how a1tot is used with the ORANIG.TAB file. From TABmate, use File..Open to re-open the TAB file, and search for (of Gloss on) a1tot.

[13] The Accuracy Summary gives separate estimates for Variables and for Data. Data will be more accurate than Variables. This is simply because most variables are %change. If some data has initial value X and increases by y% [accurate to 3 figures], the new value, X*[1+y/100], will be accurate to about 5 figures.

Most of the variables are percentage changes, but some (their names start with "del") are ordinary changes, measured in million-dollars. Values for exogenous variables are shown in red. Scroll down the list to find price indices (first letter "p"), nominal values (first letter "w"), and quantity indices (first letter "x"). Write down below what happened to:

- x4tot: aggregate exports
- x0gdpexp: real expenditure side GDP
- employ_i: aggregate employment
- x1cap_i: aggregate capital stock
- x0cif_c: aggregate imports
- p4tot: export price index
- p3tot: consumer price index
- p1lab_io: average nominal wage
- p1lnd_i: average return to agricultural land

Double-click on any number to return to the Contents screen. Then scroll down till you find the variable x1tot (industry outputs). Double-click to view the numbers. Which non-agricultural industry did worst?

Return to Contents and view results for:

- x4: exports
- x3: household use
- x1lab: employment
- regx1prim_i: regional real GDP. Which region *gained most*? Can you think why?

Note down below the following two results -- you will need them later.

- x1cap("AgroPec") =
- p1cap("AgroPec ") =

3.5. Other output files

The Summary file

Return to the GEMSIM window, that is, bring it to the front by clicking on it. Look at the data files used in this simulation by clicking on the button marked ***View Input/Output Files*** and view the output file

SUMMARY. This SUMMARY.HAR file contains various useful tables and data summaries which are calculated only from the initial input data file BASEDATA.HAR[14].

Experienced modellers rely on a good knowledge of the main features of their database. To understand why some industries perform better than others in a simulation, we have to know the special characteristics of each sector. The SUMMARY file contains various data that have proved useful in the past. Some of the most useful are:

Header	Dimension	Coefficient	Name
SALE	COM*SRC*DEST	SALE	Sales aggregates
EMAC	EXPMAC	EXPGDP	Expenditure Aggregates
IMAC	INCMAC	INCGDP	Income Aggregates
TMAC	TAXMAC	TAX	Tax Aggregates
CSTM	IND*COSTCAT	COSTMAT	Cost Matrix
MKUP	COM*FLOWTYPE *SRC*SALECAT2	SALEMAT2	Basic, margin and tax components of purchasers values
MSHR	COM	IMPSHR	Share of imports in local market
SRSE	IND	SUPPLYELAST	Short-run supply elasticity
FACT	IND*FAC	FACTOR	Primary Factor Costs
1TOT	IND	V1TOT	Total industry cost plus tax
RV1P	IND*REG	REGV1PRIM	Factor bills

Use the SUMMARY file to answer the following questions:

- What is the share of exports in GDP? [Header EMAC, Col share]
- Intermediate inputs are ?% of the costs of the ProdAnimal industry? [Header CSTM, row share]
- For which commodity do imports have the largest market share? [Header MSHR]
- Which two industries are most labour intensive? [Header FACT, row share]
- Which two industries have highest short-run supply elasticity? [Header SRSE]
- Which region earns most from *Minerio*? [Header RV1P]

The Updated Data file

Return to the GEMSIM window (click it to bring it to front). Look at the data files used in this simulation by clicking on the button marked ***View Input/Output Files*** and view the updated file *BASEDATA*. This file (actual name FIRSTSIM.UPD) contains post-simulation values for the same data items as are contained in the input BASEDATA file BASEDATA.HAR.Have a look at header 18, 1CAP.

Write down the new value for the AgroPec industry in the "updated" column below:

	Initial	Updated	Percent Change
V1CAP("AgroPec")			

Write down the original value of V1CAP("AgroPec") in the "initial" column above (you were asked to note this previously). Then write down the percentage change between Initial and Updated, using the formula[15]:

%change = 100*(Final - Initial)/Initial

The V1CAP vector contains values of capital rentals. Each value is the product of a price, P1CAP, and a quantity, X1CAP. The solution file contains values (you were asked to note these previously) for percent changes in these two variables. Write in these two values below.

[14] Thus, even though SUMMARY.HAR is recreated each time you run a simulation, its contents will not change -- unless the input BASEDATA file was changed.

