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User's Guide to SLIMFORP

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FOREWORD

The work of the INterindustry FORcasting University of Maryland (INFORUM) has gradually expanded and similar work is now underway at over fifteen institutes around the world. SLIMFORP, the basic computer programming system for the forecasting models of INFORUM, makes the modeling efforts of the many institutes a practical reality.

A strong attempt has been made to make the programs portable. The solutions to several problems encountered while transporting the programs from computer to computer now lay hidden in the code. Sice unit numbers for specific data files may not be possible on all machines, I wich to call your specific attention to Appendix 2 where the linkage between data files and unit numbers is presented especially well.

The guide has the strength that it was *not* written by the original programmer of the model but rather by one, like many of you, who had to implement the model and adapt it to another machine. Thus, I believe, more of the questions asked by the newcomers to the programs are answered and probably in a better way than if I had written this manual.

Douglas Nyhus
Internationa Institute for
Applied Systems Analysis

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User's Guide to SLIMFORP

Ulrike Sichra

1. Introduction

1.1. What is SLIMFORP

SLIMFORP is a program (or set of programs) for building national input-output models. It allows the user to make a basic model on the information contained in a single input-output table (as shown in Diagram 1.), and provides for running with ease a wide variety of scenarios. However, it is intended only as a starting point for developing a model. Though it provides for reading in equations for consumption, export, import, investment, inventory change, labour productivity rate, etc., its programming interprets only the simplest form of these equations, namely exponential growth (therefore "SLIM"). To use other functions, one just has to add other FORTRAN statements at clearly marked spots in the program.

The big bulk of statements perform the housekeeping of the data, and little programming has been done for the actual consumption patterns of the economy. But SLIMFORP is rather universal in that it can handle any number of I-O sectors (the number is only limited by the size of the computer), and also stores other statistical data on a country which could perhaps be used at a later stage, or for other purposes.

1.2. Structure of the Guide

In this guide we explain first the structure of SLIMFORP (section 2) and its special features with regard to computer used (section 3) and country forecast (section 4). In section 5 all programs and their subroutines are explained in detail, as well as the devices they need. Section 6 deals with printing routines. Sections 7 and 8 are devoted to extensions of the forecast program,i.e. more sophisticated functions for final demand and influence of exogeneous parameters, respectively. As a sample country we are using Sweden throughout this guide.

At the end of this guide there are 6 appendices; some give overviews on sections of this guide and others go into detail for the interested user. Appendix 1 deals with the organisation of random files and is included for information and control purposes. Appendix 2 is useful if you wish to understand the data flow among files and is necessary when transferring SLIMFORP to another computer. Appendix 3 is also an important piece of information for the transfer of programs, as it deals with programs and their subroutines. In Appendix 4 you find what is basically a resume of sections 5 and 6 of this guide. Appendix 5 is a resumee for PDP 11/70 users. It lists the actions necessary for compiling and running SLIMFORP. Appendix 6, finally, shows sample inputs and outputs for the printing programs.

You might find several parts of this guide redundant. This is due to the experience of users of other guides, who at different levels of knowledge would like to find different depths of information. Naturally we are open to criticism and suggestions on how to change, restructure or append this guide.

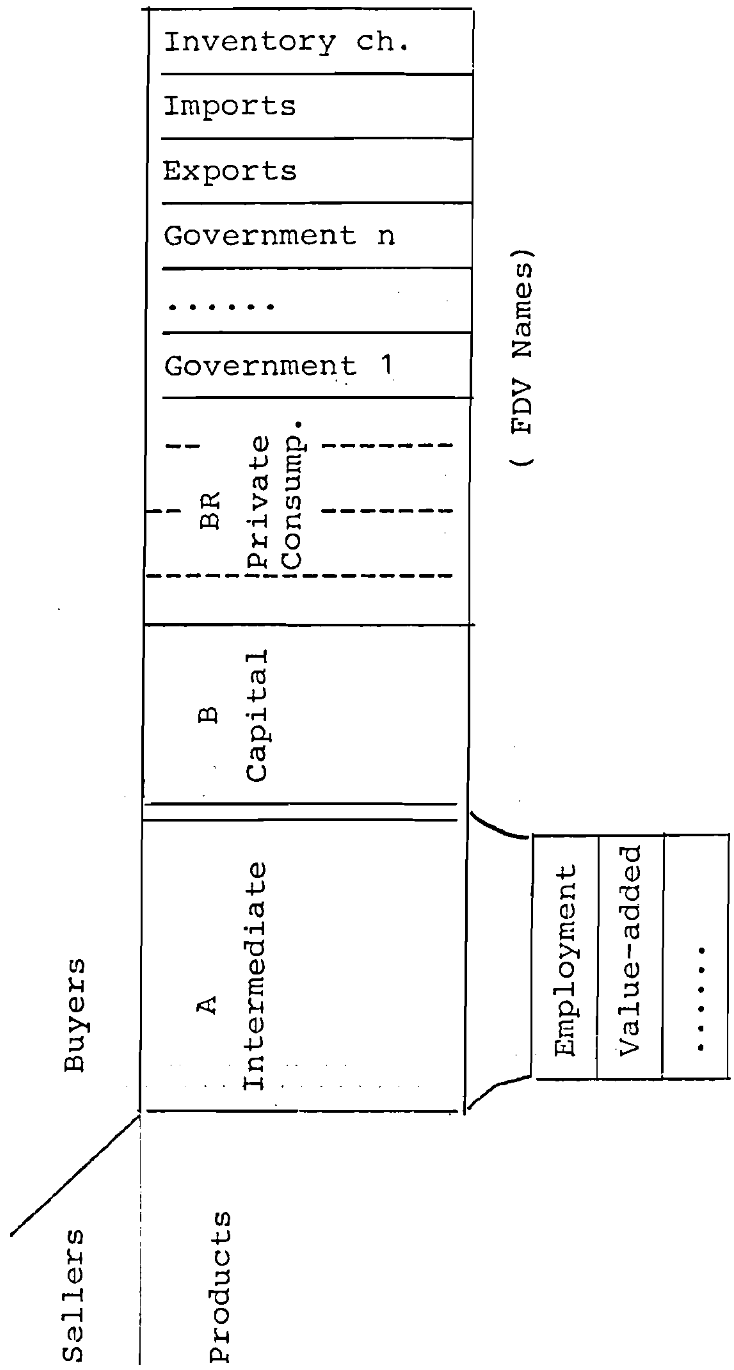


Diagram 1. Input-Output Table

2. Overview of main parts

A first rough overview might be helpful for those users who are not familiar with SLIMFORP. When starting from scratch four main steps must be executed to produce the forecast, i.e. prepare the input, make scenarios, run the forecast and produce listings. Each step has several substeps which have to be carried out in the order specified. The following is a brief explanation of each step as seen in the context of the whole SLIMFORP.

2.1. Preparation

This group of programs has to be run when first converting the I/O table into "SLIMFORP-form", or at a later stage, when there are some corrections or changes to be made in the initial table.

(1) OTM - one table maker. This program converts the traditional input-output table of a country into a form suitable for use by the subsequent programs.

(2) MATRED - matrix reader. It is executed once to read the intermediate flow coefficient matrix A, again to read the capital flow coefficient matrix B, and finally to read the bridge matrix for personal consumption expenditure, BR. Each matrix is put into its own binary file.

(3) EQRED - equation reader. This reads the equations for government expenditure, personal consumption, export, capital investment, imports and inventory change and puts them on different files (the assignments will be seen later).

