Installing and Using the Source-Code Version of GEMPACK on DOS/Windows PCs with Lahey Fortran

GEMPACK Document No. GPD-6

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Abstract

Pentium/80486/80386 PC computers with extended memory, running DOS, Windows 3.1, Windows 95 or 98, Windows NT or OS/2 provide excellent platforms for doing serious general equilibrium modelling. This document describes how to install and use GEMPACK on such machines provided they have either of the Lahey Fortran compilers F77L-EM/32 or LF90 installed on them.

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.

Authors and Earlier Editions

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REFERENCES

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1 The 80386/80486/pentium DOS/Windows Version of GEMPACK

GEMPACK runs essentially unchanged on a variety of machines. This document tells you how to install the source-code version of GEMPACK on a pentium (or an 80386 or 80486) PC which

- runs under DOS, Microsoft Windows 3.1, Windows 95, 98 or NT, and
- which has either of the Lahey Fortran compilers F77L-EM/32 or LF90 installed.

It also tells you machine-specific information you may need to know to maximise your use of GEMPACK on such a machine. This document also applies to 80386, 80486 or pentium machines running other operating systems (such as OS/2) which give users access to a DOS box.

This document describes

1. how to install and use the source-code version of GEMPACK under Windows or in a DOS box,
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, Windows 95, 98 or NT.

The source-code version of GEMPACK runs under Windows (in a DOS-like box) or in a DOS box much like it runs on other machines (including unix machines and DEC VMS machines).

WinGEM, ViewHAR, ViewSOL and RunGEM are only available under Microsoft Windows 3.1, 95, 98 or NT.

The user documentation for GEMPACK can be found in the other GEMPACK documents, of which GPD-1[1] *Introduction to GEMPACK* should be your starting point. You can carry out the installation and testing on a DOS/Windows machine as 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 DOS/Windows 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.

1.1 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 9.1). Other changes since Release 6.0 (October 1998) are documented in section 9.

---

[1] 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.

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".

2 System Requirements for Installing GEMPACK

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, Windows NT, OS/2 or DOS version 3.3 or higher.

3. Hard disk, requiring at least 40 MB free to install and test GEMPACK.

4. At least 8MB bytes of memory (RAM) if you are using F77L-EM/32 and at least 32MB of RAM if you are using LF90. At least 16MB of RAM (or 32MB for LF90) is required if you intend to use WinGEM (the Windows interface to GEMPACK).

5. Either the Lahey Fortran 77 compiler **F77L-EM/32** (version 5.01 or later), referred to as F77L3 or the Lahey Fortran 90 compiler **LF90**. Each of these compilers comes with a DOS Extender (Phar Lap) which gives access to the memory above 1MB on your machine.

Note that the compiler MUST be installed on your machine BEFORE you install GEMPACK.

Most computers easily satisfy the first four requirements. If you feel uncertain about some of these requirements and how to check them, see details in section 2.2 below.

2.2 Details

2.2.1 DOS version

You can determine which version of DOS you have by turning on your PC and, at the DOS prompt, entering the DOS command: **ver**

2.2.2 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 40,000,000 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.

2.2.3 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 8MB of RAM and most can be implemented in 16MB of RAM (although more is required to implement very large models such as ORANI and its extensions, or large intertemporal models).[2]

How to check for the amount of available extended memory

[2] The two Lahey Fortran compilers and Phar Lap can use 'virtual memory'. However we have found that the resulting virtual memory programs run too slowly (when they actually need virtual memory) to be useful. Accordingly the GEMPACK executable images produced by the GEMPACK installation process cannot access virtual memory.

You can determine how much extended memory is available on your PC by turning on your PC and at the DOS prompt entering the command: **mem**

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.

If the available extended memory is less than 8MB then you may be unable to run GEMPACK software on your PC. See section 7.6 below for more details.

2.2.4 Lahey FORTRAN compilers

The Lahey FORTRAN compilers for 80386/80486/pentium PCs are produced by Lahey Computer Systems Inc. You need either

- their Fortran 77 compiler F77L-EM/32 compiler which is called F77L3,[3] or
- their Fortran 90 compiler LF90.

Instructions for installing either of these compilers and their associated DOS Extender are given in the Lahey Fortran manuals.

If you are using F77L3, you must have version 5.01 or later (and we recommend version 5.1 or later).

If you are using LF90, you must have version 3.50 or later, and we strongly recommend that you have version 3.50c or later. (We recommend version 4.50 or later.)

You **should not use** the newer Lahey Fortran compiler LF95 since this compiler is not supported yet for use with GEMPACK. [In particular, we have not made the necessary changes to the GEMPACK code to cover changes Lahey has made to the binary file format.]

For more information, contact

Lahey Computer Systems Inc
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Computer Transition Systems
Box 4553, Melbourne 3001

Telephone : (03) 9530-6633 or (613) 9530-6633 (overseas)
FAX: (03) 9530-6644 or (613) 9530-6644 (overseas)

[3] You cannot use either Lahey F77L, Lahey Personal FORTRAN or the discontinued Lahey F77L-EM/16 compilers, and you cannot use versions of F77L3 earlier than version 5.01. We do not support the new Lahey compiler LF95 yet.

3 Installation Instructions

Source-code GEMPACK is usually supplied on a CD. Alternatively, it may be supplied on four diskettes (1.44 Mb disks).

The components to install are:

- the Source-code version of GEMPACK.

  This involves copying the Source-code files from the CD or disks and building libraries and executable images of the various GEMPACK programs.

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 9.1). **TABmate** is a Windows program for modifying and debugging TABLO Input files.[4]

If you are installing from the Source-Code CD,[5] 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 Source-Code CD if it is not already installed on your computer).

After some preliminaries, instructions for installing the Source-code version of GEMPACK are in sections 3.4 to 3.9 below. Instructions for installing WinGEM and associated Windows programs are given in sections 3.4.1 and 3.14 below. Instructions for installing the documentation are given in section 3.4.2 below.

3.1 F77L3, LF90 and Phar Lap

Before installing GEMPACK you must install your extended memory FORTRAN compiler F77L3 or LF90 and the associated DOS Extender Phar Lap. Follow the instructions in your Lahey FORTRAN compiler manuals.

For use with GEMPACK, you must install at least the following parts of the compiler (see the menu when you run the INSTALL program that comes with these compilers).

For LF90, select at least

- Lahey Fortran 90 v…., and select a Typical Installation.

[4] TABmate cannot run under Windows 3.1 so will not be installed if you are running Windows 3.1.

[5] 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

For F77L3, select at least,

- The Compiler and Libraries
- Phar Lap DOS Extender, Linker, and Library Manager

Of course, you may well wish to install more than these, such as the Sample Programs and the Lahey Blackbeard Editor. You need a text editor for use with GEMPACK and the Lahey Blackbeard Editor is a good one. [The windows version of GEMPACK also comes with a good text editor GemEdit - see section 4.4.]

