Installing and Using the Executable-Image Version of GEMPACK on DOS/Windows PCs

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This is part of the documentation of the GEMPACK Software System for solving large economic models, developed by the IMPACT Project, Monash University, Clayton Vic 3168, Australia.

Abstract

Pentium/80486/80386 computers with extended memory running Windows 3.1, Windows 95, 98 or NT provide excellent platforms for doing serious general equilibrium modelling. This document describes how to install and use the Executable-Image Version of GEMPACK on such machines. This document also describes how to install and use WinGEM, the Windows interface to GEMPACK, and associated Windows programs (including ViewHAR, ViewSOL, RunGEM and TABmate**)** under Windows 3.1, Windows 95, 98 or NT.

The Executable-Image Version allows the full range of modelling tasks (building new models or modifying existing models). Normally models are limited to those which can be implemented and solved within about 16-20 megabytes of memory. This is large enough for many medium-sized models but not sufficient for large models. In order to use WinGEM, the Windows version of GEMPACK, a machine with at least 16 megabytes of memory is needed.

Authors and Earlier Editions

Date	*Author(s)*	*Comment*
July 94	J.Harrison & K.Pearson	First edition (GPD-7) (Release 5.1)
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REFERENCES and INDEX

1. The Executable-Image Version of GEMPACK

GEMPACK runs essentially unchanged on a variety of machines. This document tells you how to install the Executable-Image Version of GEMPACK on a Pentium (or 80386/80486) PC running Windows 3.1, Windows 95, 98 or NT and tells you machine-specific information you may need to know to maximise your use of GEMPACK on such a machine.

This document describes

1. how to install and use the Executable-Image version of GEMPACK,
2. how to install and use **WinGEM**, the Windows interface to GEMPACK, and associated Windows programs, including **ViewHAR**, **ViewSOL, RunGEM** and **TABmate,** under Windows 3.1, 95, 98 or NT.

This version of GEMPACK can be used to build new models or modify existing models. Normally models are limited to those which can be implemented and solved within about 16-20 megabytes of memory (even when the computer on which the software is installed has more than this amount of memory).[2] This includes many medium-sized models, but excludes large models such as ORANI or MONASH at the usual disaggregation of 100 or more sectors and many intertemporal models. Precise details of the size of models that can be handled are given in section 6.2.1 below.

The user documentation for GEMPACK can be found in the other GEMPACK documents, of which GPD-1[3] *Introduction to GEMPACK* should be your starting point. You can carry out the installation and testing described below without being familiar with GEMPACK. But if you intend to use GEMPACK for modelling, we recommend you at least quickly read Chapters 1 to 3 in GPD-1 before attempting any modelling on your PC (and perhaps before you install GEMPACK on your PC).

An introduction to the different GEMPACK programs can be found in section 1.1 of GPD-1, while a guide to the models supplied with GEMPACK (including the Executable-Image version) is given in section 1.3 of GPD-1. A guide to the full user documentation for GEMPACK can be found in chapter 9 of GPD-1. Hands-on examples for GEMPACK can be found in GPD-8.

1

[2] These limits do not apply if you have an Unlimited Executable-Image GEMPACK licence (see section 1.2 of GPD-1).

[3] References to GEMPACK documents identify the document by GEMPACK Document (GPD) number, rather than by author or date. References are always to the version of the document which is current at the date of issue of the cross-referencing document. The GEMPACK documents referenced are listed in a separate section at the end of the References section of this document. Comments from readers on this or any of the GEMPACK documents, either pointing out errors, inaccuracies, omissions or obscurities, or making other suggestions for improvements, will be welcomed. Please address such comments to one of the authors at the Impact Project.

1.1 GEMPACK Programs Supplied with the Executable-Image Version

The GEMPACK programs included with the Executable-Image Version of GEMPACK are:

TABLO	for processing the description of your model
GEMSIM	for carrying out simulations with your model
GEMPIE	for printing simulation results
SAGEM	for carrying out Johansen simulations
MODHAR	for building or modifying data files
SEEHAR	for looking at data files
SLTOHT	for converting simulation results to other forms
MKHAR	for moving data files between different computers
RWHAR	for moving data files between different computers
SUMEQ	for obtaining information about Equations files
SEENV	for obtaining information about Environment files
CMPHAR	for comparing data on two Header Array files
ACCUM	for side-joining solutions for spreadsheet programs
DEVIA	for preparing deviations between solutions for spreadsheets

There are also the Windows programs:

ViewHAR	for viewing your data files
ViewSOL	for viewing your Solution files
WinGEM	the Windows shell for GEMPACK
RunGEM	for running simulations on an established model, and for sensitivity analysis
TABmate	for modifying TABLO Input files

Other programs can be obtained from the GEMPACK Web site:

http://www.monash.edu.au/policy/gempack.htm

1.2 Models Supplied with the Executable-Image Version

All the models usually supplied with source-code version of GEMPACK are supplied with the Executable-Image Version of GEMPACK. The models currently supplied are those listed in section 1 of GPD-8.

The models currently supplied include Stylized Johansen, Miniature ORANI, TRADMOD, ORANIG, ORANI-F, GTAP, DMR, TREES, CRTS and 5SECT. These can all be solved in 16 megabytes of memory.

1.3 Current Release

The current version of GEMPACK is Release 6.0-001 (March 1999).

The main change since Release 6.0 (October 1998) is a new version of RunGEM which makes it easy to carry out sensitivity analysis with any model implemented and solved using GEMPACK (see section 7.1). Other changes since Release 6.0 (October 1998) are documented in section 7

2. System Requirements for the Executable-Image Version

2.1 Summary

1. A pentium machine, or an 80486 DX machine, or an 80486 SX machine with a coprocessor (80487 SX), or an 80386 machine with maths coprocessor (80387).

2. Windows 3.1, Windows 95, Windows 98 or Windows NT.

3. Hard disk, requiring at least 30 MB free to install and test GEMPACK.

4. At least 16 MB of memory (RAM) or 32MB of memory for Windows NT.

If your computer easily satisfies the above requirements, you can omit the next section and go on to section 3.

2.2 Details

2.2.1 Disk space free

You can determine how much disk space is free by entering the DOS command: **dir**

The number of bytes free is shown on the screen at the end of the output. (1Mb is about a million bytes, so you will need about 30,000,000 bytes free to install, test and use GEMPACK.) Implementing your own models takes more disk space. As you would expect, the larger the model, the more space you will need.

2.2.2 Memory required

The amount of extended memory you have limits the size of models you can build. Our experience is that many models that are being built now can be implemented with 16 MB of RAM (although more is required to implement very large models such as ORANI and its extensions, or large intertemporal models).