(4) FDVRED - final demand vector reader. This program reads and puts into a file any vector of final demands which is known for the first years of the forecast. It often happens, for example, that foreign trade data become available before we know enough to make a new base matrix. FDVRED allows us to use the known vectors in the "forecast" for these years, which are in fact recent history.

2.2. Making Scenarios

This part of the forecast is the main tool to produce different visions of the future. But even if you merely want the forecast to be carried out in its standard way (i.e. 5% exponential growth) you should run the programs specified here, as they create the necessary environment for the forecast.

(1) MFIXRD - matrix fix reader. This reads fixes for the forecast of the A, B and BR matrices, that is, exogeneous specifications for the changes over the period of the forecast. It prepares three files, one for each matrix, year-by-year, over the forecast period.

(2) FIXMAT - fix the matrices. With this program the fixes for the A, B and BR matrices prepared in the before mentioned program are put into the correct storage place.

(3) FIXRED - fixes reader for final demand and input of exogeneous items such as population, labour force, etc. This program, together with MFIXRD, is the maker of scenarios. The fixes may not actually fix the forecast, but only modify it. They may be specified in a variety of ways. This program creates a binary, direct access file which is read by the different programs of the forecasting part.

2.3. Running the Forecast

This is a rather extensive set of programs which is executed as many times as the number of years to be forecast. If the country to be modelled is not too big (in terms of sectors) it is possible to merge all programs into one big program and thus have simpler and less execution commands. However, we have separated the programs so that one can clearly see the different parts of the forecast.

If the program is to be run sequentially, the choice of method (call of system commands and assignment of files and devices) depends on the computer but the sequence has to remain the same.

(1) ZERONT - set to zero NT. The year count is set to zero in this program.

(2) ZERO2 - set to zero LU2. The model output file is initialized with zero.

(3) BEGIN - begin the forecast. It initializes each year of the forecast and reads in the exogeneous variables. It solves the equations for government, exports and personal consumption expenditure.

(4) FDVEC - final demand vectors. This program consists of three subroutines:

* INVEST - solves the investment equation and checks for rerunning FDVEC and IOCOMP in case investments depend on the current year output.

** FIXFIN - puts the fixes on government, export, pce and investment.

*** DISTRI - distributes pce, final demand and capital to the different sectors.

(5) IOCOMP - input-output computation. This part of the forecast calculates the new input-output coefficients and also puts the fixes on imports and inventory and computes its final values.

(6) EMPLOY - employment calculations. Should there not be any employment figures or equations this will be treated simply as a dummy call.

2.4. Producing Output

There exists a set of programs with which one can produce listings and plots (simple lineprinter plots, in preparation).

(1) MAKTIT - make titles. All titles of the different sectors are written out in binary form for faster access in the next programs (SUMPRINT and MATLIS).

(2) SUMPRINT - make summary tables for the forecast. For specified final demand items the amounts produced in the different sectors are listed, as well as the growth rates between specified pairs of years.

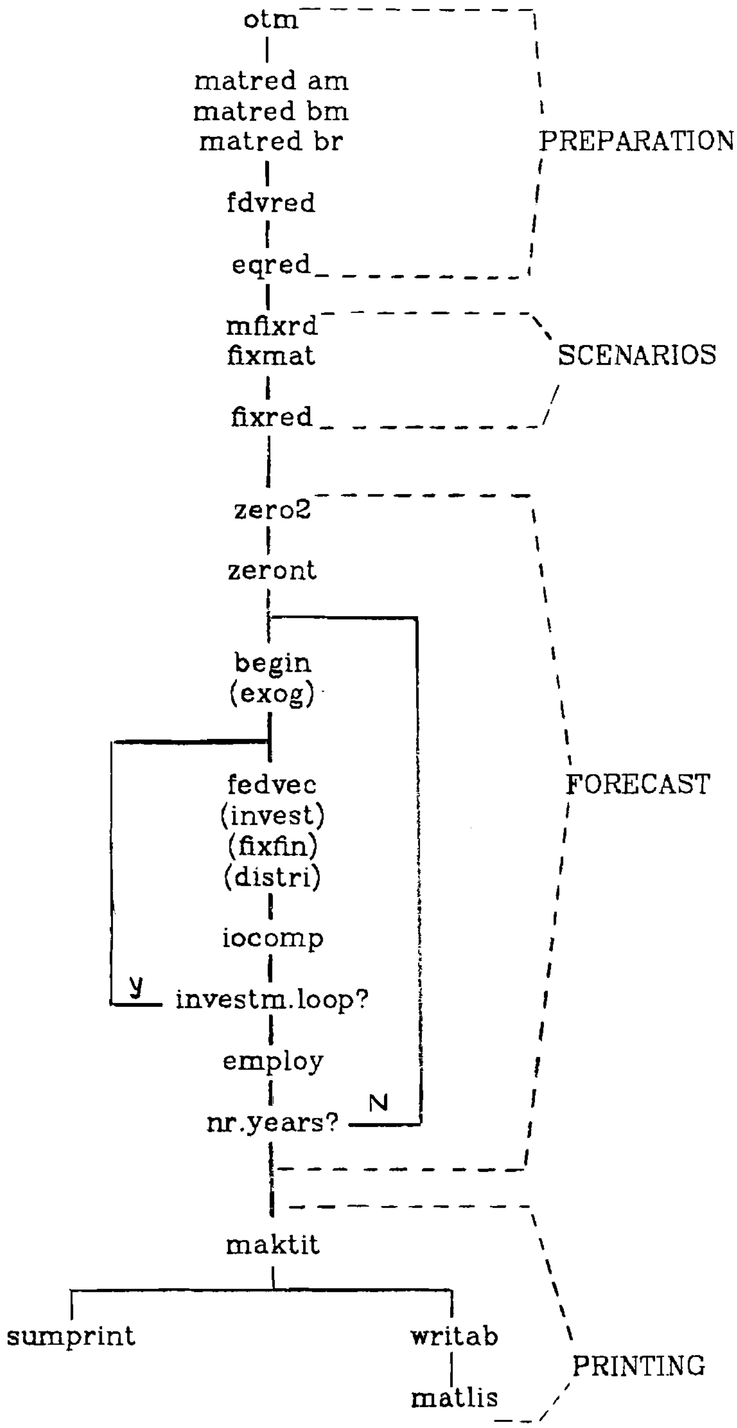
(3) WRITAB - rewrite parts of A, B and BR matrix for use in MATLIS.

(4) MATLIS - matrix listing. This printout shows the cell-by-cell flows in the specified forecast years, and its growth rates.

(5) GRAPH - the program to plot the history and forecast of the time series (in preparation).

2.5. Flowchart of Programs

The following flow a schematic overview of the programs. It is structured in the way we run the forecast on our inhouse machine.



2.6. Starting from Scratch

If one is setting up the input-output table to run SLIMFORP for the first time on the computer, one should not venture into preparing different scenarios, or runnig a large number of years. It is advisable to simply run the basic programs and then check the results in order to see whether one has made any mistakes when inputting the I/O table.

At this stage you should therefore run the forecast for only one year, and with no other fixes than the ones built into the program. In detail this means:

(1) The paramter npmax is to be set equal to 1 in the parameter statement for all programs;

(2) The input for MFIXRD is a file with these three lines only:

```
999
999
999
```

(3) The input for FIXRED is also a simple file:

```
title
baseyear,baseyear+1,1
999
999
```

(4) The input for sumprint should only request to print the item ngov+7 (= gross production).