If you change your compiler, for example from F77L3 to LF90, you need to reinstall the Source Code files again from the CD or disks. There are some different files used for the different compilers.

3.2 If You Have An Earlier Release of GEMPACK Installed

If you have an earlier release of GEMPACK installed on your machine, when installing Release 6.0, you can either choose to leave the earlier version on the disk or to first remove the earlier version. 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). This means installing Release 6.0 of GEMPACK in a different directory from the one in which you installed the earlier release.

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 or NT). 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

```
cd \
rendir gp gp52
```

will rename the directory \gp to \gp52.]

3.3 Installing Under Windows

If you are running Windows 3.1, Windows 95, Windows 98 or Windows NT, we suggest that you install and build GEMPACK libraries using the Windows installer supplied with the Source-Code CD or Source-Code disks. This way of installing is described in detail in sections 3.4 to 3.11.

If you are running some other operating system (for example, OS/2) or if you prefer to work at a DOS prompt, please follow the installation instructions in section 7 rather than those in the rest of this section.

3.3.1 If you are installing on a Network

If you are installing GEMPACK on a network, please read section 6.15 before proceeding.

In particular, if your Fortran compiler is installed on a network, you should make the changes in points (i) and (ii) in section 6.15, to your AUTOEXEC.BAT file and then reboot your computer before continuing.

You can copy the all files from the GEMPACK Source-code CD onto one machine on the network and use the files so copied to install on other machines (including those without a CD drive) attached to the network. (See section 6.15.1 for details.)

3.4 Installing from the Source-Code CD

If Source-Code GEMPACK has been supplied on four diskettes, you should skip this section and go to section 3.5.

If Source-Code 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

- Source-Code GEMPACK (including executable images)
- Files from GEMPACK 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**. The first option above means copying the Source-code files from the CD and then building libraries and executable images of the various GEMPACK programs.

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 select 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. Select the directory or type in the name of a new 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. Then click on **Ok** . Check carefully that the name of the directory is what you want since the installer is inclined to add \GP to the directory name selected.

Below we refer to this directory, where you are installing GEMPACK, as the **GEMPACK directory**. [Click on **Next** once you have selected 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 3.9 below. We recommend that you respond **yes** if you are installing Source-Code GEMPACK in a new directory, but recommend that you respond **no** if you are installing Source-Code 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]
- Source-Code GEMPACK (including executable images) [if selected]
- Files from GEMPACK licence (and fix) diskette [if selected]

[This order is chosen because the first two above are installed relatively quickly which installing Source-Code files and building libraries and executable images may take considerably longer.]

3.4.1 Installing WinGEM and Related Windows Programs

You will be told when the installation of these files 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.

3.4.2 Installing GEMPACK Documentation

You will be told when the installation of these files 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**.[6] 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 **yes** 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.

3.4.3 Copying Source-code Files and Building Libraries and Executable Images

You will be told when this part of the installation starts. First the GEMPACK installer **BuildGP** (see section 3.6) is installed onto your PC. Then BuildGP starts running. You direct it to copy the source-code files from the CD and then start building the GEMPACK libraries and executable images of the various GEMPACK programs. [Details can be found in sections 3.6 to 3.8 below.]

Now skip to section 3.6 for details about running BuildGP.

[6] PDF is an abbreviation for "Portable Document Format".

3.5 Installing From the Source-Code Floppy Disks

In this section we tell you how to install source-code GEMPACK if the source code of GEMPACK is supplied on diskettes. The GEMPACK installer is called BuildGP.

3.5.1 Transferring BuildGP to your computer

To start the installation process, insert **GEMPACK 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 install.exe starts to run, it will ask you to specify the Target Directory. This is the 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. The directory need not exist since INSTALL 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.

Below we refer to this Target Directory, where you are installing GEMPACK, as the **GEMPACK directory**.

The INSTALL program will copy the program BUILDGP.EXE, the PIF file BUILDGP2.PIF and the program GRABSCRN.EXE into the GEMPACK directory. It will also create an icon for BuildGP in the GEMPACK group.

3.5.2 Starting BuildGP

To start BuildGP either

- double-click on the BuildGP icon
  or
- you can find the program BUILDGP.EXE in the GEMPACK directory in *My Computer* (Windows 95 or NT) or *File Manager* (for earlier versions of Windows) and double-click on it there.

Now continue as in the next section.

3.6 Running BuildGP

The program **BuildGP** is designed to carry out the following tasks:

1. Copy the GEMPACK files from the GEMPACK Source-Code CD or the four Source-code diskettes to the directory on your hard disk where you want to install GEMPACK (often C:\GP).
2. Either make changes to your AUTOEXEC.BAT to add this GEMPACK directory to your path (with your permission) or indicate what changes need to be made.
3. Check your system to see if Fortran is installed, if there is enough disk space, whether the licence is in the correct place, and check the DOS path.
4. Make the GEMPACK libraries by compiling many groups of subroutines.
5. Make the GEMPACK programs (Executable images) by compiling the programs and linking to the libraries.

You need not do all these tasks in one go. If you need to, **you can exit** from BuildGP **and restart** it again later to complete the installation of GEMPACK (see section 3.5.2).

When BuildGP starts to run, it offers you two choices.

If you are installing from a CD, these choices are:

- Copy files from the installation CD
- Build libraries and executable images.

If you are installing from disks, these choices are:

- Copy files from the installation diskettes
- Build libraries and executable images.

Click on the first of these ***Copy files from the installation CD (or diskettes)*** and then click on the ***OK*** button. Then continue with the section below.

3.7 Copying the Files from the Installation CD or Floppy Disks

Next you are asked which version of Fortran you will use. Either click on

F77L3

or

LF90

and then click on the ***OK*** button.

Then you are asked to specify in **which directory** you wish to install GEMPACK. The default offered is the target directory selected in installing the programs BuildGP in section 3.5.1. Normally you should accept the default (but you can choose another directory if you wish to). We will refer to this directory as the **GEMPACK directory**.

What happened next depends on whether you are installing from a CD or from disks.

- If you are installing from a CD, the installer will ask you to confirm the name of the drive containing the CD. Click ***OK*** (after changing the name of the drive if necessary). BuildGP will copy the files from the CD onto your hard disk.
- If you are installing from the four disks, you will be asked to insert the GEMPACK disk number 1 into your floppy drive. You must also specify the name of this drive (for example, **B:**) if it is not **A:**. Once the disk is inserted, click on ***OK***. BuildGP will copy the files from this disk onto your hard disk. Repeat for the remaining disks 2, 3 and 4.