You can determine how much memory is available from information shown on the screen as your computer boots up. Another method is to enter the command **mem** at the DOS prompt and look at the available extended memory.

Alternatively, under Windows 95, 98 or NT, click on **Help | About** in the main menu of **My Computer**. This will tell you how much physical memory is available to Windows.

3. Installation Instructions

The Executable-Image Version of GEMPACK is usually supplied on a CD. Alternatively, it may be supplied on five diskettes (1.44 Mb disks).

The components to install are:

- the Executable-image version of GEMPACK.

  This involves copying executable images of the different GEMPACK programs (as listed in section 1.1) from the CD or disks to the hard disk of your computer. These are the programs you use to solve and modify models.

If you are using Windows, you should also install

- WinGEM, the Windows interface to GEMPACK, and associated Windows programs including ViewHAR, ViewSOL, GemEdit, RunGEM and TABmate.

  ViewHAR can be used to view and modify data on GEMPACK Header Array files. **ViewSOL** can be used for viewing Solution files (results of simulations). **GemEdit** is a text editor used by WinGEM . **RunGEM** is a Windows interface for carrying out simulations with models (see section 9.3 of GPD-4 and section 5 of GPD-8) and for doing sensitivity analysis (see section 7.1). **TABmate** is a Windows program for modifying and debugging TABLO Input files.[5]

If you are installing from the CD,[6] you can also install

- electronic versions of the GEMPACK user documentation.

  You can read or print this GEMPACK documentation using the Adobe Acrobat Reader (which you can also install from the Executable-Image CD if it is not already installed on your computer).

3.1 If You Have An Earlier Release of GEMPACK Installed

If you have an earlier release of GEMPACK installed on your machine, you may prefer to move it before installing Release 6.0, or else to install Release 6.0 in a different directory. Indeed, it is probably best (if you have enough disk space) to leave the earlier version on the disk until you have successfully installed and tested Release 6.0 (in case an unexpected problem occurs).

If you decide to move the existing version before installing Release 6.0, you can change the name of the directory it is in using the File Manager (Windows 3.1) or My Computer (Windows 95, 98 or NT).[7]

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[4] If you need to install under DOS or under OS/2, please contact the Impact Project for different files and instructions.
[5] TABmate cannot run under Windows 3.1 so will not be installed if you are running Windows 3.1.
[6] If you are installing from the diskettes, you can download electronic copies of the GEMPACK documentation (and the Adobe Acrobat Reader) from the GEMPACK web site at address http://www.monash.edu.au/policy/gempack.htm
[7] Alternatively, if you prefer to work under DOS, you can use the RENDIR command if it is available on your PC. For example, the commands to rename directory \gp to \gp52 are

```
cd \
rendir gp gp52
```

3.2 Installing from the GEMPACK Executable-Image CD

If the Executable-Image Version of GEMPACK has been supplied on floppy diskettes, you should skip this section and go to section 3.3.

If the Executable-Image version of GEMPACK has been supplied on a CD, you should insert the CD into your CD drive. Then select from the **Start Menu** (if using Windows 95, 98 or NT), or from the **File Menu** (if using Windows 3.1)

Run...

and enter in the RUN box,

e:\install.exe (Replace **e:** by the drive letter for your CD – for example, **f:\install.exe**)

You are first asked to select which components you wish to install. You can select some or all of

- GEMPACK Executable-image files
- Files from Executable-image licence (and fix) diskette
- Windows GEMPACK files (WinGEM etc)
- GEMPACK documentation (PDF files)

Click in the check boxes to indicate which you want to install, then click on **Ok**.

If you have been provided with a new GEMPACK licence, it will be supplied on a disk (not on the CD). If you have checked the first item above, you should also check the second item above so that your new licence is copied to your computer as part of the installation procedure.

If the letter sent with your CD indicates that there is a bug fix disk included, you should check the first two items above so that these bug fixes are incorporated into the version of GEMPACK you install.

Then you are asked to indicate the folder (another name for "directory") in which to install the relevant components. The default is the directory **C:\GP**. We suggest that you install in this default directory unless you have another version of GEMPACK already there. In that case, perhaps choose directory **C:\GP60**. However you can choose any directory you please. Click on the **Browse** button to choose another directory. The directory need not exist since the installer will create it for you. Indeed it may be best to choose a directory that does not already exist since, otherwise, the installation procedure may overwrite existing files. After selecting the directory click on **Ok** . **(**When you return to the original screen check carefully that the directory name is what you want. Sometimes the install program adds \GP to the end of the name you have selected.)

Below we refer to this directory, where you are installing GEMPACK, as the **GEMPACK directory**. [Click on **Next** once you have indicated the directory.]

Then you will be asked if you wish the Install program to make relevant changes to your AUTOEXEC.BAT file. Details about these can be found in section 6.7 below. We recommend that you respond **yes** if you are installing Executable-image of GEMPACK in a new directory, but recommend that you respond **no** if you are installing GEMPACK in the same directory which contained an earlier version of GEMPACK.

The Install program then begins to install the components you have selected. These are done in the following order.

- Windows GEMPACK files (WinGEM etc) [if selected]
- GEMPACK documentation (PDF files) [if selected]
- GEMPACK Executable-Image files [if selected]
- Files from Executable-image licence (and fix) diskette [if selected]

3.2.1 Installing WinGEM and Windows programs from CD

This occurs as part of the CD installation. You will be told when the installation of theWinGEM and associated Windows programs starts. It takes the installer only a few seconds to copy the relevant files into the directory you have chosen. The installer also creates icons for the various programs (WinGEM, ViewHAR, ViewSOL, RunGEM, GemEdit and TABmate) on your desktop.

The destination folder should usually be the GEMPACK directory previously selected.

3.2.2 Installing GEMPACK documentation from CD

This occurs as part of the CD installation. You will be told when the installation of the GEMPACK documentation starts. Again it takes the installer only a few seconds to copy the relevant files into the directory you have chosen. The electronic versions of the GEMPACK documentation installed are so-called **PDF files**.[8] These can be viewed or printed with the **Adobe Acrobat Reader**. The installer asks if you want this Acrobat Reader installed. We recommend that you only say **Install** if you do not have any version of this Reader on your PC (otherwise say **no**).

If you choose to install the Adobe Acrobat Reader, the Adobe installer will be run. The installer may take a minute or so to check your computer before beginning the installation. If the Adobe installer suggests rebooting your computer, we suggest that you say **no** so that you complete the other installations first.

3.2.3 Copying the Executable-Image Files from CD

The installation of the GEMPACK Executable-Image (the installing of the GEMPACK programs listed in section 1.1) is done next. You will be told when this part of the installation starts.