3. Transportability of SLIMFORP

Slimforp is currently operating on the IIASA PDP 11/70 and the VAX, both running under the UNIX Version 7 operating system.[1] The PDP 11/70 is a large "mini" with available core adequate to handle programs with up to 13,000 floating point numbers. We believe that the programs can be transferred rather easily to most other installations. Of course, the command language has to be changed, but that should not cause big problems. The potential difficulties are:

(1) The programs use the FORTRAN statements **include** and **parameter.** These are part of the new ASCII standard, so presumably they are, or will soon become, widely available. Their use can be circumvented, for a single country model, by a few hours' work with the text editor.

(2) SLIMFORP puts all of its matrix input-output through a subroutine called ATRAN, which uses special **high-speed input/output routines** available in the UNIX system. ATRAN should be rewritten for different computer installations to make use of the fastest mass-input-output means available at that installation.

We have three versions available on the standard tape. The IIASA version using UNIX system calls is called ATRAN. The Univac version is called UNIATRAN, and a slow-moving FORTRAN version that can be used to get started anywhere is called FATRAN (ATRAN, UNIATRAN, FATRAN are the "filenames", the subroutine is always called ATRAN). The most appropriate of these should be used. One of ATRAN's jobs is to connect logical units 11 through 20 (and also 21 when using UNIX) to appropriate external files. If UNIATRAN or FATRAN are being used, the connection will have to be made by programs in the executive language of the system being used. What those connections are is shown in Appendix 2 of this guide.

(3) The main forecast output, the fixfiles and some other files are stored in **binary files with fixed record length** and fixed record number (on some installations). It depends on the computer used as to how these definitions and accesses should be implemented.
All programs (except EQRED) use this type of files.

(4) The big loop of the forecast part in SLIMFORP is designed to match the requirements of our PDP 11/70 under UNIX. It is also due to the size limitations of our computer that SLIMFORP consists of so **many main programs** instead of only a few. Depending on the computer a number of changes can be made in this direction.

(5) **Assignment of input and output files** has to be done beforehand for many operating systems. The necessary information to make the correct assignments is found in Appendix 2.

(6) The parameter **nif** (number of integers per floating number) in the parameter list depends on the computer one is using. In most big installations nif=1, on our PDP 11/70 nif=2. It will be explained later how and when to use it.

(7) A number of **programming details** might have to be solved differently on another machine.

- * The check of 'end of file' on input.
- ** Implicit 'do loop' on input which is larger than the actual input (not than the format). On the PDP 11/70 under UNIX the missing elements are set equal to zero.

[1] There are small differences between both machines, this guide though will concentrate on the PDP 11/70 features.

*** Left or right adjustment of character strings stored in integer or real variables. The logical comparison of string variables might be different or not allowed.

**** The opening or closing of files might have to be handled with more care, as well as the number of files open at one time.

**** The program OTM creates files which are read by the programs MATRED, EQRED and FDVRED. Due to pecularities of our compiler, the first character in an outputfile is always used for line control purposes. It is thus necessary to remind this if another machine behaves differently. The relevant formats in OTM are number 32, 42, 52 and 70. In the subroutine PUNCH5 it is format 22.

(8) **Small files** have to be prepared to control the program execution

* The file **year** has one line, containing the last two digits of the base year (year of the I/O table).

** The file **yes** has also only one line, with a "1" in the first column.

(9) If one is using the IIASA computers one should check, that the correct **directory names** are being used. When using another computer this might be a completely different story anyway. The directory names play an important role in ATRAN (assignment of filenames to devices), and are very often refered to in the run files.

In order to take difficulties one at a time, one should not try to get a new model going on a new computer. It is best to come to IIASA and use the computer on which the system is already operating in order to build the basic model. This model can then be transferred to your home computer. If that is impossible, then one should first make an available model run and only then begin on one's own. For control purposes we have included sample input and output listings in Appendix 6. By means of these results you can check the implementation of Sweden on your machine.

We shall assume that you are at IIASA or on a similar machine and want to make a new model. We will assume that you are starting from the Swedish model which you want to remake into a model for another country.

4. Changes of Parts which are Country Specific

In addition to the changes needed to adapt SLIMFORP to run on another computer than IIASA's PDP 11/70, there are a few changes to be made in order to make the forecast for each of the different countries.

A number of parameters have to be adjusted, some titles have to be set up and a few data statements and formats have to be changed so as to match the characteristics of that one country. As mentioned in the previous section we will take all examples from the Swedish case.

4.1. Parameters

The parameters can be seen as one of the most important parts of SLIMFORP as they drive the structure of the I/O table and the forecast, in combination with the equations to calculate final demand.

In a simple standard I/O table the number of rows and columns of the A-Matrix (diagram 1) is the same, but if there are sectors, which only produce and do not buy, then the A-Matrix might have more rows than columns (this is the case in Sweden). On the other side, if you also read in employment, value added, etc., you have in total a bigger number of rows than just the ones of the A-Matrix (this is also applicable in the case of Sweden).

The differences from one country to another country lie in its original data (I/O table) and its parameters. In order to stay flexible with regard to the coding, the authors of SLIMFORP chose to keep as much information as possible in the parameter section. By this a quick switch from one country to another country is possible. We can divide the parameters in three main groups:

4.1.1. Parameters in OTM

There are three lines of parameters in OTM which are country specific. For Sweden they are:

```
      parameter ns=39, nca=38, nc=134, jahrb=75, nri=48
      parameter jcap=105, jimp=108, jq=134, jpce=40
      parameter ncaps=1, ngov=25, ngp4=29, jgov=109
      parameter npceb=65
c     ns = number of rows in table
c     nca = number of columns of square matrix A
c     nc = total number of columns read in
c     jahrb = base year
c     nri = total number of rows to be read in
c     jq = column number of total outputs
c     jcap,jimp,jpce,jgov = column number of the named
c     column
c     ncaps = number of columns in b matrix,
c     ngov = number of government columns
c     ngp4 = ngov + 4
c     npceb = number of personal-consumption sectors
```

One has to adjust them to the size of the input-output table of the individual country.

NOTE:

The format number 52 in the program OTM might be too small for the input-output table of your country. If you get an error message on execution it is necessary to change this format to a larger one. But do not forget to accordingly change the format number 25 in the program FDVRED, otherwise you will get wrong numbers.

4.1.2. Parameters for all other Programs

The large set of parameters which are needed in all programs of SLIMFORP (but OTM) also needs adjustment according to the country to be forecast. They are stored in a file called "Param".
These are for Sweden:

```
      parameter ns=39,nca=38,nemps=39,ngov=25,ncaps=1
      parameter matfxm = 400,ninvit = 1,nmatrx = 3
      parameter npceb = 65, nsmax = 65
      parameter ns1=40,  ns2=41, ns3=42,  ns5=44
      parameter nif = 2, ncg = 31
      parameter npcep=10,nexpp=8,nimpp=8,nvenp=9
      parameter nempp=8,npmax=16,nx=20, ngovp = 1
      parameter nfxmax =200,nxe=1,nxp=1,ncapp=1
      parameter nins=1,nstrs=0
      parameter nname=33
c      matfxm = number of possible fixes in matrices (limited
c             by the program size)
c      nca = number of columns in A matrix,
c      ncapp = number of parameters in capital sector
c      ncaps = number of capital sectors = number of columns
c             in B matrix
c      ncg = ngov + 6 = number of columns in fdvred matrix
c      nempp = number of parameters in employment equations
c      nemps = number of employment sectors
c      nexp = num. of param in export equations,
c      nfxmax = maximum nr. of fixes of fdv
c      ngov = number of government columns of final demand
c      ngovp = number of government equation parameters
c      nif = number of integers per floating word; 2 on pdp,
c           1 on univac
c      nimpp = number of parameters in import equations
c      nins = number of investment sectors
c      ninvit = number of investment iterations; 1 if there
c             is no dependence of investment on current
c             production; otherwise 2.
c      nmatrx = number of matrices a,b,bridge, etc used
c      nname = ncg + 2 = ngov + 8
c      npceb = number of pce items before bridge table
c      npcep = number of parameters in the pce equations
c      npmax = max  number of years to be forecast
c      ns = number of rows in A matrix
c      ns1=ns+1
c      ns2=ns+2
c      ns3=ns+3
c      ns5= ns+5
c      nsmax = maximum of ns, ncaps and npceb
c      nstrs = number of construction sectors
c      nvenp = number of parameters in inventory equations
c      nx = number of exogenous  items such as population
c      nxp = number of parameters of exgeneous equations
c      *******************************************
c
c
```

```
c
c    fortran unit numbers of direct access files
     parameter lu1=1, lu2=2, lu3=3, lu4=1, lu5=3
     integer*4 k0
```