If you are installing from a CD, and if you checked "Files from GEMPACK licence (and fix) diskette" as one of the components to install (see section 3.4 above), you will now be asked to insert the licence and fix diskette into your floppy disk drive. You will also be asked to indicate the name of the relevant drive (A:, B: etc). The installation procedure will copy your licence file and also make any bug fixes contained on the diskette.

If you are copying files from the four diskettes (this does not happen if you are copying from a CD),

BuildGP checks to see if any changes are needed to your **AUTOEXEC.BAT** file. If so, you will be asked whether or not you permit BuildGP to make the required changes to this file.

1. If you answer ***yes*** (which we recommend), additions will be made to AUTOEXEC.BAT and your current AUTOEXEC.BAT file will be copied to C:\AUTOEXEC.GP6.
2. If you answer ***no***, your AUTOEXEC.BAT file will not be changed but the new file AUTOEXEC.GPN will be written containing what BuildGP recommends should become your AUTOEXEC.BAT file. You will then need to make the required changes later.

The changes are to add the GEMPACK directory to your path and also to set an environment variable called GPDIR which tells the GEMPACK programs where to find the GEMPACK licence and the GEMPACK libraries. You will need to reboot your computer before these changes come into effect. (However you can complete the installation before you reboot.)

In either case, when BuildGP informs you that it has handled changes as requested, just click on ***OK***.

This completes the copying of files. Now we suggest that you continue in BuildGP to build the GEMPACK libraries and make executable images of various of the GEMPACK programs (as described in the section 3.8 below). However if you wish to, you can exit from BuildGP at this stage and restart it as described in section 3.7.1 below when you are ready to build the libraries and programs.

3.7.1 If You Need to Restart BuildGP

If you have used BuildGP to copy the files to your hard disk (as in section 3.7), but were not able to complete building the libraries and executable images (see section 3.8 below), you need to restart BuildGP to do that. Start BuildGP running in the same way as described in section 3.5.2.

When BuildGP starts to run, click on the option ***Build libraries and executable images***, and then click on the ***OK*** button. Then proceed as in section 3.8 below.

3.8 Building Libraries and Executable Images

(a) If you have just finished the section 3.7, and are still running BuildGP, check that the compiler and GEMPACK directory are as you expect. [If not, you may need to consult us.]

(b) If you have just re-started BuildGP running, after selecting *Build libraries and executable images*,
1. check carefully that the directory containing the source-code GEMPACK files is correct. If not, use the ***Browse*** button to select the directory you want to use.
2. The correct compiler (F77L3 or LF90)should be selected automatically. [If not, please select the one you wish to use.]

Now (in either case (a) or (b) above), click on the ***Start build*** button. BuildGP will go through the various steps to build libraries and executable images. This will take several minutes (perhaps somewhere between 10 and 30 minutes depending on the speed of your machine). If all goes well, you will eventually see a message saying that the libraries and images have been built successfully. In that case, just click ***OK*** and note the next information before BuildGP exits.

If an error occurs during this build process, you will be told the name of the procedure when the error occurred. We suggest that you note this name on paper, then exit from BuildGP.

If possible, an Error log is shown containing the last few lines on the screen before the error occurred. This may give you some idea as to what is happening.

Possible Checks and Actions to try:
1. Check that there is plenty of room on your hard disk.
   [If not, you will need to delete some files to create space.]
2. Then reboot your computer.
3. When it restarts, start BuildGP running.
4. Then indicate that you want to build libraries and images.
5. Check the directory (it should be the one you want - otherwise use ***Browse***).
6. Then select ***Options*** in the BuildGP menu bar and then select ***Continue from previous build*** from under the ***Options*** menu. This should start right into the place where the previous error occurred.
7. If the error does not re-appear, continue with the build. If it reappears, please notify us at the Impact Project. If an Error log has been created, please send it with details of what happened.

There are some checks built into BuildGP which check the amount of **disk space** which is free on the drive you have selected for the GEMPACK directory. You can override these checks if you disagree or you can exit from BuildGP, clear some more disk space and then restart BuildGP to continue the build.

3.9 After A Successful Build

When BuildGP has successfully built the libraries and executable images, the installation procedure is almost finished. All that remains is to put into effect any changes suggested for your AUTOEXEC.BAT file. Such changes will have been suggested
- by the Source-Code installer if you are installing from a CD, or
- by BuildGP (if you are installing from diskettes) when it completed copying the files from the diskettes (and messages about them will have been repeated after the libraries and images were made).

If you installed from diskettes and BuildGP did not recommend any changes to your AUTOEXEC.BAT file after copying the files (see the end of section 3.7 above), you can skip the rest of this section and go to section 3.10.

If you allowed the Source-code installer or BuildGP (as appropriate) to make changes to AUTOEXEC.BAT, you just need to restart your computer now. This will complete the main part of the installation of GEMPACK. Once your computer restarts, you can go on to go to section 3.10 below.

If you did not allow the Source-code installer or BuildGP (as appropriate) to make changes to AUTOEXEC.BAT, you must make the required changes yourself.

If you installed from diskettes, BuildGP has written a new file AUTOEXEC.GPN as the suggested AUTOEXEC.BAT file. The simplest way ahead is to copy this file to become AUTOEXEC.BAT (perhaps after renaming your existing AUTOEXEC.BAT to some other name). Then you need to restart your computer. This will complete the main part of the installation of GEMPACK. Once your computer restarts, you can go on to section 3.10 below.

3.9.1 Changes Needed in AUTOEXEC.BAT

Alternatively, you must make changes to AUTOEXEC.BAT yourself. The important changes to AUTOEXEC.BAT are that

- the directory into which you installed GEMPACK must be on your DOS path, and
- if this directory is not C:\GP, the DOS environment variable GPDIR must be set equal to this directory.
  [For example, if you installed GEMPACK in directory D:\PROGRAMS\GP60, you must insert a line
  SET GPDIR=D:\PROGRAMS\GP60
  into your AUTOEXEC.BAT file (or do something equivalent to that).]

Once you have made these changes, you must **restart your computer** before proceeding.

3.10 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 have more than 64Mb of memory (RAM), see section 6.9 for a possible change to CONFIG.SYS or CONFIG.NT.

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

3.11 GEMPACK Licence

If your GEMPACK licence file has been sent on a disk (either a disk accompanying the CD or else on the first of the four installation disks), a file called LICEN.GEM on your first disk will have been copied to the 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.

3.12 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.

3.13 Uninstalling GEMPACK

To uninstall GEMPACK from your computer, carry out the following steps:

1. Delete all the files in the directory containing GEMPACK and its subdirectories. Then remove this directory.
2. Remove the lines in your AUTOEXEC.BAT which add the GEMPACK directory to your path, and remove the SET GPDIR=... statement from AUTOEXEC.BAT.