3.2.4 GEMPACK Licence/Fix Disk

If you have selected this as part of the installation of the Executable-Image files, you will be asked to insert the licence fix disk in your floppy drive and to select the name of the drive (usually **a:**, but you can change it to **b:** if necessary.)

3.2.5 Reboot if necessary

After all the files have been installed and the install program finishes running, check any changes made to your AUTOEXEC.BAT.

You may also have to make some changes to your **CONFIG.SYS** or **CONFIG.NT** as described in section 3.2.6 below.

Finally **reboot** your computer to bring these changes to your path and the variable GPDIR and CONFIG files into effect.

[8] PDF is an abbreviation for “Portable Document Format”.

3.2.6 Possible Changes to CONFIG.SYS or CONFIG.NT

You may need to make changes to files CONFIG.SYS or CONFIG.NT.

If you are running Windows 3.1, 95 or 98,

check the file CONFIG.SYS in your default directory \. Look for the lines

FILES = xx
BUFFERS = yy

If necessary, change these (use your text editor) so that the number xx is at least 60 and yy is at least 20. If either of these lines is not present, add new lines

FILES = 60
BUFFERS = 20

as appropriate. (If you do not have a CONFIG.SYS file, create a new one containing the two lines above.)

If you are running Windows NT,

you need to add a *Files* statement to the text file CONFIG.NT. [This file is usually in directory C:\WINNT\SYSTEM32] We recommend

FILES = 70

(or higher).

If you needed to change CONFIG.SYS or CONFIG.NT, you should reboot your computer after making the changes.

3.3 Installing From the GEMPACK Executable-Image Floppy Disks

In this section we tell you how to install GEMPACK if the Executable-Image Version of GEMPACK is supplied on floppy diskettes. [You should skip the rest of this section and go on to section 3.4 if you are installing from a CD.]

3.3.1 Copying the Executable-Image Files from Disks

To start the installation process, insert **GEMPACK Executable-Image Disk 1** in your floppy drive. Then select from the **Start Menu** (if using Windows 95 or Windows NT), or from the **File Menu** (if using Windows 3.1)

Run...

and enter in the RUN box,

a:\install.exe (Substitute **b:** instead of **a:** if your floppy drive is **b:**)

When the install program ***install.exe*** starts to run, it will ask you to specify the Destination Folder. This is the folder (or directory) in which you wish to install GEMPACK. The default is the directory **C:\GP**. We suggest that you install in this default directory unless you have another version of GEMPACK already there. In that case, perhaps choose directory **C:\GP60**. However you can choose any directory you please. Click on the **Browse** button to choose another directory. The directory need not exist since the installer will create it for you. Indeed it may be best to choose a directory that does not already exist since, otherwise, the installation procedure may overwrite existing files. After selecting the directory click on **Ok** . **(**When you return to the original screen check carefully that the directory name is what you want. Sometimes the install program adds \GP to the end of the name you have selected.)

Below we refer to this directory, where you are installing GEMPACK, as the **GEMPACK directory**. [Click on **Next** once you have indicated the directory.]

Then you will be asked if you wish the Install program to make relevant changes to your AUTOEXEC.BAT file.[9] Details about the PATH and GPDIR can be found in section 6.7 below. We recommend that you respond **yes** if you are installing Executable-image of GEMPACK in a new directory, but recommend that you respond **no** if you are installing GEMPACK in the same directory which contained an earlier version of GEMPACK.

You have now copied all the files from the GEMPACK Executable-Image disks. The files in the GEMPACK directory C:\GP and its subdirectories will occupy about 16 Mb of disk at this stage. More precisely, there should be

- at least 14 .EXE files and at least the files LICEN.GEM and PKUNZIP.EXE in directory \GP,
- a large number of files in subdirectory \GP\EXAMPLES.

NOTE: You need to carry out a further install to install WinGEM, ViewHAR, ViewSOL and RunGEM (see section 3.3.3).

[9] The changes to your AUTOEXEC.BAT are to add the following statements to the end of your AUTOEXEC.BAT: (Assuming you are installing GEMPACK in folder C:\VVV as an example,)

```
SET GPDIR=C:\VVV
PATH=C:\VVV;%PATH%
```

3.3.2 Reboot if necessary

You may also have to make some changes to your **CONFIG.SYS** or **CONFIG.NT** as described in section 3.2.6. You should make any such changes before rebooting.

If you have changed AUTOEXEC.BAT or possibly CONFIG.SYS, reboot your system as follows before proceeding to the rest of the installation:

(a) If you are running Windows, exit from Windows (choose ***File | Exit*** from the Windows main menu) to get back to DOS. Then press Ctrl, Alt and Del simultaneously.

(b) If you are running Windows 95 or NT, you will need to restart your computer. To do this, from the ***Start*** menu of Windows 95 or NT, select ***Shut down...*** Then select the option "Restart your computer?" and click on ***Yes***.

3.3.3 WinGEM, ViewHAR and ViewSOL installed from Floppy Disks

If you are installing from floppy disks, you must install WinGEM and Windows programs as a separate installation. Insert the first of the **WinGEM** disks in your floppy drive.

Then select from the **Start Menu** (if using Windows 95 or Windows NT), or from the **File Menu** (if using Windows 3.1)

Run...

and enter in the RUN box,

a:\install.exe (Substitute **b:** instead of **a:** if your floppy drive is **b:**)

The installation process may ask you whether to add the WinGEM directory to your path. If you have already added the directory to your path when installing the GEMPACK Executable Image files, answer ***No*** to this question.

The installer creates icons for the various programs (WinGEM, ViewHAR, ViewSOL, RunGEM, GemEdit and TABmate) on your desktop.

In earlier versions of GEMPACK, the WinGEM, ViewHAR and ViewSOL files were in subdirectories of the GEMPACK directory. However now all the files are in the main GEMPACK directory.

3.3.4 Copying the GEMPACK Licence File

If your GEMPACK licence file has been sent on a floppy disk (either the licence/fix disk accompanying the CD or else on the first of the installation floppy disks), the installation procedure should have copied a file called LICEN.GEM from the floppy disk to the GEMPACK directory. If not, copy LICEN.GEM to this GEMPACK directory.

If you already have the licence on your computer in another directory, please copy the file LICEN.GEM to this current GEMPACK directory.

Please see section 1.2 of GEMPACK document GPD-1 for details about GEMPACK licences for Release 6.0.

Release 6.0 licences are different from Release 5.2 licences but can be used with Release 5.2 programs.

3.3.5 Applying a GEMPACK Fix

This subsection is relevant only if the letter sent with your software says that there is a **bug fix disk** included.