Actually only the values on the 10 first parameter cards have to be changed. Comment cards following the parameter statements explain the meaning of these parameters. For example, if your A Matrix has 78 rows, you change the first card to read "ns=78" where it now says "ns=39". (Although the number of columns in the A matrix, *nca*, may be smaller than the number of rows, the first *nca* rows must correspond one-to-one with the columns. The extra rows may be used for physical indexes, or for special detail; they do not enter into the logic of the model.) The last line in the parameterfile,

```
     integer*4 k0
```

makes sense only on a 16-bit word machine. It means that 4 bytes should be used for storing k0. If your machine has no such instruction, throw away this card. Note also the definition of the parameter *nif*. If your machine uses a 32 or 36 bit word, you must set nif=1.

4.1.3. Parameters used in the Printing Routines

Likewise, you should modify the file "printpar", which for Sweden is just

```
     parameter np12=33, np12p1=34
c    np12 = ngov +8,
c    np12p1 = np12 + 1
c
c    the next parameters are used only in the matrix
c    listing routines
     parameter ncfd = 32, nlab=10
     parameter nyrmax=5
c    ncfd = number of components of final demand (=np12-1)
c    nlab = number of labels = 4 + 2*nmatrx
c    nyrmax = maximum number of years to be listed in one
c    run
```

Only the first 2 parameter lines need revision, the last one has to stay as it is, for all countries, due to the requirements in the programs.

4.2. Data-statements

There are quite a number of data statements in the programs which need some changes depending on the country you are forecasting.

4.2.1. Data Statement in OTM

There are three data statements in OTM:

```
      data fdn/'pce ','exp ','imp ','ven ','ofi ',
     & '201 ','202 ','203 ','204 ','205 ','206 ','207 ',
     & '208 ','209 ','210 ','211 ','212 ','251 ','252 ',
     & '253 ','254 ','255 ','256 ','258 ','259 ','260 ',
     & '261 ','262 ','res '/

      data key/0,107,108,106,109,110,111,112,113,114,115,
     & 116,117,118,119,120,121,122,123,124,125,126,127,
     & 128,129,130,131,132,133/
```

and

data cap /'cap'/ , am /'am'/ , bm /'bm'/ , br /'br'/ , pce /'pec'/

the first two being country specific and closely related to each other.

In *fdn* one specifies the abbreviations (three characters) of the final demand sectors which have to be in line with the abbreviations used in *fdvnames*. The only change necessary here is to remove the government names (in this case from 'ofi' to 'res' as there are 25 government sectors in Sweden), and fill in as many names as your country has, instead. In each number corresponds to the column number where the element mentioned in *fdn* is stored. In Sweden for example 'imp' is the 108th column in the I/O table Note that *pce* is mentioned but not addressed in key (number 0). This sector has just been kept for the sake of completeness.

The third data statement contains the titles of the matrices (AM, BM, BR), the personal consumption (PCE) and capita sectors (CAP) names. A change in this statement will probably only be needed when mayor changes are being made to OTM (e.g. more than one capital sector).

4.2.2. FDV - Names

The element *fdvnames*, which comes into the programs by means of "include", just consists of one data statement, which for Sweden is:

```
 data name /'ofi','201','202','203','204','205','206'
& ,'207','208','209','210','211','212','251','252','253'
& ,'254','255','256','258','259','260','261','262','res'
& ,'exp','pce','imp','ven','cap','xog'
& ,'lpr','emp'/
```

Only the "government names" need revision (first three lines). If ngov=3, then we need 'gv1', 'gv2', 'gv3' instead of 'ofi', ..., 'res' -- and no more.
It is important that the names 'gv1', 'gv2', ..., 'gvn', 'exp', 'pce', 'imp', 'ven', 'cap', 'xog' stay in the specified order, which corresponds to the order in which the forecast results are written out to device LU2 (see later). 'emp' has to be the last entry in fdvnames, any other number of names needed can be inputted between 'xog' and 'emp'.

4.3. Titles

Part of the data preparation is also to make a set of titles to go with your numbers. These titles are to be written on a file in the format

format (4x,5a4,24x,5a4)

in the following order:

line nr.	contents
1	comment card (e.g. nr of titles in each group)
1+1	intermediate sector 1
:	:
:	:
1+ns	intermediate sector ns (nr of rows)
1+ns+1	investment sector 1
:	:
:	:

1+ns+ncaps	investment sector ncaps (nr of columns in B matrix)
1+ns+ncaps+1	private consumption sector 1
:	:
:	:
1+ns+ncaps+npceb	private consumption sector npceb
1+ns+ncaps+npceb+1	employment sector 1
:	:
:	:
1+ns+ncaps+npceb+nemps	employment sector nemps
1+ns+ncaps+npceb+nemps+1	exogeneous variable 1
:	:
:	:
1+ns+ncaps+npceb+nemps+nx	exogeneous variable nx

The titles in Sweden start:

```
39 sectors,1investment,65consumption,39 employ,
  1jordbruk och jakt                        agriculture and hunting
  2skogsbruk                                forestry
  3fiske och fiskevard                      fishing
  4gruvor och mineralbrott                  mining
  5skyddad livsmedelsindustri               sheltered food industry
  6konkurr. livsmedelsindustri              competitive food industry
  :
  :
```

For better reading of the output we have provided space for titles in two languages, one language in each column. At the moment of printing the results one can chose the language by setting a specific parameter in the input control file of the printing routines (to be explained later). The second column of titles, if wanted, should start at column 49, but they are **not** a must.

4.4. Control Input for the Printing Routines

The printing routines SUMPERINT and MATLIS need control parameters to drive the amount and sequence of the output printed. These parameters are practically country-independent. Only the lines with the titles for the different sectors change with the country one is modelling. We refer to section 5 where the programs are described in detail.

4.5. Input for the Scenarios

These inputs are of course country specific, but only in relation to the numbers used, and not to the format. Therefore we refere to the corresponding section 5 of this guide where the programs which prepare the scenarios are being discussed.

5. Execution of SLIMFORP

In part 2 of this guide you find a brief overview of the programs which belong to SLIMFORP. In this part you will have referenced each program again, but in more detail, and takingn into consideration computer and country peculiarities as well.

Of course you will have to actually read the programs if you want to understand what they do in every detail. Part 5 is designed to make the acquaintance with them easier and more of a pleasure than a burden. We discuss here each program, putting at the beginning of each paragraph the name of the main program and subroutines to be compiled, as well as the input and the output devices needed. (To some readers the expression "logical unit" might be more familiar than "device", but the latter expression is kept throughout this guide). A consistent notation has been chosen for the file names. A file name starting with "Mass-" is always a mass storage file (fast I/O, to be accessed with ATRAN). A filename ending with "bin" is a random access file, created with "define file" (on the PDP 11/70, or with a similar command on another machine). File names and program names will be written in capitals. In Appendix 4 an abbreviated version of the same story is given.