[15] If you are too tired to do mental arithmetic, click the Programs menu item at the top of ViewHAR, then click on the Calculator icon which appears.

	p1cap	x1cap
V1CAP("AgroPec")		

Use the two variable results above to check that:

updated V1CAP = [original V1CAP]*[1+p1cap/100]*[1+x1cap/100]

How does GEMPACK know which price and quantity variables must be used to update V1CAP? That information comes from a line in the file ORANIG.TAB, which reads:

```
Update  (all,i,IND)   V1CAP(i) = p1cap(i)*x1cap(i);
```

This updated data file has the same headers as the original input file. In fact, it is possible to use the updated data as the starting point (or initial data) for a second simulation. We might do this if we wanted to find the effect of one shock *followed by* another shock. Updated data files are used in a similar way by recursive dynamic models, a type of multiperiod CGE model which solves one year a time. The simulation for year T produces an updated data file which is used as input by the simulation for year T+1.

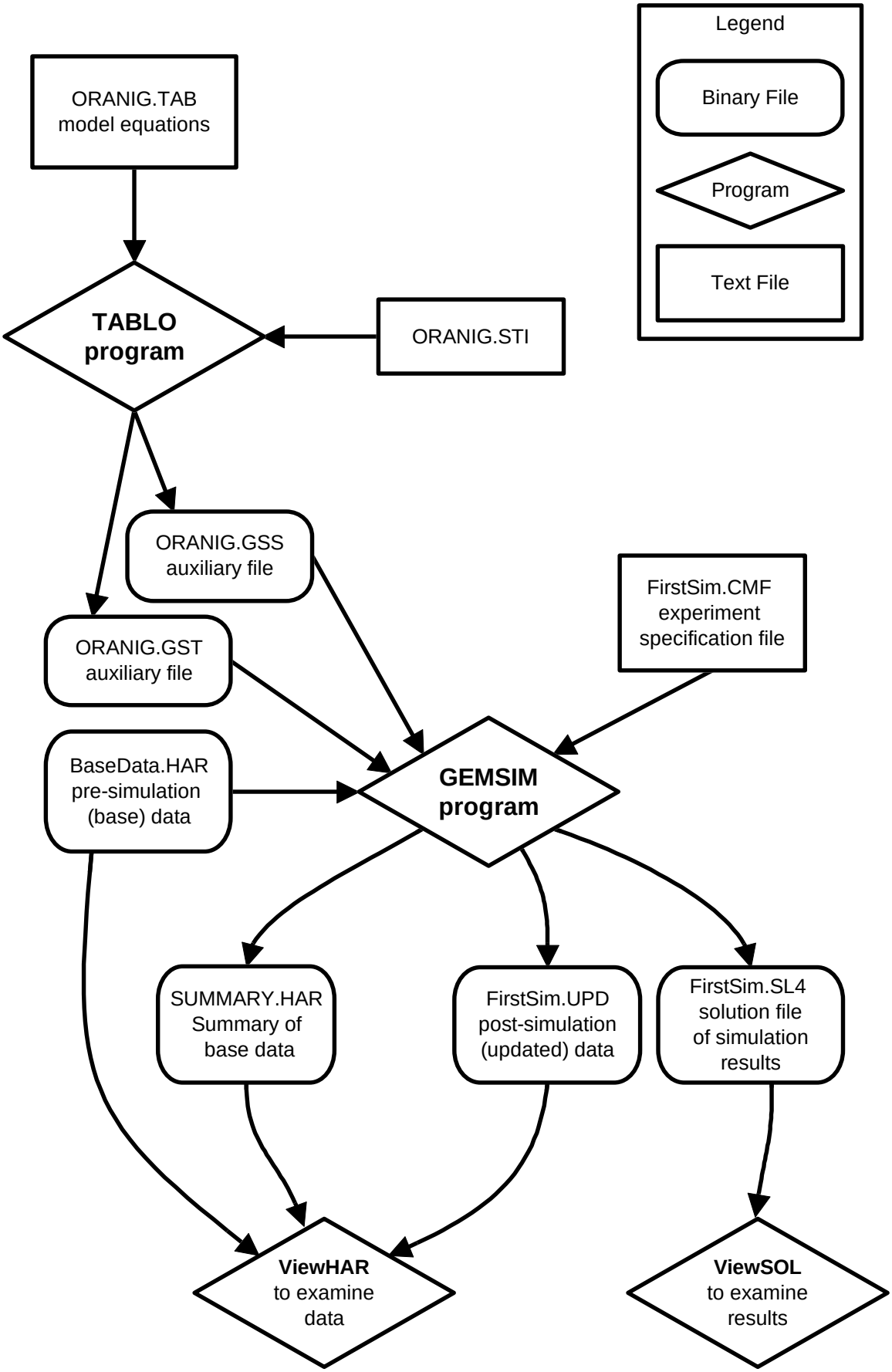

Figure 1: Stages in the GEMPACK process

3.6. Diagram of stages in the GEMPACK process

Figure 1 shows, in simplified form, the main stages in the process that you have just gone through. In the diagram:

- diamond- or lozenge-shaped boxes are GEMPACK programs, such as TABLO, GEMSIM, ViewHAR and ViewSOL.
- rectangles with rounded corners are binary (special format) files which can only be used by particular GEMPACK programs.
- rectangles with sharp corners are ordinary text files, which you could examine or modify with any text editor or word processor. You used the TABmate text editor to look at these files.

The process begins with the text file ORANIG.TAB which contains the equations of the model. The TABLO program translates the TAB file into two auxiliary GSS/GST files, which contain a computer-language representation of the model equations. Another small text input file, ORANIG.STI, specifies various TABLO options[16].

The two GSS/GST files are used by GEMSIM to solve the model [ie, run simulations]. GEMSIM requires two other input files:

- the data file BASEDATA.HAR, containing input-output data and behavioural parameters. This data file contains all necessary information about the initial equilibrium.
- experiment details from a text file FIRSTSIM.CMF, which specifies:
  (a) which variables are to be exogenous (ie, held constant or shocked);
  (b) shocks to some exogenous variables;
  (c) the solution method; and
  (d) the names of input and output files.

The GEMSIM simulation produces three output files:

- the FIRSTSIM.SL4 solution file shows percentage changes in variables from the initial equilibrium. SL4 solution files are in a special binary format: you can examine their contents with the ViewSOL program.
- the FIRSTSIM.UPD updated data file contains post-simulation values for the same data items as are contained in the input data file BASEDATA.HAR.
- the SUMMARY.HAR file contains various useful tables and data summaries which are calculated only from the *initial* input data file BASEDATA.HAR. The contents of the summary file do not depend on the experiment specified in the CMF file.

The files BASEDATA.HAR, FIRSTSIM.UPD, and SUMMARY.HAR are all Header Array files which you can examine using ViewHAR.

All the steps and files shown in Figure 1 are conveniently managed by the WinGEM interface program. However, it is possible to run the same programs without WinGEM by typing into a command prompt (DOS box). The traditional, command-line, method is still the only way to run GEMPACK on some other operating systems, such as UNIX.

The more expensive "source code" version of GEMPACK does not require GEMSIM. Instead TABLO (assisted by a Fortran compiler) produces a model-specific EXE file which runs the simulation. In Figure 1, GEMSIM would be replaced by a file ORANIG.EXE, which could solve the model faster than GEMSIM. For really big models (or huge databases) the source code version is necessary.

3.7. Changing the closure and shocks.

Several simulations can be carried out on the same model by changing the closure and/or the shocks as described in the Command file. Now you will make a new Command file in the text editor and then run another simulation using GEMSIM.

To change the command file FIRSTSIM.CMF, copy it to a new name FIRSTSIM2.CMF as follows:

In the main WinGEM menu, choose ***File | Edit...*** then open the file FIRSTSIM.CMF.

[16] Are you anxious to know what is in the STI file? It contains *condensation* instructions specifying *omissions*, *substitutions* and *backsolves*. Clear now? These interesting details are covered later in the week.

Click on ***File | Save As*** and save the file under the new name FIRSTSIM2.CMF.

Then use the text editor to modify this file, following the steps below.

In the original longrun closure, the variables **fgret** and **capslack** were held fixed, causing **gret** (real rates of return to capital) to be fixed (gloss on **gret** to see). The interpretation is that, with an open capital market, rates of return cannot in the long-run diverge from those available in other countries. Imagine that the capital market was **not** open. To model this, we could hold fixed the aggregate capital stock, allowing all Brazilain industry rates of return to float together.

Find the line:

```
exogenous capslack; ! switch off aggregate capital constraint
```

and alter it to read

```
exogenous x1cap_i; ! switch ON aggregate capital constraint
```

Don't forget the semicolon after x1cap_i. When GEMSIM reads the CMF file, an exclamation mark causes the rest of that line to be treated as a comment.

Exit from the editor after saving your changes.

Click on ***Simulation | Gemsim Solve*** and ***select*** Command file FIRSTSIM2.CMF.