If you are installing from floppy disks as described earlier in section 3.3, you need to apply the fix separately. If you are in doubt as to the state of your GEMPACK files rerun the installation from the Executable-Image floppy disks as described in section 3.3.1. To apply the fix, open a DOS box on your computer and insert the fix disk in your floppy drive. Suppose that your GEMPACK directory is C:\GP60EXE and that your floppy drive is **a:**, then at the DOS prompt, enter:

a:\patchei c:\gp60exe a:

This will run the patch program PATCHEI.BAT or PATCHEI.EXE on the floppy disk and carry out the fix.

3.4 Text Editor

When installing and using GEMPACK, you will need to be able to edit text files. This is often best done using a text editor (that is, an editor designed for handling text files exclusively). A text editor EDIT is supplied with DOS or Windows. There are many other text editors available on PC machines.

If you install WinGEM, you can use its associated text editor **GEMEDIT**.

Alternatively, you can use a word processor (such as Microsoft Word or WordPerfect) to edit text files; if so, you must be careful to save the resulting file as a text file.

3.5 Installing from the Executable-Image CD Copied to the Network

If you copy all the files from the GEMPACK Executable-Image CD onto the network file server, you can use the files so copied to install GEMPACK on other machines (including those without a CD drive) attached to the network.

To do this, use **My Computer** (or some similar windows utility) to copy **all** files in the top directory e:\ and e:\ACROBAT from the GEMPACK Source-code CD (replace **e:** by the drive letter for your CD) to a directory on the network (and appropriate subdirectories). There is no need to copy the files for the CoPS Web pages in directories e:\FTP , e:\HTM and e:\BROWSERS. Then you can run the copied INSTALL.EXE to install GEMPACK on the network or on other machines which have access to the network.[10]

3.6 Making Floppy Disks from the CD

If your computer does not have a CD drive installed, you can make floppy disks on another computer which does have a CD drive. Then use the instructions in section 3.3 to install on the PC or portable computer which does not have a CD drive.

To make floppy disks from the CD, open *My Computer* (Windows 95, 98 or NT) or *File Manager* (for Windows 3.1) and look at the CD drive. Look at the folder or directory called DISKS. It should contain two sets of files:

- EXEINST.EXE, EXEINST.W02, EXEINST.W03, EXEINST.W04, EXEINST.W05
- WININST.EXE, WININST.W02, WININST.W03, WININST.W04, WININST.W05, WININST.W06.

The files EXEINST.* are the Executable-Image floppy disks. Copy each file to a separate floppy disk labelled clearly 1 to 5. [The first disk should contain just EXEINST.EXE and the last should contain just EXEINST.W05.] Insert the first EXEINST disk in the computer without a CD drive and enter

a:\exeinst.exe

to start the installation (instead of **a:\install.exe**). Follow directions in section 3.3.1. [You will be prompted to insert the other disks.]

Similarly, the files for installing WinGEM and other Windows programs are called WININST.*. Copy each file to a separate floppy disk labelled clearly 1 to 6. [The first disk should contain just WININST.EXE and the last should contain just WININST.W06.] Insert the first WININST disk in the computer without a CD drive and enter

[10] Suppose, for example, that you have copied all files (including those in all subdirectories) from the CD into directory V:\DATA\INSTALLS. Then you can Run program V:\DATA\INSTALLS\INSTALL.EXE to install GEMPACK.

a:\wininst.exe

to start the installation (instead of **a:\install.exe**). Follow directions in section 3.3.3. [You will be prompted to insert the other disks.]

3.7 Accessing the CoPS Web Pages from the CD

The GEMPACK CD also contains a snapshot, created in April 1999, of the Centre of Policy Studies (CoPS) Web site at Monash University. It is created as a convenience for those who do not have easy or rapid Internet access. Please be aware that the real Web site may well have been updated since this CD was created. The real web address is *http://www.monash.edu.au/policy/*

To access this snapshot of the web site, you do **not** have need to be connected to the Internet. However, you do need a Web Browser, such as Netscape or Internet Explorer. Enter the location:

e:/welcome.htm where "e" is the drive letter of your CD drive.

Links pointing to sites outside the Centre of Policy Studies , and *mailto* links have been preserved, but will only function if you are connected to the Internet.

Self-extracting EXE archives are included for those who do not have a browser or the Acrobat reader. There are 16-bit and 32-bit versions of the Netscape browser in the BROWSERS directory of the CD and of the Acrobat reader in the ACROBAT directory of the CD. In each case copy the EXE to your hard drive and run it to install the program.

Included in the CoPS Web pages are PDF versions of many of the CoPS/Impact Project Working papers which you can read or print out using the Acrobat reader.

4. Testing the Installation

In this section we suggest that you test the main features of the installation by carrying out a simulation with the Stylized Johansen model.

If this simulation does not work, you will need to go back to some of the steps in section 3 above.

Since most users will work with WinGEM, we first tell you how to carry out the testing via WinGEM.

4.1 Making a Directory for the Stylized Johansen Model

Start WinGEM running, following the procedure described in section 2.1 of GPD-8. Then prepare a directory for the model SJ (Stylized Johansen) as described there in section 2.5.2, and set the working directory, also as described there in.

4.2 Checking the DOS Path and Access to Your GEMPACK Licence

Before carrying out the test simulations, we suggest that you check that your DOS Path has been set correctly and that GEMPACK programs are able to access your GEMPACK licence.

To do this, select

File | Shell to DOS

from the main WinGEM menu. [That is, click on ***File*** and then click on ***Shell to DOS*** from the menu items which drop down.]

This will start a DOS box running. [If the font in the DOS box is too small to read, change the Font size of the System font. Under Windows 95 or NT, use the dropdown box on the left hand side of the Menu bar to an appropriate size, for example 10 x 18.]

In the DOS box, type in the commands

**cd **
tablo

If your DOS settings are set correctly, the GEMPACK program TABLO will start to run and it will find your GEMPACK licence. In this case you will be offered lots of options for the program TABLO.

Stop TABLO running by typing Control-C (that is, hold down the Control key, which is usually on the left of your keyboard and may be labelled "Ctrl", and, while holding it down, touch the C key). TABLO should stop running (though you may need to type Control-C twice). Now type

exit

which should close the DOS box. You are now ready to carry out the test simulations, so please skip to the next section.

1) If TABLO does not start running, your DOS Path is not as required. This may mean that you didn't change your AUTOEXEC.BAT file, or perhaps you haven't yet rebooted your computer since you made

these changes.

2) If TABLO started running but reported that it could not access your GEMPACK licence, the error message will tell you which licence file the program was trying to access. Please check that your licence file (it is called LICEN.GEM) is in the directory in which you installed GEMPACK. If the program indicates it is trying to access LICEN.GEM in a directory which is different from the one in which you installed GEMPACK, check the parts of section 6.7.1 which relate to the DOS environment variable GPDIR.