5.1. OTM - One Table Maker

Compilation: otm

Input: device5 = otminput (input/output table in standard form)

Output: device1 = am (input/output matrix)
device2 = bm (capital flow matrix)
device3 = fdv (final demand vectors)
device6 = eqs (equation parameters)
device8 = br (bridge matrix for personal consumption expenditure)

The first program to tackle is OTM (one table maker) which prepares all of the data input for SLIMFORP on the basis of one input/output table. The program begins with a set of parameters explained in section 4 (4.1.1. Parameters in OTM).

Change the values of the parameters in the three "parameter" statements to match your table. Their meaning is explained in the comment cards immediately following each "parameter" statement. Then move to the "data fdn/" statement and modify it to have as many of the "govn" names as there are government columns in your matrix. (This number appeared as *ngov* in the parameter statements.) Then modify the next line by putting under each name the number of its column. Here pce = personal consumption expenditure, imp = imports, exp = exports, and gov1, gov2, etc. are the government columns. In order to produce a correct table you should give a "0" as the column number of pce, although it is written in another column. (The pce part will be added in the program automatically, even if not specified !!).

Depending on the storage mode of your I/O table the read command has to be changed (columns or row wise).

You must now prepare your input/output flow table in the form of card images by columns, with ten entries per card.

These cards will be read by the statements:

```
      do 20 j = 1,nc
20    read (5,22) (a(i,j),i=1,nri)
22    format(10x,10f7.0)
```

where *nri* is the number of rows and *nc* is the number of columns in the entire table, counting the final demand columns and any definitional columns, such as "total intermediate sales", not actually used by the model. Note that each column begins on a new card. Imports must appear as a **negative** column, rather than as a positive row as in most statistical publications. All of the personal consumption expenditure and the capital investment vectors should be side-by-side. The file with these card images is to be called OTMINPUT.

OTM is a rather important and at the same time flexible part of SLIMFORP. It is possible here to input exogeneous parameters which will be written out to device 6 (= EQS). Their names and positions within the table have to be counted as government sectors and be treated with special care. Employment can also be started in the same way the exogeneous variables get started. It is, however, also possible to input by hand some values to EQS or to start these variables in FIXRED. To start with, however, you should not plunge into these complicated issues, but only run a simple I/O table. Now compile OTM and run OTM with the OTMINPUT file described above as its standard input.

You might encounter an error message when running OTM, specially when writing to device 3 (=FDV) if the sum of capital or pce gets too big. The corresponding format which would need adjustment is:

```
52 format(1x,a4,i2,i4,10f8.0)
```

But you must not forget to also change the format in FDVRED (to be discussed later) when you read in the figures written to device 3 (= FDV). In FDVRED it is:

```
25 format(a3,i1,i2,i4,10f8.0)
```

After having executed OTM you can make changes or corrections to the different output files which are to be put into mass-storage files with some of the next programs.

5.2. MATRED - Matrix Reader

Compilation: matred and atran

Input: device 5 = am (input/output matrix)
device 5 = bm (capital flow matrix)
device 5 = br (bridge matrix)
(one after the other)

Output: device 6 = checkfile
and
device 13 = Mass-BM (capital flow matrix, mass storage)
device 14 = Mass-AM (input/output matrix, mass storage)
device 16 = mass-BR (bridge matrix, mass storage)
(one after the other)

This program takes some of the output created by OTM and makes mass storage files out of it to allow faster access. The files AM, BM and BR created by OTM can be taken as they are and need no handling before executing MATRED, except when you encounter errors or want to make some additions. Errors can also be corrected by executing MFIXRD, which will be explained later. Thus there is no need to run OTM more than once.

MATRED has to be executed three times, in order to put the A-Matrix (intermediate flow), the B-Matrix (capital flow) and the BR-Matrix (bridge matrix) into three mass storage files.

The format of the input file is always the same. Each file begins with a card giving the number of rows and columns in the matrix it contains. Then comes the matrix, five coefficients per card, in the format

```
 10 format(a2,a3,5(2i3,f9.3))
```

In each of the five triplets, there comes first the row number, then the column number, then the coefficient.The order of the cards or of the coefficients is of no consequence to the results. Here is an example from the Swedish model:

```
am  39 38,number of rows and columns
am    1  1 0.034704  1  5 0.241771  1  6 0.144602  1  7 ....
am    1  9 0.000115  1 12 0.000491  1 14 0.018788  1 21 ....
  :
  :
```

If you are using UNIX the program will take care of assigning the proper output device numbers to the different input files. If you are on another machine you should take care of this part yourself (depending on the implementation of ATRAN). The device 6= *checkfile* will always be created for control purposes.

5.3. FDVRED - Final Demand Vectors Reader

Compilation: fdvred

Input: device 5 = yes + year1 + fdv (control parameters and final demand vectors)

Output: device 6 = checkfile
device LU3 = fdvbin (final demand vectors, random access)

Similar to the previous program, FDVRED makes a binary file from one of the outputs produced by OTM. This output is a random access file with fixed record length. Its organisation can be seen in Appendix 1.
The input to FDVRED in Sweden is for example:

```
1
75
exp 75  1  1156.   263.    87.  2378.   575.   557. ..
exp 75 11   334.  4016.  1135.   554.     0.   708. ..
exp 75 21   425.     0.   205.     0.   252.     0. ..
exp 75 31     0.  1558.     5.     0.    88.     0. ..
imp 75  1  2728.   473.    65.  5753.  1748.  2621. ..
  :
  :
```

The first line is just a "1", to indicate that you are starting from scratch, (no other option is allowed), the second line is the last two digits of the base year and then comes the file FDV created by OTM.

NOTE:
You should now remember to change format 25 if you had changed format 52 in OTM !

5.4. EQRED - Equation Reader

Compilation: eqred, tuck and atran

Input: device 5 = yes + eqs (control parameter and equation parameters)

Output: device 17 = Mass-eqs1 (parameters of equations for government, pce, exports and exogeneous variables)"
device 18 = Mass-eqs2 (parameters for capital investment)
device 19 = Mass-eqs3 (parameters for imports and inventory, and triangulation order)
device 20 = Mass-eqs4 (parameters for employment equations and control variables)

This routine reads the equations of the model, the personal consumption expenditure bridge table -- if any, the aggregation code for the investment equations, and the triangular order of the input-output sectors. The type of equation speoified by a card is indicated by its first three letters, as follows:

gov government expenditures
pce personal consumption expenditure
exp exports
imp imports
cap capital investment
ven inventory
emp employ
xog exogenous variables
bri bridge table between pce categories and input-output sectors
iag aggregation code for investment sectors
itr triangulation order of input-output sectors
etc.

A sample input can be:

```
1
exp   1   1   1156.
exp   2   1    263.
exp   3   1     87.
exp   4   1   2378.
 :
 :
imp   1   1   2728.
imp   2   1    473.
imp   3   1     65.
 :
 :
pce  64   1    967.
pce  65   1   3010.
itr
35  10  20   2  27   9  11  28  24  16  32  31  19  23  ...
 4  36  33  12  29  26   3  21   5   1   6   7  38  37  ...
```

The first line of the input is a "1" to indicate that we are starting from scratch (also here it is not allowed to do anything else). In SLIMFORP the "equation" only consists of the value of the variable in the base year (as you can easily see by comparing the figures). It is up to the user to input more sophisticated equations (by changing the input file EQS).