If you are merely short of disk space and want to preserve the GEMPACK software for later use,

1. you can just delete some of the GEMPACK Executable images from the GEMPACK subdirectory, for example, GEMPIE.EXE, SLTOHT.EXE etc
2. **Don't delete** PKZIP.EXE, PKUNZIP.EXE, GRABSCRN.EXE or BUILDGP.EXE
3. You can also delete the libraries (*.LIB) in the GEMPACK directory and the libraries in subdirectories LIBS and TABLO.
4. If you later want to restore GEMPACK, restart BuildGP as described in section 3.7.1 and rebuild the libraries and executable images.

3.14 Installing WinGEM and Related Programs from Floppy Disks

If you are using Microsoft Windows 3.1, 95, 98 or NT, you will want to install WinGEM, the Windows interface to GEMPACK and the associated Windows programs ViewHAR, ViewSOL, RunGEM and TABmate. [If you are using a different operating system, you should skip this section and go on to the next section.]

If your source-code GEMPACK was supplied on a CD, you will have installed WinGEM and related programs following the instructions in section 3.4.1 above, so you should skip the rest of this section.

If WinGEM etc were supplied on diskettes, proceed as below. This installation must be done under Windows, Windows 95, Windows 98 or Windows NT.

To install WinGEM, insert the first of the **WinGEM installation disks** into your floppy disk drive.

(a) If you are using Windows, select ***File | Run*** from the Program Manager's main menu.
(b) If you are using Windows 95 or Windows NT, select ***Run...*** from the Start menu.

In either case you need to enter

a:\install.exe

(where you should change **a:** to **b:** etc as necessary) and then click on ***Ok***.

This will carry out the installation of WinGEM, during which you will be asked the following questions.

(a) When asked about the folder in which you wish to install WinGEM (the installation program refers to this as the **Destination Location**), respond with the name (and drive) of the directory in which you installed GEMPACK (usually C:\GP). If you have installed GEMPACK in a folder other than C:\GP, click on the Browse button, and type in the name of the folder or select it. The relevant files for your computer will then be copied, (32-bit files for Windows 95 or NT and 16-bit files for Windows 3.1).
(b) There is also a question regarding changes to your AUTOEXEC.BAT. If you have just installed the Source code version of GEMPACK, you can probably say No to these changes since they were made earlier by BuildGP.

The Install program will also create icons for WinGEM, ViewHAR, ViewSOL GemEdit, RunGEM and TABmate. These will appear either in a group called GEMPACK (for Windows 3.1) or on your desktop. If you do not want these icons either delete them or drag them to the Recycling Bin.

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

3.15 Applying a GEMPACK Fix

This section is relevant only if the letter sent with your software says that there is a **bug fix disk** included. Usually the separate disk sent with your CD will just contain your GEMPACK licence file LICEN.GEM.

If you are installing from CD, it is safest to apply GEMPACK fixes as part of the normal install process from the GEMPACK Executable-Image CD as described in section 3.4. This method means that you install GEMPACK again from the CD and then apply the fix. This ensures that the GEMPACK files are as we expect before the fix is applied.

If you are installing from floppy disks as described in section 3.5, 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 Execuatble-Image floppy disks as described in section 3.5. 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:\GP60 and that your floppy drive is **a:**, then at the DOS prompt, enter:

a:\patch c:\gp60 a:

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

3.16 If you are using F77L3

If you are using F77L3, you may find you need to increase some program parameters in order to fit your model into the storage arrays in the GEMPACK programs provided. See section 6.5 below for more details about how to do this. However there is another way to increase parameters for some of the utility programs such as SLTOHT and GEMPIE.

On the GEMPACK website at address

http://www.monash.edu.au/policy/gpf90.htm

there are Fortran 90 stand-alone Executable Images of some GEMPACK Utility programs:
GEMPIE, SLTOHT, SEEHAR, MODHAR, SUMHAR, CMPHAR, MKHAR, RWHAR, SUMEQ, SEENV.
These programs have Fortran 90 memory management with allocatable arrays. We suggest that you down-load these programs from the Web since their parameters do not need to be increased.

However you still need to increase parameters in the main programs TABLO, GEMSIM and SAGEM as described in section 6.5.

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 in two different ways.

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

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, and set the working directory, also as described there.

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. In that 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.

If TABLO does not start running, your DOS Path is not as required. This may mean that you didn't accept the BuildGP's suggestion about changes to your AUTOEXEC.BAT file, or perhaps you haven't yet rebooted your computer since you made these changes. Please check again the steps in section 3.9 and then repeat this part of the testing.

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 3.9 which relate to the DOS environment variable GPDIR. Repeat this testing once you have remedied any problems.

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 2.1.3, 2.1.4, 2.1.5a and 2.1.5b in section 2.1 of GPD-8. This carries out the simulations using a TABLO-generated program (see also sections 2.5.5 of GPD-1). You might also like to carry out this same simulation using GEMSIM, following Examples 2.1.6, 2.1.7, 2.1.8a and 2.1.8b of section 2.1 of GPD-8. In either case, check that the results of the simulation are as expected (see, for example, section 2.7 of GPD-1). You might also like to carry out Examples 2.1.1 and 2.1.2 in section 2.1 of GPD-8.

If any of these tests does not work, re-check the steps in the installation in section 3 above. In particular, 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 3.10.

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 or a TABLO-generated program, 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. This is why we asked you in section 4.2 above to test the DOS version of GEMPACK before installing WinGEM. 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 1of GPD-8), especially the Stylized Johansen and Miniature ORANI models.

Follow section 5.1 below if you are going to use WinGEM (that is, if you are running Windows or Windows 95). Follow section 5.2 below otherwise.

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, ORANIG and ORANIF.

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 some 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 the GEMPACK directory (usually C:\GP). Note that your PATH command 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 Use TABLO-generated Programs

You have installed a source-code version of GEMPACK on your PC and have a suitable Fortran compiler (F77L3 or LF90), so you will probably prefer to use TABLO-generated programs instead of GEMSIM for simulations. (For small models such as Stylized Johansen and Miniature ORANI there is not much difference in speed. But TABLO-generated programs will run faster with large models.)

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

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 machines either via the GEMPACK **sti** option or using redirection of input as in, for example,

gemsim < sjlb.sti

or using the 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 Increasing (or Decreasing) Program Parameters

The new features of Fortran 90 allow greatly improved memory management as described in Chapter 3 of GPD-4. If you are using the Lahey LF90 compiler, you should no longer receive messages to increase program parameters. If you are using the F77L3 compiler you may still need to increase parameters.

As indicated in section 5.5 of GPD-1, you may need to increase (or decrease) the size of one or more parameters in a GEMPACK program or a TABLO-generated one. See also sections 2.4 and 5.13 in GPD-2.