Check that the PATH and GPDIR are correctly set. To do this, first go into a DOS box, and type the DOS command

set

Check that the PATH is as you expect, that is, that it includes the GEMPACK directory (usually C:\GP). If you installed GEMPACK in a directory other than C:\GP, also check that the variable GPDIR has its expected value. If either of these is not as required, read section 6.7 (and check that you rebooted). Only proceed when everything is as required.

If you are unable to diagnose the problems here, please type

exit

(which will close the DOS box) and then click on WinGEM (which should be at the top of your screen). Select

Options | Generate diagnostic file

Select a directory in which to save the diagnostic file (the file will be called **diagnose.txt**). Then please send (via email or fax) this file (it is a text file) to us at the Impact Project. We will endeavour to assist. Details about how to contact the Impact Project are in GEMPACK document GPD-1, section 1.6.

4.3 Simulations to Test GEMPACK and WinGEM

To test that GEMPACK and WinGEM are working correctly, we suggest that you carry out the simulations with Stylized Johansen in Examples 2.1.6 to 2.1.8 of Chapter 2 of GPD-8. This carries out the simulations using GEMSIM (see also section 2.5 of GPD-1). Check that the results of the simulation are as expected (see, for example, section 2.7 of GPD-1).

If any of these tests does not work, re-check the steps in the installation in section 3 above.

If your program fails to run because a file mysteriously will not open, it may be that you do not have enough file handles. Check that you have a "FILES=…" statement in your CONFIG.SYS or CONFIG.NT as described in section 3.2.6.

4.4 GEMPACK and WinGEM

If you have previously used a version of GEMPACK under DOS (or another operating system), you will probably think initially of WinGEM as providing an interface to this DOS version. If you are new to GEMPACK, you should probably not worry about trying to distinguish between WinGEM and GEMPACK.

Note that WinGEM comes with its own text editor **GEMEDIT** (which can handle large text files up to about 16 Mb in size). We suggest that you use this editor when required to edit text files (such as Command files, TABLO Input files) for GEMPACK. [However, if you are already familiar with another text editor, you can

tell WinGEM to use this alternative editor by selecting ***Options | Change editor...*** from WinGEM's main menu.]

WinGEM also comes with the Windows programs **ViewHAR,** which allows you to view the data on GEMPACK's Header Array files directly, and **ViewSOL**, which allows you to view Solution files directly. [Those who have used GEMPACK before can think of ViewHAR as an alternative to the GEMPACK program SEEHAR and ViewSOL as an alternative to the GEMPACK program GEMPIE.] ViewHAR and ViewSOL are written by our colleague Mark Horridge (Centre of Policy Studies, Monash University). ViewHAR and ViewSOL are not documented in the GEMPACK user documentation. However you will find them well documented via their ***Help*** menus.

4.4.1 How WinGEM Works

You will see that when you carry out a modelling task using WinGEM, WinGEM starts one of the GEMPACK programs running in a DOS box. The WinGEM program windows are designed to enable you to carry out most modelling tasks simply.

You should be aware that not all modelling tasks are automated via WinGEM. For example, when you use WinGEM to run SEEHAR to look at the data on a Header Array file, you get to look at all the data on the file. If you only want to look at some of the arrays on the file, you will need to run SEEHAR interactively. You could do this by going to a DOS box and running SEEHAR interactively. But you will probably find it easier to do this through WinGEM's ***Programs | Run programs interactively...*** menu.

In running GEMSIM, it is **not possible to give terminal input** under the normal ***Run*** button method where a Command file is selected and used in the simulation. In models which use terminal input, you will need to use ***Run interactively*** or ***Run from STI file.***

WinGEM is really an interface to the DOS version of GEMPACK rather than a separate version of GEMPACK. WinGEM can only function correctly if the DOS version is also functioning properly. Note that WinGEM requires Release 5.2 (or later) of GEMPACK - it will not function as expected in conjunction with Release 5.1 (or earlier) of GEMPACK.

5. Familiarising Yourself with the Software

In this section we give suggestions for hands-on computing which will help you to become familiar with many important features of the use of GEMPACK on 80386/80486/pentium machines. These are based on the models supplied with GEMPACK (see section 1 of GPD-8), especially the Stylized Johansen and Miniature ORANI models.

Note that the files corresponding to the example models sent with GEMPACK are all in the EXAMPLES subdirectory of your GEMPACK directory (usually C:\GP\EXAMPLES). You should be able to carry out simulations with all of these models in 16Mb of memory.

5.1 Using WinGEM

Detailed suggestions for hands-on computing using WinGEM can be found in section 2 “Getting Started with GEMPACK via WinGEM” of GPD-8. This begins with examples based on the Stylized Johansen and goes on to examples based on Miniature ORANI, GTAP and ORANIG.

5.2 Not Using WinGEM

Detailed suggestions for hands-on computing using WinGEM can be found in section 3 “Unix/DOS Prompt: Hands-on Computing” of GPD-8. This begins with examples based on the Stylized Johansen and goes on to examples based on Miniature ORANI. You should ignore the examples there using TABLO-generated programs.

6. Building Your Own Models

This section contains other information relevant to working with GEMPACK on your DOS or Windows machine. Most of it applies whether you are running WinGEM or not (though most of the changes discussed below need to be made in DOS or in a DOS box).

6.1 New Model's Directory Location

We suggest that each new model you build is put in a separate directory on the hard disk, outside of \GP. Note that your PATH command (as set in section 6.7.1 below) will ensure that the GEMPACK programs are found correctly when, for example, you (or WinGEM) issue the command

tablo

When you use WinGEM with any model, make sure that you set WinGEM's working directory to point to the directory containing the files for this model (as spelled out in section 2.1.3 of GPD-8).

6.2 If Your Model Becomes Too Large

This may happen because you have exceeded the limits on your Executable-Image licence, or because you have run out of available memory on your computer.

6.2.1 Executable-Image Licence Limits

Ths subsection applies if you have a Limited Executable-Image GEMPACK licence. It does not apply if you have an Unlimited Executable-Image licence (see section 1.2 of GPD-1).

A limit is imposed on the size of the models you can carry out simulations with using this Executable-Image Version of GEMPACK. The only programs that may end with an error because your model has exceeded these limits are GEMSIM and SAGEM. The limits only apply to simulations. There are no limits imposed on the size of data-manipulation tasks you can carry out with the Executable-Image version of GEMSIM.

We expect that all simulations which could have been carried out with the Release 5.2 Executable-image version of GEMPACK will also be allowed with the Release 6.0 Executable-image version.