In each equation, the first four letters identify the type of variable, and each parameter is identified by first, the sector number to which it applies, and second, by the number of the parameter in the equation. Each card is read with the format

```
10 format(a3,2x,5(2i3,f9.0))
```

this is, five parameters can be read by card. The resulting output for the government sectors is a three dimensional matrix, so that each element of each column of the government matrix may have its own equation. It need not necessarily carry just government columns; it may also be used for private, non-market services, or for exports divided by destination, or whatever other portion of final demand needs more columns. These extra column go into the count for the parameter ngov and their names appear in the first ngov names in the file FDVNAMES (just a data statement, included in many programs with #include).
If you want you can also add by hand some exogeneous parameters for the equations which are then stored on a mass sortage file, together with other parameters to be listed below. But exogeneous variables and employment can also be inputted in FIXRED at a later stage.

The last text to be read in EQRED is *itr*, the triangulation order of the matrix. It is followed by ns sector numbers written in the right order of computation. In Sweden for example, sector 35 will be calculated first, then sector 10, sector 20, etc. and at last sector 39.

The output of EQRED is mass storage files to be accessed with the subroutine ATRAN. These mass storage files are used in the forecast part and if required the development of the parameters through the years can also be recorded here.

5.5. MFIXRD - Matrix Fixes Reader

What is addressed under the label MFIXRD are actually two programs, MFIXRD and FIXMAT which always have to be executed together, one after the other.

5.5.1. MFIXRD - Fixes Reader

Compilation: mfixrd, linint

Input: device 5 = year1 + matfixes (control parameters and fixes for the matrices"

Output: device 6 = checkfile
device LU2F = random access file with fixes

MFIXRD reads the fixes for the AM, BM, and BR matrix from device 5 and stores them in a random access file LU2F.

If you are now starting from scratch, you can disregard the different types of fixes and their format, and you simply create the following file *matfixes:*

```
999
999
999
```

But if you are an experienced user, here is an example of possible fixes:

```
bmf,i 19  1 75  1.000 80  2.000 90  5.000
999
amf,g 13  0 76  1.000 80  5.200 90
amf,g  1 -1 75  2.000 80  1.500 90
  5  2  4  8 10 40
999
brf,l  1  6 75  2.000 80  0.020
brf,l  1  4 75  1.000 80   .010
999
```

The general format of a line in the *matfixes* input is:

xxx,fnnnmmm y1 x1 y2 x2 y3 ... with the format (a3,1x,a1,2i3,7(i3,f7.0)), where

xxx : matrix name (bmf, amf or brf)

f : type of fix (i,g or l, to be explained below)

nnn : row number of fix (> 0)

mmm : column number of fix

- mmm > 0 column mmm will be fixed
- mmm = 0 all elements of the row will be fixed
- mmm < 0 a group of columns will be fixed; the number of elements in that group and the elements are specified in the next line with format (ni4)

yi : last two digits of year to be fixed

xi : fix parameter for the year i specified

After all fixes for one matrix have been inputted there has to follow a line starting with "999". This is the flag to show that the fixes for the first matrix are finished and the fixes of the next matrix are to begin. The order of fixes, first for BM, then for AM, at last for BR, is to be kept. If there are no fixes for a matrix just the line with "999" has to be inputted.

If a further fix of a matrix refers to a group already specified, the same negative column number as previously used can be inputted again. In this case a blank line follows, instead of the group specification. It is not possible to specify more than 100 groups.

The program can handle the following types of fixes:

i : **index growth.**
Index fixes have to be inputted in pairs, i.e. (y1, x1), (y2, x2), etc, where yi is the last year and xi the index which will be applied to the coefficient of that year. The first index has to be given for the base year and all subsequent indices will be normalized to that base year index. The indices for the intermediate years not specified are calculated by interpolating linearly between two specified years. In case of missing indices for all years till the end of the forecast period, the last index will be applied.
In the above example the element in row19, column1 of the B-Matrix is multiplied with index 1. in the base year (75), index 2. in the year 80 and index 5. in the last year (90). For the missing years the indices will be set by interpolating linearly between the given ones.

g : **exponential growth rate** (= continuously compound annual).
The fix given is a percentage, i.e. xi = 5.2 means 5.2% growth. For each rate you specify begin and end year, in the example all elements of row 13 have a 1% exponential growth between 1976 and 1980, and then a 5.2% growth till 1990 (or baseyar-1+npmax, if npmax is smaller than 16). Missing rates till npmax (last year of the forecast) are set equal to the last fix.

l : **logistic growth.**
The years specified in this fix are of no importance as the fix will start from the second year (counted from the base year) and will be applied up to npmax. The two parameters to be inputted are:
x1 = first change
x2 = reduction of first change

x1 and x2 are percentages similar to the parameters in the g mode.

Then y(t+1) = y(t)*(1+x1)
y(t+2) = y(t+1)*(1+x1n) and x1n = x1*(1-x2)
In the example the element in row1, column6 of the BR-Matrix will have a logistic growth with x1=2. and x2=0.02.

Several fix cards may be used for the same item, but only the same type of fix can be used in all of them. Each new line has to start from the year it finished on the previous card.

If the column number of a fix is 0, it will be interpreted as an across the row change; all coefficients in the row will follow the specified path. Thus the third fix card above specifies that all of the coefficients in row 13 will grow exponentially by 1% between 1976 and 1980; the increase is linear. Finally there is the possibility of specifying a group of coefficients in a row which all follow the same fix pattern. The fourth card, with the -1 in the column number position, notifies the program that the next card will define the group to which the fix on this card applies. This group will be called group 1; the next card says that there are 5 columns in this group and that they are 2,4,8,10 and 40.

In the examples we have observed a careful spacing of the input. Under UNIX this spacing may be replaced by a comma at the end of each field.

In Appendix 1 you can see how the random access file LU3F is organized, this is specially useful if you are testing the program on your machine and the results are not the ones you expect.

5.5.2. FIXMAT - Fix Matrices

Compilation: fixmat, atran

Input: device LU2F = random access fixes and modes
device 13 = Mass-BM (capital flow matrix)
device 14 = Mass-AM (input/output matrix)
device 16 = Mass-BR (bridge matrix)

Output: device 6 = checkfile
device LU2F = random access fixes and modes
device 11 = Mass-BM-New (fixed capital flow matrix)
device 12 = Mass-AM-New (fixed input/output matrix)
device 15 = Mass-BR-New (fixed bridge matrix)

FIXMAT reads the file LU2F created by MFIXRD and imposes the fixes on the elements in the AM, BM and BR matrix respectively. In the course of this run the AM, BM and BR matrices are rewritten on another device. But not only the base year is stored again in the new devices, but all subsequent years up to the last year are written out, if available, or set to zero. Thus it is necessary to execute MFIXRD and FIXMAT even if you do **not** have any fixes for the matrices.

5.6. FIXRED - Final Demand Fixes Reader

Compilation: fixred, prefix, linint, atran

Input: device 5 = fixes (fixes for final demand)
device LU1 = previous fixes
device LU3 = fdvbin (created in fdvred), with last year dates and final demand data for the base year.
device 20 = Mass-eqs4, size of common, for internal reasons.

Output: device 6 = checkfile
device LU1 = fixbin (random access file with fixes and their types).

This program processes the *fix* cards which are used to specify various scenarios in the final demands and starts the exogeneous variables. The fixes are read from a file called fixes. The first card of this file is the title for that scenario. The second card gives the starting year of the forecast, the terminal year and a variable called *kurz*. If kurz = 1 we get a very reduced control output on device 6, if kurz = 0 the control output is much longer.