To do this for a GEMPACK program, change directory to the directory where you installed the main GEMPACK programs (usually C:\GP) and edit the appropriate source file (for example GEMPIE.FOR for GEMPIE) as described in section 5.5 of GPD-1. Then, to make the new executable image (.EXE file), use MKMAIN (see section 7.5 above) as in, for example,

mkmain gempie

For utility programs (not TABLO, GEMSIM or SAGEM) there is a simpler way to avoid the problem of increasing parameters: **download the Fortran 90 Executable Image** from the GEMPACK Web site. See section 3.16 for details.

For a TABLO-generated program, edit the source (.FOR file) and then use LTG to create the new executable image as in, for example,

ltg sj

(or else pass in the stack size as a second argument if you need to specify the stack size, as explained in section 6.7 below).

For TABLO, the parameter values are held in the Include files in subdirectory TABLO of the GEMPACK directory (usually C:\GP\TABLO). If you are using F77L-EM/32, these Include files have suffix **.FOR** (for example TABLE1.FOR) while if you are using LF90 these Include files have **no suffix** (for example TABLE1.) You should edit the relevant one. (See section 14.2 of GPD-4 and section 2.4 of GPD-2 to find in which Include file each parameter is defined.) Then remake TABLO.EXE by changing directory to the main GEMPACK directory (usually C:\GP) and typing in the command **mktablo**.

For GEMSIM, the parameter values are held in the two Include files in subdirectory TABLO of C:\GP. If you are using F77L-EM/32 these files have suffix **.FOR** (for example GSINC.FOR) while if you are using LF90 they have **no suffix** (for example GSINC.). You should edit the relevant one. (See section 14.2 of GPD-4 and section 5.13.1 of GPD-2 to find in which Include file each parameter is defined.) Then remake GEMSIM.EXE by changing directory to C:\GP and typing in the command **mkgemsim**.

6.6 If a Fortran 90 Program Runs Out of Memory

If you are using the Fortran 90 compiler LF90, it may happen that the task you are carrying out with any of the programs requires more memory than is available on your computer. If so 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).

6.7 Changing The Size of Program Stacks for TABLO-generated Programs

You may get an error message from the Phar Lap DOS Extender saying that a TABLO-generated program has run out of program stack. In this case you must increase the size of the program stack. The file LTG.BAT which is used to compile and link TABLO-generated programs includes a default stack size following "-St". (To see the current default value, look in this file in directory C:\GP.) You can increase the stack size for TABLO-generated programs by passing you desired stack size to LTG as a second argument.[7] For example

ltg model 800000

produces an executable image of the TABLO-generated program MODEL.FOR and sets the stack size to 800,000 bytes. If, when you use LTG to increase the stack size, your current size isn't large enough, try increasing it again.

You can get a good indication as to how large to make the stack size by looking at the compilation phase. When the main program is compiled (this happens at the start of the LTG command), you will probably see a warning message about the minimum size of the stack in cases where the stack size given by LTG is not large enough.

For more information about stack sizes, see section 2.8.3 of the Lahey manual "DOS Extender & Tools".

6.8 Memory Required by TABLO-generated Programs

As explained in section 5.10.2 of GPD-2, there is a trade-off between speed of execution of TABLO-generated programs and the amount of memory they require. TABLO has various options at the Code stage which affect how much memory the program for a given model will require. (In general, those requiring more memory will run faster.)

If you find that, using the default options in the Code stage of TABLO, you do not have enough memory to run the program, you will need to select one or more of the low memory options described in section 5.10.2 of GPD-2. In particular, read the paragraphs under the heading "Advice on Which of These to Select" near the end of that section.

6.9 Accessing More Than 64Mb of Memory

Your Fortran compiler may not access more than 64MB (megabytes) of memory unless you take special action. If your computer has more than 64MB of physical memory and you are concerned that GEMPACK programs are not able to access more than 64MB, you should insert a variant of the following line

[7] The LTG2 command used with Release 5.1 to increase stack size is now simply LTG.

DEVICE=C:\WINDOWS\HIMEM.SYS /NUMHANDLES=128

into your CONFIG.SYS (or CONFIG.NT under Windows NT) file. In the above line, the "/NUMHANDLES=128" is the special part which gives access to more than 64MB of memory. The exact path for HIMEM.SYS may be different on your computer. Indeed you may find a line like that above without the NUMHANDLES part; if so, just add the relevant part to that line.

6.10 Compiler Options

The compiler options used in the standard installation (as carried out in section 3 above) are ones that, in our experience, produce executable images which run as fast as possible. In particular, we have not included the compiler option which checks at run time that array subscripts remain within the expected range.[8] Provided there is no bug in the GEMPACK software, such checking should be unnecessary since GEMPACK software also checks array subscripts.

If you prefer to have the extra security provided by option /B, and are not concerned about extra run time,[9] you may change the setup on your computer to include option /B by following the steps below.

cd \gp
chkfig

This will copy the options in F77L3CHK.FIG or LF90CHK.FIG to all relevant .FIG files. To implement the option, you must first rebuild the GEMPACK library file(s) via

mklib

Then remake any desired executable images (via mktablo, mkgemsim mkmain sagem and/or "mkmain sagem" etc).

[If you are using theF77L3 compiler or the LF90 compiler then LTG.BAT and LTGS.BAT use the same F77L3.FIG or LF90.FIG that is present in your GEMPACK directory GPDIR (usually C:\GP).]

If, later, you want to return to the standard (faster running) options, you can do so via the commands

cd \gp
fstfig
mklib
mktablo
mkgemsim
mkmain xxx (for main programs "xxx" as desired)

6.11 Stand-alone Executable Images

If you copy one of the executable images from your machine to another machine, it will not run unless that machine has Lahey Fortran and Phar Lap installed. This is because the executable images you have made on your machine (using "mkmain" or "ltg") need to be able to find the Phar Lap run-time system.

---

[8] If you are using F77L-EM/32, this compiler option is denoted by /B ("Check array subscripts and character substring bounds") - see section 2.2.5.2 of the Lahey F77L-EM/32 manual "Programmer's Reference". If you are using LF90 this compiler option is denoted by -chk.

[9] In our experience, adding the compiler option to do bounds checking increases the running time of programs by between 20 and 40 per cent.

It is easy to make stand-alone executable images of the various programs. These stand-alone versions have the Phar Lap run-time system included in them so they will run when copied to any suitable DOS machine, (that is a pentium, an 80486 DX machine or an 80386 machine with an 80387 coprocessor) They are not restricted to machines with Lahey Fortran and Phar Lap installed. We describe below how you can make such stand-alone executable images.

However you should note that the GEMPACK programs TABLO, GEMSIM and SAGEM require a GEMPACK licence. Accordingly, under the terms of your GEMPACK licence, you must not copy (or send copies of) executable images of these to machines outside the site which is covered by your GEMPACK licence. [But you are allowed to send copies of the other GEMPACK programs, including TABLO-generated ones, outside of the site covered by your GEMPACK licence. However, you should note that TABLO-generated programs may require a "large simulations" licence if they are used with a large model - see section 1.2.5 of GPD-1.]