The limits on the size of simulations that this Executable-Image version of GEMSIM can solve are:

- Total number of (components of) endogenous variables, including any backsolved for, must be no more than 30,000.
- Total number of (components of) variables (exogenous and endogenous, including any backsolved for) must be no more than 35,000.
- Total number of (components of) endogenous variables in the condensed system must be no more than 10,000.
- Total number of (components of) variables (exogenous and endogenous) in the condensed system must be no more than 16,000.
- Number of nonzeros in the Left-Hand Side (LHS) matrix (for any step of the simulation) must be no more than 75,000.
- Total number of reals and integers used for coefficients (pre-simulation and updated), plus those used to store simulation results, must be no more than 150,000.

- Total number of components of variables (in the condensed system or backsolved of) with one argument[11] and more than 40 components must not be more than 1000. [This condition should only affect single-country models with more than 40 sectors.]

All the other programs supplied with this Executable-Image version should be able to handle arbitrarily large tasks, subject only to the amount of memory on your computer.

If a simulation you are carrying out exceeds the limits for the version of GEMSIM supplied with this Executable-Image version of GEMPACK, you will receive a message like the following one.

%% This simulation has exceeded the dimensions allowed with GEMSIM for your type of Executable-image GEMPACK licence.

To continue you would need a source-code version of GEMPACK (or an "Unlimited Executable-image" licence, if appropriate for you).
You can obtain these from the GEMPACK distributors.

This will be followed by details telling you by how much your simulation has exceeded the three limits specified above.

With the Executable-Image Version, your main alternative is to find another way of carrying out the same task. The only other alternative is to obtain a larger version of GEMPACK (this usually means the source-code version of GEMPACK, which allows you to reconfigure programs to take advantage of all the memory in your computer).

The limits shown above are also the limits for a Release 6.0 TABLO-generated program without any form of GEMPACK licence. If a simulation with a TABLO-generated program exceeds any of these limits, it will require at least a Large-simulations licence - see section 1.2 of GPD-1.

6.2.2 Not Enough Memory Available on your Computer

If the task you are carrying out with any of the programs supplied with the Executable-Image version of GEMPACK requires more memory that is available on your computer, you will receive a message saying that the program is stopping because it is

unable to allocate sufficient memory.

If this happens, you may be able to free up more memory by closing down any other applications running (for example, word processors), in which case you can then try to rerun the task. Otherwise you need to find some other way of carrying out the task (or buy more memory).

6.3 Using GEMPACK in a DOS box

If you prefer to, or need to, work in a DOS box, we strongly suggest that you always work in the DOS box that WinGEM provides via its

File | Shell to DOS

[11] Variables with two or more arguments, only one of which ranges over a set of size more than 1 are also included here.

menu option. The settings of this DOS box have been designed to produce good productivity, especially for GEMPACK users who are running long simulations in a DOS box and simultaneously working with other Windows programs (for example, wordprocessing or spreadsheet programs). In particular, programs running "in the background" in these DOS boxes usually receive a reasonable fraction of total CPU time without disrupting the foreground task.

6.4 Using Stored-input Files in a DOS Box

This section does not apply if you are running WinGEM.

You can use Stored-input files under DOS on 80386/80486/Pentium machines either via the GEMPACK **sti** option or using redirection of input as in, for example,

gemsim < sjlb.sti

or using the new command line **-sti** feature (introduced with Release 6.0 of GEMPACK - see section 7.3 of GPD-4), as in, for example,

gemsim -sti sjlb.sti

[The latter may be more robust under Windows NT.]

If you make your own Stored-input files to use via input redirection, it is a good idea to include the line

bat

at the start of these files. This means that, if the program encounters invalid input, it will stop. (See section 5.3 of GPD-1 for more about this.)

6.5 Interrupting Programs and Controlling Screen Output

This section only applies when you are running under DOS or in a DOS box.

6.5.1 Interrupting Programs

Sometimes you will start a program running and then realise that it is not doing what you intend. You can interrupt the program and return to the DOS prompt by typing Control-C (that is, hold down the Control key, which is usually on the left of your keyboard and may be labelled "Ctrl", and, while holding it down, type C). Sometimes you may have to type Control-C twice to achieve this.

6.5.2 Controlling Screen Output

Often screen output goes much too quickly for you to read. You can control it using the

Control-S Control-Q

keystrokes. (For Control-S, hold down the Control key, which is usually on the left of your keyboard and may be labelled "Ctrl", and, while holding it down, type S).

Use Control-S to stop the screen output and Control-Q to start it again. You can repeat these as needed. However, if you get out of step, say by typing two Control-S in a row, you will lose control

of the output and have to wait until the program ends; even Control-C (see section 6.5.1 above) will probably fail then.

On some machines the Scroll Lock key works in a similar way. (It first stops screen output, then starts it, then stops it, and so on.)

6.6 DOS Batch Files

If you create DOS batch (.BAT) files for carrying out tasks including running GEMPACK programs, you may like to take advantage of the fact that, if any GEMPACK program ends with a fatal error, it sets the value of the DOS parameter ERRORLEVEL value to 1. You can test for this in .BAT files to stop the batch job early in such a case.

For example, the .BAT file below runs SAGEM and then GEMPIE. If the SAGEM run ends unsuccessfully, the test of ERRORLEVEL after it aborts the batch job and gives a message saying that the job was unsuccessful.

```
REM Beginning of batch file
REM  Run SAGEM
REM (uses DOS input redirection) sagem < sag1.sti
REM Next uses the GEMPACK alternative (see section 7.3 of GPD-4)
sagem  -sti sag1.sti
REM test ERRORLEVEL to see if this was successful
if errorlevel 1 goto error
REM  Run GEMPIE
gempie < gemp1.sti
if errorlevel 1 goto error
echo off
echo BATCH JOB SUCCESSFUL
goto endbat
:error
echo off
echo *** ERROR: BATCH JOB FAILED ***
:endbat
REM End of batch file
```

6.7 Changes to the DOS Settings

In this section we explain the setting of the PATH variable and the Environment variable GPDIR without assuming that the installation program has carried out these changes to DOS settings for you. This topic is one which is changing as the various Windows operating systems change. There are new ways of setting the PATH and Environment variables which are available under Windows NT not explained here.

6.7.1 DOS PATH and AUTOEXEC.BAT

The usual place to install GEMPACK is in the directory C:\GP on part of your hard disk.

You can install it in a different directory if you prefer. In that case, whenever we refer to **C:\GP** or **\GP** you should replace that by the name of the directory in which you installed GEMPACK.

The directory C:\GP must be on the DOS path.

To arrange this, you must edit the appropriate file (called AUTOEXEC.BAT in your default directory \) which is executed when you turn on your PC. (If you have no such file, create one.) You

should add these directories to the PATH line in that file.[12] (Use a text editor, such as the EDIT which comes with DOS.)