The input file *fixes* is very similar to the previously explained file *matfixes*. The formats are nearly the same, only there are more types of fixes in the final demand fix reader. An example of fixes can be:

example	format
demonstration 28 february	20a4
75,80,1,	3i3
ofi,iz 0,75,1.000,78,2.000,80,1.000,90,1.000,	a3,1x,2a1,i4,7(i4,f10.0)
pce,iz 30,75,1.000,78,1.500,80,1.000,90,1.000,	:
pce,cz 9,75,.1,80,5000.,90,3000.,	:
imp,iz 18,75,1.000,78,1.500,80,1.00,90,.300,	:
imp,az 12,75,7456.,78,8000.,80,7000.,90,5000.,	:
ven,az 10,75,1616.,78,1000.,80,500.,90,100.,	
exp,iz -1,75,1.0,78,2.0,80,1.0,90,2.0,	:
5 1 2 3 4 5	20i4
xog,az 1,75,1000.,78,2000.,90,5000.,	a3,1x,2a1,i4,7(i4,f10.0)
999	
999	

The general format of the fixes is:

xxxtz nnn y1 x1 y2 x2 ... ...

with

xxx : final demand sector to be fixed, it is one of the elements of the array XXXX name (fdvnames)

t : type of fix, to be explained below

z : indicator to tell whether previous fix on this sector has to be cleared (z = "z") or not (z = any other character)

nnn : element to be fixed:

- nnn > 0 the element "nnn" of xxx will be fixed
- nnn = 0 all elements of xxx are to be fixed, this is not allowed for imports and inventory
- nnn < 0 a group of elements in xxx will be fixed, the next card specifies which elements belong to it and how many there are; this option is not allowed for imports and inventory, there may not be more than 30 groups.

yi : last two digits for which the fix is applied

xi : parameter of the fix

After a group fix has been inputted it must be followed by either a card with the number of elements of that group and their specification, or a blank card if the group has been specified previously. The input format for the group specification is (20i4).

The types of fixes can be:

a : **actual value;**
for each year yy you specify the value x1 to be used; the intermediate years not indicated will be interpolated linearly.

m : **multiplication;**
together with each year you specify the value xi which should be multiplied with the corresponding element of the forecast result

i : **index;**
similar to the index option in MFIXRD for each year, starting with the base year, you specify the index. The indices are normalized to the base year and will be applied to it.

c : **constant term;**
to be added to the value produced by the model's equation. For each year you specify the value xi to be used as a constant term.

g : **growth rate;**
this rate is used in the same way as in MFIXRD. It is applied to the base year. If a growth rate is not specified for each pair of years, a linear interpolation will be made to cover the missing years. The rate stays constant for all years between the last specified and the last year of the forecast.
The input data for the growth rate fix is:
xxxtznnn y1 x1 y2 x2 y3 x3 y4
(each growth rate is surrounded by beginning year and ending year).

r : works **like the g-mode;**
it can be used after any a, c or m fix, with some exceptions depending on the sector. *xog* only allows an "r" following an "a" fix; there is no "g" allowed for *xog* (as it has to get started first); the r-fix following another fix has to start where the previous fix ended. The input format for the r-fix is the same as for the g-fix.

The "z" in the fifth column of an input card means that any previous fix on this item should be removed. If you have another line of fixes for exactly the same element the "z" has to be replaced by a blank (this is always needed for the r-fix). On a "continuation" fix the first year must be identical to the last year of the preceding card.

The signal for stopping the fixes of final demand is a line starting with "999".

The next input is the fixes for employment, which have the same format as the fixes for final demand, also followed by a "999" line.

In Appendix 1. you can see the contents of the random access file LU1 = fixbin.

5.7. RUNLOOP - Forecast

This program is the forecasting part of SLIMFORP and therefore its most important part. Up to now it is written so as to produce a **slim** output, i.e. simple, with no exogeneous influences and 5% exponential growth rate in the final demand sectors if not specified differently in the fixes. At the same time, here is room to make extensions to SLIMFORP and produce a more sophisticated forecast.

We have succeeded in having SLIMFORP running on our small inhouse computer PDP 11/70 for quite a number of sectors. This was only possible after splitting FORE (the original forecast program) into many main programs. As we think that the guide gains in clarity if we deal with small portions at a time we will explain here all separate parts of FORE (as we use them on our machine for big input/output tables).

The last part in this section suggests an integration of all parts of the forecast into one program (main programs become subroutines).

5.7.1. ZERO 2 - Zero LU2

Compilation: zero2

Input: none

Output: device LU2 = modoutbin

The only function of this program is to zero out the forecast output which is written on a random access file and is called *modoutbin* throughout the forecast.

5.7.2. ZERONT - Zero NT

Compilation: zeront

Input: device LU1 = fixbin (fixes of final demand)

Output: device LU1 = fixbin (fixes of final demand)

Similar to the previous program, this one is executed to zero out the "first year" counter *nt*. This variable, which is stored in the first record of the random access file fixbin drives the amount of years to be forecast.

5.7.3. BEGIN

Compilation: begin, exog, atran

Input: device LU1 = fixbin (fixes of final demand)
device LU3 = fdvbin (final demand vectors)
device LU2 = modoutbin (forecast output)
device 17 = Mass-eqs1 (equations for government, pce, exports and exogeneous variables)

Output: device LU1 = fixbin (fixes of final demand)
device LU2 = modoutbin (forecast output)
device 17 = Mass-eqs1
device 6 = checkfile
device 21 = finn (UNIX solution)

The forecast starts with this program. Each new year of calculations has to start here, and this is also the reason that this program checks as to whether the last year of the forecast *(npmax)* has been reached. If so, a control variable is set to stop the run and is stored in the first record of FIXBIN.
When using UNIX on the PDP 11/70 at IIASA you will see that the file *finn* will be created on the "end-condition" and system commands are then used to check whether the forecast is finished or not. Depending on the system and computer you are using the solution might be different.
In section 5.7.7 you will find a solution which relies solely on FORTRAN statements. That option of course assumes that all programs fit in core at once, and that you have only **one** main program (FORE) and all the rest are subroutines.

In BEGIN the subroutine EXOG is called. It starts the exogeneous variables which are inputted in FIXRED and therefore stored in *fixbin*. The sectors government, export and pce are calculated, according to the equations read in from device 17 = Mass-eqs1. In SLIMFORP these equations are very simple, as has already been mentioned, and only a standard 5% growth is given to these sectors. If there are any future values known beforehand, and stored in FDVBIN, they are taken here as well and superimposed on the standard growth.
The year count is also increased in BEGIN, and therefore *fixbin* is used as input

(actual year) and output (new year). The results are written to *modoutbin*, in the appropriate locations of the random access file. For the organisation of the forecast output *(modoutbin)* we refer to Appendix 1.

5.7.4. FDVEC - Final Demand Vector

Compilation: fdvec, invest, fixfin, distri, atran

Input:
device LU1 = fixbin (fixes for final demand)
device LU2 = modoutbin (forecast output)
device LU3 = fdvbin (final demand vectors)
device 11 = Mass-Bm-New (capital matrix)
device 15 = Mass-BR-New (bridge matrix)
device 18 = Mass-eqs2 (capital investment equations)

Output:
device LU2 = modoutbin (forecast output)
device LU1 = fixbin
device 18 = Mass-eqs2
device 6 = checkfile
device 21 = finn (UNIX solution)

The program FDVEC is only used to call three subroutines, INVEST, FIXFIN and DISTRI. The first subroutine, INVEST, calculates the equation for investment (5% growth in SLIMFORP) with parameters taken from device 18 = Mass-eqs2, or superimposes on it future values stored in *fdvbin*. There is the possibility of making the investments dependent on current production, which would result in a rerun of the investment part (and associated parts, i.e. the whole FDVEC part). The parameter *ninvit* drives this option and in the subroutine INVEST the pointer is set to perform the correct action. This pointer is the same as used in BEGIN (to drive the number of forecast years) and is stored in the first record of the random access file fixbin.