When you copy a stand-alone executable image to a machine which does not have Lahey Fortran or Phar Lap installed on it, you may need to make changes to the CONFIG.SYS file, following the instructions in section 7.1.2.

6.11.1 Making Stand-alone Executable Images

You can make a stand-alone executable image of the GEMPACK programs except for TABLO, GEMSIM and TABLO-generated ones by using the batch file MKMAINS.BAT in C:\GP. For example, to make a stand-alone executable image of GEMPIE, enter the commands

cd \gp
mkmains gempie

To create a stand-alone executable for a TABLO-generated program, use the batch file LTGS.BAT (the "S" means "stand-alone") in C:\GP. For example, to make a stand-alone image of SJ, enter the command

ltgs sj

which produces a stand-alone executable SJ.EXE. To carry out multi-step simulations using this TABLO-generated program on other suitable DOS machines, copy SJ.EXE and its associated Auxiliary Statement and Table files SJ.AXS and SJ.AXT to the other machine. You will also need to copy the data file SJ.DAT and probably suitable GEMPACK Command files or Stored-input files.

You can make a stand-alone executable images of TABLO and GEMSIM by using the batch files MKTABLOS.BAT and MKGMSIMS.BAT respectively in C:\GP. But such images require your GEMPACK licence and must only be used on machines covered by your GEMPACK licence.[10] To make such executable images enter the commands

cd \gp
mktablos (for TABLO)
mkgmsims (for GEMSIM)

[10] You will need to copy your GEMPACK licence LICEN.GEM (usually found in directory C:\GP) to the other machine. If you install the GEMPACK executable images in a directory different from C:\GP, you will need to assign a suitable value for the DOS environment variable GPDIR by inserting a line "SET GPDIR=..." in the AUTOEXEC.BAT file on this machine (see section 7.1.1 below). [Of course you are only allowed to copy your licence file to machines within the site covered by your GEMPACK licence.]

The resulting files TABLO.EXE and GEMSIM.EXE will run on any suitable DOS machine. To use GEMSIM.EXE on such a machine to carry out multi-step simulations with models, you will also need to copy the GEMSIM Statement and Table files (these have suffixes .GSS and .GST) for the model to the other machine. (These files are produced when you run TABLO and ask it to produce output for GEMSIM.) You will also need to copy any data files and relevant Command or Stored-input files.

The batch files MKMAINS.BAT, LTGS.BAT, MKTABLOS.BAT and MKGMSIMS.BAT differ from the non-S versions MKMAIN.BAT, LTG.BAT, MKTABLO.BAT and MKGEMSIM.BAT by linking in a so-called "stub" which is a version of the Lahey/Phar Lap DOS Extender; see section 1.7 of the Lahey manual "DOS Extender & Tools" for more information.

If your TABLO-generated program is one that requires a large stack (see section 6.7 above), you can pass to stack size to LTGS.BAT to make a stand-alone executable as in, for example,

ltgs model 800000

See also section 4.3 of GPD-1 for information about carrying out simulations on other machines.

6.12 Compiling and Linking TABLO-generated Programs

Wherever your TABLO-generated program is located on the disk, you can compile and link it using one of the commands LTG or LTGS depending on whether or not you want to make a stand-alone image. See sections 6.7 and 6.11 above for more details.

6.12.1 Fortran 90 TABLO-generated Programs

If you are using LF90, you will notice that TABLO produces a file with suffix .F9M as well as the usual files with suffixes .FOR, .AXS and .AXT when it creates a TABLO-generated program. This .F9M file is required for compiling and linking the TABLO-generated program (similarly to the .FOR file). However this .F9M file is not required for running the TABLO-generated program so if you delete the .FOR file you can also delete this .F9M file.

6.13 Interrupting Programs and Controlling Screen Output

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

6.13.1 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.

6.13.2 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 6.13.1 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.)

6.14 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
```

6.15 Installing GEMPACK on a Network

Some organisations have found it desirable to run the DOS-Lahey 80386/80486/pentium PC source-code version of GEMPACK and the associated Fortran compiler from a network. For example, this can reduce the need for separate copies of the Lahey compiler.

Below are some pointers to using GEMPACK and /or Fortran on a network.

If you have the Lahey Fortran F77L3 or LF90 on a network, please note the following.

(i) You must put the statement

```
SET DOSX=-SWAPDIR C:\
```

into your AUTOEXEC.BAT if you are using F77L3.

(ii) When compiling (eg via LTG), the Fortran compiler needs to know where the relevant Fortran library is to be found. You can avoid having to edit the various .BAT files by having all users set the value of the DOS environment variable **GPFLIB** to point to this directory. For example, if you are using F77L3 and this is installed in directory L:\PACKAGES\F77L3 on your network, then ask each user to put the line