For example, if you find a line

PATH = C:\;C:\DOS

you should change it to

PATH = C:\;C:\DOS;C:\GP

If you do not find a PATH line, make a new line

PATH = C:\GP
(If you plan to install GEMPACK on a disk drive different from C:, specify that drive in the PATH line.)

If you plan to install the GEMPACK files in directory C:\GP, no other change is required to AUTOEXEC.BAT.

But if you intend to install these files in another directory (not C:\GP), you need to add an extra line to AUTOEXEC.BAT to set the DOS variable called GPDIR.[13] For example, if you intend to install the GEMPACK files in directory D:\PROGRAMS\GP60, add the following line to AUTOEXEC.BAT.

SET GPDIR=D:\PROGRAMS\GP60

(Change this appropriately to indicate where you actually installed these files.) Note that it is important not to include any spaces in this line, apart from the one between SET and GPDIR.

EXAMPLE

Suppose you have a machine with starting hard disk C:, suppose that COMMAND.COM is in C:\, that your external DOS commands are in C:\DOS, and that you intend to install GEMPACK on drive E in directory \GP60. Then your AUTOEXEC.BAT file should contain at least the following:

PATH C:\;C:\DOS;E:\GP60
SET GPDIR=E:\GP60

[12] The installation program does this differently by adding the statement to the end of your AUTOEXEC.BAT

```
PATH=C:\GP;%PATH%
```

This adds the directory C:\GP to the start of your current path.

[13] Make sure there is only one such "SET GPDIR =…" statement since Windows NT sometimes just looks at the first of these whereas Windows 3.1 or Windows 95 look at the last.

7. Changes from Release 6.0 (October 1998)

This section documents changes made since Release 6.0 (October 1998). These changes are mainly enhancements which are available in Release 6.0-001 (March 1999).

Apart from the new features in RunGEM documented in section 7.1, the material in this section is fairly technical and assumes familiarity with Release 6.0 of GEMPACK. If you are new to GEMPACK, you should use this section as reference material after you have become familiar with the software.

7.1 Systematic Sensitivity Analysis via RunGEM

The new version of RunGEM (version 1.2, April 1999) distributed with Release 6.0-001 of GEMPACK makes it very easy for users to carry out systematic sensitivity analysis with any models implemented and solved using GEMPACK. You can compute how sensitive your simulation results are to changes in the underlying parameters (for example, Armington parameters) of your model, or to changes in the shocks.

To obtain documentation and help for this facility, click on

Tools | Help on Systematic Sensitivity Analysis (SSA)

in RunGEM's main menu. [A hands-on introduction to the other aspects of RunGEM can be found in chapter 5 of GPD-8.]

7.2 Range checking can apply when not doing automatic accuracy

If you are carrying out a simulation, range checking (see section 2.2 of GPD-4) can now apply when automatic accuracy (see section 12.3 of GPD-4) is not being done.

The statements "range test updated values = ... ;" and "range test initial values = ... ;" (see section 2.2 of GPD-4 and page 19-115 of GPD-4) are now extended to add an additional alternative value of "warn". That is, they have the form

range test updated values = updated|extrapolated|both|no|warn ;
range test initial values = yes|no|warn ;

If you are not doing automatic accuracy, the default value is "WARN" in each case. [If you are doing automatic accuracy, the default values are still BOTH and YES respectively, as set out in section 2.2.6 of GPD-4.]

If automatic accuracy is not being done, if one of the values is out of range,

> (i) if the relevant "range test ..." is set at "WARN", then a warning is shown for the first few instances but the simulation carries on as if these warnings were not given.
> (ii) if the relevant "range test ..." is set at "YES", then the simulation ends with a fatal error after the value out of range is shown (in the log file). Possibly several out-of-range values of the same type (initial, updated or extrapolated) may be shown before the program stops.
> (iii) if the relevant "range test ..." is set at "NO", the relevant testing is not done.
>
> We recommend setting these to "YES" so that you do not accept simulation results in which a value goes out of range. [If a value goes out of range, you can increase the number of steps or use automatic accuracy to keep the values in range.]

(a) If "range test updated values = both ;", then both updated and extrapolated values out of range are fatal errors.
(b) If "range test updated values = updated ;", then updated values out of range are fatal errors, and the software merely warns about extrapolated values out of range.
(c) If "range test updated values = extrapolated ;", then extrapolated values out of range are fatal errors, and the software merely warns about updated values out of range.

If automatic accuracy is being done,

then "WARN" is a new possible value for these “range test ... ;" settings. If the relevant "range test ..." is set at "WARN", a warning is shown for the first few instances out of range but the simulation carries on as if these warnings were not given. [In particular, the subinterval is not redone.]
The only difference between setting one of these to "NO" or to "WARN" is that in the latter case you see warnings in the log file.

If any range checks are set to be warnings only, a summary at the end tells how range check failures there have been (if there are any). You can check if there have been any by searching for "not in the required range" in your log file.

7.3 Assertion failures can now be warnings

Assertions are introduced in section 11.4 of GPD-4. There is a new statement

assertions = yes|no|warn ;

available in Command files for TABLO-generated programs and GEMSIM.

(i) The statement "assertions = no ;" is equivalent to the statement "nas = yes ;" (see section 11.4 of GPD-4). When this is in operation, Assertions are not checked.
(ii) The statement "assertions = yes ;" is equivalent to the statement "nas = no ;". This is the default. When this is in operation, assertion failures are treated as fatal errors.
(iii) When the statement "assertions = warn ;" is in operation, assertions are checked, but a failure results in a warning only. The first few warnings are shown in detail on the log file.

A summary at the end tells how many assertion failures there have been (if there are any). You can check if there have been any by searching for "assertion failure" in your log file.

7.4 Reporting memory used by TABLO-generated programs and GEMSIM

Fortran 90 TABLO-generated programs now give reports as to how much memory is required (or used). GEMSIM (fortran 90 or fortran 77) does the same.

The memory used is reported in two parts (referred to as the TGMEM1 and TGMEM2 parts). For large models, the TGMEM1 part is usually the larger of these. You will find brief descriptions of these two parts in any simulation log file (search for “TGMEM”).

Note that these reports do not include memory required for the nonzeros generated doing the LU decomposition (where memory is allocated according to the size of the parameters MMNZ and MMNZ1). The amount of memory used for these is

12*MMNZ bytes if MA48 is used,
(4*MMNZ + 8*MMNZ1) bytes if MA28 is used.

The minimum MMNZ and MMNZ1 values required are echoed at the end of the run of these programs. [See section 3.3.3 of GPD-4 and section 5.13.2 of GPD-2 for more about MMNZ and MMNZ1.]