Rerun program GEMSIM with command file FIRSTSIM2.CMF (similarly to Step 2 above).

Then look at the results (FIRSTSIM2.SL4) using ViewSOL. ViewSOL allows you to open several solution files at once. Open the solution from your previous simulation (FIRSTSIM.SL4). Compare the results for macro variables. Is the rise in GDP greater or less with the aggregate capital stock (rather than rates of return) fixed ? Explain.

4. GEMPACK without WinGEM

In the examples above we ran the programs TABmate, ViewHAR, GEMSIM and ViewSOL from within WinGEM. However GEMPACK allows you to work in many other ways. There are various other Windows programs including **RunGEM** which is good for running simulations when you are using a standard model which you do not want to change.

In the following set of examples we will use TABmate as editor, run the simulation in RunGEM and then look at the results using RunGEM.

4.1. Running TABmate

Click on your desktop ***TABmate*** icon to start it running. (In the previous examples we started TABmate from within the program WinGEM). Click on the Open folder in the top left hand corner and select

Files of Type : TABLO files (.tab)*

in the box at the bottom of the screen. Open the file C:\GPWork\ORANIG\ORANIG.TAB

To run TABLO to check for errors, select the button ***TABLO Check***. If there is an error, TABLO will point out where it is and you can edit the screen to fix it**.**

Try some of the other buttons to look at the Information (Inf) file and the Log file. When you have finished looking at these files, close them by selecting ***File | Close***

Return to the page containing ORANIG.TAB and select the ***TABLO STI*** button. A small window should appear asking if you want to run or edit the file ORANIG.STI. Click the ***Run*** button. This has the same effect as running TABLO from a STI in WinGEM. If no errors are found, it goes on to generate the code needed to actually run the model. It generates either FORTRAN code or GEMSIM code according to a setting in the STI file**.** In the computer laboratory, we are using the Executable-Image version of GEMPACK which only allows you to write output for the program GEMSIM.

The names of the files created are ORANIG.GSS and ORANIG.GST. These files contain implementation of the model in the TABLO Input file ORANIG.TAB. Exit from TABmate.

4.2. Running simulations using RunGEM

Click on your desktop ***RunGEM*** icon to start it running. [If this is the first time RunGEM has been used, you may be asked to select a model to work with. Click OK and select the model ORANIG.GSS in the directory C:\GPWork\ORANIG. RunGEM may also tell you that the default closure is missing. Just ignore this and click OK.]

The RunGEM screen has the appearance of a Tabbed notebook with separate pages. Click in turn on the pages labelled **Model/Data** **Closure** **Shocks** and so on to change from one page to another.

Below you will use RunGEM to repeat the FIRSTSIM simulation from earlier.

On the Model/Data page select the button ***Change Model*** and select the file created in TABmate **C:\GPWork\ORANIG\ORANIG.GSS**

In the box below place your cursor on the line

```
file BASEDATA = ...
```

and **right-click.** Select the menu line *Select or change file name* and select the file **C:\GPWork\ORANIG\BASEDATA.HAR** since this is the data file for the model ORANIG.

On the Closure page, click the Load Closure button and choose file ORANIGSR.CLS (which contains the usual shortrun closure for the ORANIG model): then click the Check Closure button.

On the Shocks page, first click the *Clear Shocks* button. Then, click on the arrow beside the box marked *Variable to Shock* and select the variable **a1tot**

In this simulation, you are to give shocks for industry AgroPec, which you specify in the *Elements to shock* box. Click on the down arrow on this box and select the element "AgroPec"[17]. Give it a shock of 10%. Add this shock to the shock list by selecting the ***Add to Shock List*** button. Next, from the *Elements to shock* box, select the element "Other Agric" and give it a shock of -10%. Add this shock also to the shock list by selecting the ***Add to Shock List*** button.

Look at the page Output Files (probably no changes are needed).

Then go to the Solve page. Change the solution method to Euler 3,4,5 steps. Add a few words to describe the simulation in *Verbal description* box. Then click on the **Solve** button to run the simulation. To see the results go to the Results page. These results should be the same as those calculated earlier using WinGEM and the Command file FIRSTSIM.CMF.

Exit from RunGEM as usual.

[17] You might be be told that the Size and elements of the set IND are not yet known [they must be read from the BASEDATA file]. Click **Yes** to ask RunGEM to check the closure. After a few seconds you will be told that the closure is OK. Now return to the Shocks page and select variable a1tot as the *Variable to shock*. Then click again on the *Elements to shock* box. This time you will see the elements of the set IND.