```
SET GPFLIB=L:\PACKAGES\F77L3\LIB
```

in their AUTOEXEC.BAT file.

The person installing GEMPACK (building the libraries and executable images) should add this line to his/her AUTOEXEC.BAT and reboot before running BuildGP (see section 3.5.1 above).

(iii) If you are using F77L3 (this point is not relevant if you are using LF90), having all .EXE files on the network can have some associated problems because of the differing amounts of memory different users have on their desk PC. For example, if you link up a very large version of say SAGEM (for 20x20 GTAP say) this may require 30Mb to run. While you may have this memory, another user running smaller models may not have and so won't be able to run the program. You can solve this problem by high-memory users having their own local copy of the EXE. [It is easy to modify LTG.BAT or MKMAIN.BAT to produce the EXE locally rather than on the network.]

(iv) Another issue is who has access to the GEMPACK source etc on the network. Only people with access (write access) can increase parameters etc.

6.15.1 Installing from the Source-Code CD Copied to the Network

If you copy the all files from the GEMPACK Source-code CD onto the network file server, you can use the files so copied to install 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 the directories e:\GP60SC and e:\ACROBAT from the GEMPACK Source-code 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.[11]

6.16 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 3.5 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 GP60SC. It should contain four subdirectories D1, D2, D3 and D4. Copy all of the files in each of these directories to a separate floppy disk labelled clearly disk 1 to disk 4.

Insert the first disk in the computer whch does not have a CD drive and enter

a:\install.exe

[11] 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.

Then follow the directions in section 3.5.

To make disks for installing WinGEM and associated Windows programs, return to the computer with the CD drive and look on the GEMPACK CD for the directory called DISKS.It should contain a sets of files:

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

The files for installing WinGEM and other Windows programs are called WININST.*. Copy each file to a separate floppy disk and label these disks 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

a:\wininst.exe

to start the installation (instead of **a:\install.exe**). Follow the directions in section 3.14. [You will be prompted to insert the other disks.]

7 Installing under DOS or in a DOS box

The main steps in installing GEMPACK if you are using the batch file approach at the DOS prompt or in a DOS box (instead of using the BuildGP Windows installer) are:

1. Change your DOS path to include the GEMPACK directory, (that is the directory where all the GEMPACK main programs are stored) and make various other changes to your DOS settings, as described in section 7.1. You must reboot after these changes.
2. Copy your GEMPACK licence to the correct place - see section 7.3
3. Copy the GEMPACK files from the installation diskettes - see section 7.3.
4. Make the GEMPACK libraries and Executable Images of the GEMPACK programs - see sections 7.4 and 7.5.
5. Checking your installation - see section 7.7.

7.1 Changes to the DOS Settings

7.1.1 DOS PATH and AUTOEXEC.BAT

You will install GEMPACK in a directory on your hard disk. The simplest directory name to choose is the default directory **C:\GP.** We suggest you install in this default directory unless you have another version of GEMPACK installed there already. In that case, perhaps choose **C:\GP60.** However you can choose any directory you please. We refer to this directory where you install GEMPACK as the **GEMPACK directory** in the instructions below.

The GEMPACK directory (usually C:\GP) must be on the DOS path, as must the directory (usually \F77L3\BIN for F77L-EM/32 or \LF9040\BIN for LF90 Version 4.0) containing the relevant parts of the Fortran compiler. To arrange this, you must edit the appropriate file (called AUTOEXEC.BAT in your default directory C:\) 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. (Use a text editor, such as the EDIT which comes with DOS or the Lahey Blackbeard Editor.)

For example, if you find a line

PATH = C:\;C:\DOS

you should change it to

PATH = C:\;C:\DOS;C:\GP;C:\F77L3\BIN (if using F77L-EM/32), or
PATH = C:\;C:\DOS;C:\GP;C:\LF9040\BIN (if using LF90 Version 4.0)
or
PATH = C:\;C:\DOS;C:\GP;C:\LF9035\BIN (if using LF90 Version 3.5)

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

PATH = C:\GP;C:\F77L3\BIN (if using F77L-EM/32), or
PATH = C:\GP;C:\LF9040\BIN (if using LF90 Version 4.0)
PATH = C:\GP;C:\LF9035\BIN (if using LF90 Version 3.5)

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

Note that the file COMMAND.COM (usually found in directory \ on your starting hard disk) and the external DOS commands (often found in directory \DOS on your starting hard disk) must also be on the PATH. If they are not, add them to the PATH line in your AUTOEXEC.BAT, as described above.

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, you need to add an extra line to AUTOEXEC.BAT. 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, that you have installed F77L3 on drive D: in directory D:\F77L3, 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;D:\F77L3\BIN;E:\GP60
SET GPDIR=E:\GP60

7.1.2 CONFIG.SYS or CONFIG.NT

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. We recommend

FILES = 70

(or higher).

7.1.3 If you are installing on a Network

If you are installing GEMPACK on a network, please read section 6.15 before proceeding.

7.1.4 Reboot

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

7.2 Pre-installation Check

Before starting the installation of GEMPACK, we suggest you check that the PATH etc is correctly set. To do this, first exit from Windows (if relevant) or go into a DOS box. Then type the command

set

Check that the PATH is as you expect. 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, re-read section 7.1 (and check that you rebooted). Only proceed when everything is as required.

7.3 Copying the GEMPACK Files

Attach to the relevant hard disk. (If this is C:, type in the command

C:

for example.) Then type in the commands below (as given in bold). Note that some of these commands involve your floppy drive (usually A: or B:). Below we refer to this as A:. If yours is different, you should replace A: appropriately.

1. Create the directory \GP and change directory to it, by typing the commands below.

mkdir \GP
cd \GP

2.If this is the first time you have installed Release 6.0 (or later), you need to copy your GEMPACK licence file LICEN.GEM from the first GEMPACK disk. [This is necessary even if you had a previous version of GEMPACK since Release 6.0 licence files are different from Release 5.2 licence files.] To do this, insert the first GEMPACK disk into your floppy drive. Type in the next command (replacing A: if necessary).

copy A:licen.gem

3. Leave (or insert) GEMPACK disk 1 in your floppy drive. Type in the next commands (replacing A: if necessary).

copy A:*.bat
gem1 A: 77 (if you are using F77L-EM/32), or
gem1 A: 90 (if you are using LF90)

4. When this has finished, insert GEMPACK disk 2 into your floppy drive. Type in the next command (replacing A: if necessary).

gem2 A: 77 (if you are using F77L-EM/32), or
gem2 A: 90 (if you are using LF90)

Then repeat for disk 3.
gem3 A: 77 or **gem3 A: 90**

Then repeat for disk 4.
gem4 A: 77 or **gem4 A: 90**

You have now copied all the files from the GEMPACK disks. The files in directory C:\GP and its subdirectories will occupy about 8-9Mb of disk at this stage.

7.4 Make the GEMPACK Libraries

If you are running Windows 95 it is best to restart your computer in DOS before continuing with the installation. To do this, ***Shut down...*** from the ***Start*** menu of Windows 95. Then select the option "Restart the computer in MS-DOS mode?" and click on ***Yes***.

If you are running Windows NT, we suggest you use the Windows method BuildGP as it is more robust under Windows NT than working in a DOS box.

Type in the following commands.

cd \gp
mklib

(There will now be a lot of screen activity. The GEMPACK subroutines are being compiled and added to the library or libraries in \GP. This will take somewhere between 5 and 50 minutes depending on your machine. Ignore "file not found" messages since some of these are expected.) If you are using F77L-EM/32 these is just two libraries **GP60.LIB** and **TBGDUM.LIB** while if you are using LF90 there are several libraries including **GP60A.LIB**, **GP60B.LIB, TBGDUM.LIB, EXT.LIB** and **MH1.LIB**.

Check that the relevant .LIB file(s) are in directory \GP using the commands

cd \gp
dir *.lib

If you are using F77L-EM/32, the file GP60.LIB should be approximately 2.9 Mb in size. If you are using LF90, the files GP60A.LIB and GP60B.LIB should be approximately 2.4 Mb and 1.9 Mb respectively in size.

If the file(s) are not there or if they are a lot smaller, you will need to redo this. First check again the points in section 7.2 above and the files detailed in section 7.3 above, then repeat this section.

7.5 Making Executable Images

The programs are supplied as Fortran source code (.FOR files). You can see which programs are available via the command

dir \gp*.for

To make the executable image of any of the GEMPACK programs except for TABLO and GEMSIM, you can use the MKMAIN.BAT file in \GP. You simply attach to \GP and then run MKMAIN followed by the relevant program name, for example GEMPIE, as in

cd \gp
mkmain gempie

Later, you can repeat the above for other programs as desired.

At present, we suggest that you make executable images of the most frequently-used GEMPACK programs (other than TABLO and GEMSIM - see below for these) by entering the command

mksome

Note that the executable images produced have extension .EXE (for example SAGEM.EXE).

7.5.1 Making an Executable Image of TABLO

To make an executable image of TABLO, change directory to \GP and run MKTABLO.BAT via the commands

cd \gp
mktablo

This will take several minutes to complete.[12] At the end, the file TABLO.EXE should be in directory \GP.

7.5.2 Making an Executable Image of GEMSIM

To make an executable image of GEMSIM, change directory to \GP and run MKGEMSIM.BAT via the commands

cd \gp
mkgemsim

This will take several minutes to complete. At the end, the file GEMSIM.EXE should be in directory C:\GP.

[12] If you are using LF90 and you receive an "Out of memory" error from the compiler, please rerun this in DOS itself (rather than a DOS box); if the error persists, please contact us at the Impact Project.

7.6 Memory Required for the Programs

If you have 16Mb or more of memory on your PC, you can skip this section and go to section 7.7.

When you start running a Fortran program which has been compiled and linked with the Lahey Fortran, the program displays a box which tells you how much memory is available.
(i) If you plan to run GEMPACK under DOS (rather than in a DOS box of Windows etc), you need to see that at least 4000K of memory is available.
(ii) If you plan to run GEMPACK under Windows, Windows 95 (or in a DOS box under OS/2), you need to see that at least 6000K of memory is available.

The amounts indicated above[13] will allow you to run all the GEMPACK programs as sent on the installation disks. But they may require more memory if you need to reconfigure them, following the procedure described in section 6.5 above.

If the above test shows that less memory is available than indicated above, you may not be able to run all of the programs as sent. You may be able to increase the amount of memory available by removing device drivers and/or caches. (You will probably need to edit your AUTOEXEC.BAT and/or CONFIG.SYS files to do this. You will need to restart your computer for such changes to take effect.)

7.7 A Final Check

If you are intending to run GEMPACK under Windows, Windows 95 or in a DOS box under OS/2, return to this operating system and go into a DOS box for the next testing.

To check that the DOS PATH has been set correctly, that the DOS variable GPDIR is set appropriately if required (that is, if you installed GEMPACK in a directory other than C:\GP), and that your GEMPACK licence file is in the correct place, issue the following commands

**cd **
tablo

The program TABLO should start running, access the licence file, and then present you with its options screen.

If this happens, all is well. Simply type 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). This will interrupt the program and return you to the DOS prompt. (You may have to type Control-C twice to achieve this.)

If TABLO does not begin running as described above, something in your setup is not correct. First recheck the points in section 7.2 above and then check that the licence file LICEN.GEM is in directory \GP via the commands

cd \gp
dir *.gem

Also check that you have sufficient memory (see section 7.6 above). Once these all appear correct, repeat the test at the start of this section. If all is still not well, you may need to repeat parts of the installation.

[13] These amounts apply if you are using F77L-EM/32. Possibly a little more is required if you are using LF90.

7.8 Running GEMPACK Programs Including TABLO-generated Ones

Under DOS, this is done just by typing in the name of the program, as in, for example,

sagem

or

sj

7.9 Compiling and Linking TABLO-generated Programs

In most cases this can be done from any directory by issuing the command LTG followed by the name of the program as in, for example,

LTG SJ

However, for some large programs, it is necessary to use a variation of this to specify the stack size, as explained previously in section 6.7.

8 Testing the Installation under DOS

In this section we suggest that you test the main features of the installation by carrying out a simulation with the Stylized Johansen model in two different ways.[14]

If either of these simulations does not work, you will need to go back to some of the steps in section 7 above. In particular, re-check the points mentioned in sections 7.2 and 7.7 above.

8.1 Making a Directory for the Stylized Johansen Model

First make a new subdirectory, for example \SJ, and copy the files relevant to Stylized Johansen into it as below.

mkdir \sj
cd \sj
copy \gp\examples\sj*.*

8.2 Simulation via a TABLO-generated Program

Run TABLO by typing in the command

tablo

and then give the responses as shown in section 2.6.1 of GPD-1. This should create the TABLO-generated program SJ.FOR. Then compile and link this via the command[15]

LTG SJ

This should create the executable image SJ.EXE. You can check this by entering

dir *.exe

[You have just carried out Steps 1(a) and 1(b) described in section 2.6.1 of GPD-1.]

Next run SJ.EXE via the command

sj

When prompted, give the two responses

cmf
sjlb.cmf

These tell the program to take all input from the GEMPACK Command file SJLB.CMF (see section 2.6.1 of GPD-1). There will be a lot of activity on the screen. When the program finishes running, check that the following message is on the screen near the end:

```
 (The program has finished without error.)
```

[14] If you are going to use GEMPACK under Windows or Windows 95 or in a DOS box under OS/2 or Windows NT, you should do this testing in a DOS box.
[15] We only use capitals in this command to distinguish clearly between "el" and "one" at the start.

This run should create the Solution file SJLB.SL4 and a Solution Accuracy file SJLB.XAC. You can check this via the commands

dir sjlb.sl4
dir *.xac

[You have just carried out Step 2 in section 2.6.1 of GPD-1.]

Now run GEMPIE via the command

gempie

to convert the Solution file SJLB.SL4 to the GEMPIE Print file SJLB.PI5 by giving the responses in section 2.6.1 of GPD-1. Check that the results are (approximately) as shown in Table 2.7 in section 2.7 of GPD-1. [You can use the DOS editor "edit" to check the results via the command

edit sjlb.pi5

Go to the end of the file and check the results against Table 2.7 in GPD-1. You can exit from "edit" by typing **Alt-F** (hold down the **Alt** key and hit **F**) and then touching **x** (exit).]

8.3 Simulation via GEMSIM

You might like to test that you can also use GEMSIM to carry out the same simulation. To do so, proceed as follows.

(a) First delete the important output files (produced by the testing in section 8.2 above) via the commands

del *.sl4
del *.xac
del *.pi5

(b) Run TABLO by typing in the command

tablo

and then give the responses as shown in section 2.6.2 of GPD-1. This should create the GEMSIM Auxiliary files SJ.GSS and SJ.GST.

(c) Run GEMSIM by typing in the command

gemsim

As before give the responses

cmf
sjlb.cmf

As above, check that the files SJLB.SL4 and SJLB.XAC have been created.

(d) Run GEMPIE as above. Check the results in file SJLB.PI5 as before.
If any of these tests does not work, re-check the steps in the installation in section 7 above.

9 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 9.1, 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.

9.1 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.]

9.2 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.

9.3 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.

9.4 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.

9.5 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.

9.6 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.

9.7 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.

9.8 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.

9.9 "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".

9.10 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.

9.11 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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[16] 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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