With these reports you can get a rough estimate of the total memory required to run the program. To do this, add the TGMEM1 and TGMEM2 parts, add the above values for MMNZ,MMNZ1 and then add about 4-5 megabytes for other memory and for memory required for the code itself.

7.5 Programs ACCUM and DEVIA

These programs are documented in section 6.6 of GPD-4.

(i) ACCUM can now produce accumulated results as well as side-by-side results. See the new options ACC,ACI.
(ii) DEVIA can now produce year-on-year differences. See the new option NAC.
(iii) DEVIA can now be told the name of a Solution file associated with the results being processed - see new option SOL. If you use this option, DEVIA will correctly process change and percentage-change variables.
(iv) The Release 6.0-001 versions of these programs run considerably more quickly than the Release 6.0 versions. Some bugs have been fixed.

7.6 New option ADD when modifying data in MODHAR

When you modify the data on an array using MODHAR, the Release 6.0 version of MODHAR offered the options "r" (replace) or "s" (scale). [See GPD-3 for details about MODHAR.]

The Release 6.0-001 version of MODHAR also offers the new alternative "a" (add). With this option, the numbers entered are added to the values at the original header.

7.7 GAMS output from SEEHAR, TABLO-generated programs and GEMSIM

SEEHAR, TABLO-generated programs and GEMSIM can be used to convert data held on GEMPACK-style data files to GAMS-style data files (see section 16 of GPD-4).

These programs now add GAMS-type lines at the start of the files. The added lines are to ensure that GAMS treats the GEMPACK-style comment lines as comments. This saves users the trouble of removing these GEMPACK-style comment lines. This enhancement should make it easier for GAMS files written by GEMPACK to be joined together with other GAMS files.

SEEHAR has a new option **GM3**. To see the details, type “GM” when the SEEHAR options menu is presented.

7.8 Default for levels results and SLTOHT

The program SLTOHT can show levels results from a simulation (see section 2.1.1 of GPD-4).

Option LV from the options menu of the Release 6.0 version of SLTOHT did not make it clear that NLV (no levels results) is the default, although this was clearly stated in section 2.1.1 of GPD-4.

7.9 "Check-on-read coefficients" statements

TABLO-generated programs and GEMSIM can carry out various levels of checking of set and element information when reading data from Header Array files (see section 5.2 of GPD-4).

The default value for “check-on-read coefficients = … ;” was not specified unambiguously in the Release 6.0 documentation. [On page 5-33 (section 5.2) of GPD-4, the default was stated to be "warn". In chapter 19, page 19-114, of GPD-4, it was stated to be "no".

In Release 6.0-001, the default has been set to "no".

7.10 Slight incompatibility between Release 5.2 and 6.0 text files

Release 6.0 programs (including SEEHAR) write the coefficient name as part of the "how much data" heading at the start of each array (see section 20.1 of GPD-4). This coefficient name cannot be read by Release 5.2 GEMPACK programs.

7.11 Recursive Formulas over Intertemporal Sets

The implementation of formulas with an ALL index ranging over an intertemporal set is not documented in GPD-2. The text below remedies this and points out a related bug which is now fixed. We are grateful to Robert McDougall for pointing out the bug and the gap in the documentation. [This section will only be of interest to readers who work with intertemporal sets and/or intertemporal models as documented in chapter 7 of GPD-2.]

Consider an intertemporal set TIME with elements t1 to t10 and consider subsets of this, TIME1 with elements t1 to t9 and TIME2 with elements t2 to t10. Consider two coefficients C1 and D each with one argument ranging over the set TIME. Suppose also that values have already been assigned to D(t) for all t in the set TIME.

(a) Consider the formula

```
(all,t,TIME1)  C1(t+1) = C1(t) + D(t) ;
```

Note that, in TABLO-generated programs, loops over intertemporal sets are always carried out in order going from the first to the last element of the set. [That is, the formulas are carried out **forwards** in time.] Hence the formula above is carried out as 9 separate formulas (corresponding to the 9 elements of the set TIME1). First the formula is carried out for t=t1 so that C1(“t2”) is set equal to C1(“t1”)+D(“t1”). Then it is carried out for t=t2 [which assigns a new value to C1(“t3”)] and finally for t=t9 (which assigns a new value to C1(“t10”)].

Provided that the value of C1(“t1”) is set before hand, this will calculate in turn the values of C1 at points t2, t3, …, t10 in the usual backwards-looking way often needed in an intertemporal model.

Note also that the most recent values are always used on the RHS. Thus, for example, when calculating the value of C1(“t3”), it uses the value of C1(“t2”) which was calculated in the previous instance of the formula (that is, the formula with t=t1).

(b) Consider now the formula

```
(all,t,TIME2)  C1(t) = C1(t+1) + D(t) ;     ! not valid !
```

The intention of this is presumably to set the values of C1 working **backwards** in time. That is, provided that the value of C1(“t10”) is set before hand, this would calculate the values of C1(“t9”) from the values of C1(“t10”) and D(“t9”), then the value of C1(“t8”) from this new value of C1(“t9”) and the value of D(“t8”), and so on. For this to work out as described, TABLO-generated programs

would need to run the loop over t backwards. They do not do this (as indicated above). Accordingly this formula would not be evaluated as intended.

It is a bug in Release 6.0 of GEMPACK that the formula above did not generate an error when TABLO processes it. This bug is fixed in Release 6.0-001.

(c) In formulas (whether the ALL qualifiers range over intertemporal or non-intertemporal sets), TABLO-generated programs always use the most recent values on the RHS. Consider the formula

```
(all,t,MIDTIME) C1(t) = [C1(t-1) + C1(t+1)] / 2  ;  ! wrong !
```

where MIDTIME is the set with elements t2 to t9. The intention of this formula is presumably to replace the values of C1(t) by the average of the previous and subsequent C1 values. This would not be achieved with the present implementation of formulas since, when t=t3, the value of C1("t2") used on the RHS would be the most recent one - that is, the one calculated by the above formula with t=t2.

At present, the simplest way of implementing the intention stated above would be to create a copy (say C2) of the values in coefficient C1 and then apply the formula above with C2 on the RHS. That is, replace the formula above by the formulas

```
(all,t,TIME) C2(t) = C1(t) ;
(all,t,MIDTIME) C1(t) = [C2(t-1) + C2(t+1)] ;
```

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[14] The numbering of GEMPACK Documents has been re-started with Release 5 of GEMPACK, when the abbreviation "GPD" was first used. Previous editions of these documents did not have the same numbers as the current editions. Pre-Release-5 documents are numbered "GED-xx".

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