The next subroutine in FDVEC, FIXFIN, puts the fixes taken from the random access file fixbin on government, export, personal consumption and investment. Of course, if there are any data for these sectors in FDVBIN (future values), these are superimposed on the fixes. The result is written into the model output file *modoutbin*.

The last subroutine in this group is DISTRI. It calculates the total final demand by adding up all sectors and aggregating, if necessary, capital and personal consumption (taken from device 11 and 15 respectively). The total final demand is transmitted to the other programs by storing it temporarily in the slot of inventory in *modoutbin*.

5.7.5. IOCOMP - Input/Output Computations

Compilation: iocomp, atran

Input:
device LU1 = fixbin (fixes of final demand)
device LU3 = fdvbin (final demand vectors)
device LU2 = modoutbin (forecast output)
device 12 = Mass-AM-New (A-Matrix of I/O coefficients)
device 19 = Mass-eqs3 (equations for imports and inventory, and order of triangulation)

Output:
device LU2 = modoutbin (forecast output)
device 19 = Mass-eqs3

This part of the forecast makes the input/output calculations. The factors to do this are read in from device 12 = Mass-AM-New. In the course of the Seidl-process IOCOMP also fixes imports and inventory, taking the values from *fixbin*, or superimposing future values stored in *fdvbin*. If none of the values are there

imports are increased by 5% (SLIMFORP) and inventory is left as it is, reading the equation parameters from device 19 = Mass-eqs3. Here is the place where you would input more sophisticated equations for both sectors.
After the computations have been done the result is written to *modoutbin*.

5.7.6. EMPLOY - Employment

Compilation: employ, atran, ...

Input: device LU1 = fixbin (fixes of final demand)
device LU2 = modoutbin (forecast output)
device 20 = Mass-eqs4 (equations for employment)

Output: device LU2 = modoutbin
device 20 = Mass-eqs4
device 6 = checkfile

The employment calculations are performed here. It depends on the user what type of equations he or she uses. In device 20 = Mass-eqs4 the parameters for employment can be found, if they have already been read in OTM. In *fixbin* you can also find employment fixes if you chose FIXRED to input them there.

For Norway, for example, the author of the forecast program chose to read in the first employment values in FIXRED and to calculate from them the parameters of the employment equations, which are the ratio "output/employment". Each new year in the forecast either takes the employment figures in FIXRED (if lasyr (ngov+6) > nyr), or else it calculates the new employment figures:

emp(t) = q(t) / (empeq * e**0.05)
i.e. a 5% growth on employment.

The user should not forget that the first five words in device 20 = Mass-eqs4 are meant to store the sizes of the different equation records (neco(i)). The next locations are then used to store the parameters of the employment equations and, if they are time dependent, the new set of parameters can also be written out each year.

5.7.7. FORE

Compilation: fore, zeront, zero2, begin, exog, fdvec, invest, distri,fixfin, iocomp, employ, atran

Input: device LU1 = fixbin
device LU2 = modoutbin
device LU3 = fdvbin
device 11 = Mass-BM-New
device 12 = Mass-AM-New
device 15 = Mass-BR-New
device 17 = Mass-eqs1
device 18 = Mass-eqs2
device 19 = Mass-eqs3
device 20 = Mass-eqs4

Output: device LU1 = fixbin
device LU2 = modoutbin
device 17 = Mass-eqs1
device 18 = Mass-eqs2
device 19 = Mass-eqs3
device 20 = Mass-eqs4
device 21 = Finn (UNIX solution)
device 6 = checkfile

If you are working on a big computer where all the forecasting programs can fit at once then this section is of interest to you. It shows you how to put all programs as subroutines into one big program called FORE, and thus solving the "loop-problem" with plain FORTRAN statements.

The program is simply the sequence of all the forecast programs described up to now. This means, that in order to understand the different routines of the program it is only necessary to look at the preceding sections, there you will find them referenced as main programs.

6. Printing

There are some routines which allow the user to look at the results of the forecast in a convenient way, and to chose which things he or she wants to look at. The printing routines are called SUMPRINT and MATLIS, the plotting routine is called GRAPH. There are some helping programs that go with these programs, they will all be explained in this section of the guide.

6.1. MAKTIT - Make Titles

Compilation: maktit

Input: device 5 = titles

Output: device LU5 = titbin (random access files with titles)

This program makes a random access file out of the titles given as input, in order to allow faster access to them. The titles inputted have to be in strict order:

titles of intermediate sectors
titles of capital sectors
titles of personal consumption sectors
titles of employment sectors
titles of exogeneous items

The program is capable of reading two columns of titles (two languages), which are inputted with the format:

(4x,5a4,24x,5a4)

The first line of the input is interpreted as comment card and will be skipped. The resulting random access file is organized in a straight forward way. You will find details of it in Appendix 1. Both subsequent programs, SUMPRINT and MATLIS, use the resulting random access file as input to produce the listings.

6.2. SUMPRINT - Summary Printing

Compilation: sumprint, growth, nelm, engl1, engl2, enlgl3, engl5

Input: device 5 = sumprintdat
device LU2 = modoutbin
device LU5 = titbin

Output: device 6 = sumtab (listing of results)
device 7 = checkfile

SUMPRINT is designed to make a summary printing of the results of the forecast (stored in *modoutbin)*. Actual values and growth rates between given pairs of years are printed. As in *modoutbin* only the final demand sectors are stored, these are the only items that can be outputted here. In order to get values for the intermediate sectors you are referred to the program MATLIS, to be explained later.

The subroutines used in the program SUMPRINT do not need any explanation; from their names one can easily understand their function. The subroutines ENGL.. are designed to allow for printing in two different languages.

The control input to this program, on device 5, is a rather lengthy file. With it you decide on the amount of data which is going to be printed. The contents of this file is:

line variable name format

1	heading 1		5a4,24x,5a4
2	heading 2		5a4,24x,5a4
3	heading 3		5a4,24x,5a4
4	heading 4		5a4,24x,5a4
5	heading 5		5a4,24x,5a4
6	heading 6		5a4,24x,5a4
7	comment card (dummy)		
8	nlinmx, jahrb, nengp	8(6x,i4)	
9	comment card (dummy)		
10	z1 z2 z3 .. z10	20i4	
11	comment card (dummy)		
12	y1 x1 y2 x2 .. .. y10 x10	20i4	
13	comment card (dummy)		
14	ix iy text		2i2,5a4,20x,5a4
15	ix iy text		2i2,5a4,20x,5a4
:			
:			
14+ngov+9-1	ix iy text		2i2,5a4,20x,5a4
14+ngov+9	comment card (dummy)	:	
14+ngov+9+1	ix iy text		:
:			
14+ngov+9+nx	ix iy text		2i2,5a4,20x,5a4

The first six lines of the file are headings which have to be specified in all cases. Here again one can input two columns (starting the second column at position 46) in order to have the choice between two languages.

nlinmx : maximum number of lines to be printed on one page, should be set according to the lineprinter used, but 55 seems to be a reasonable value

jahrb : beginning year of the forecast, i.e. base year of your input-output table

nengp : parameter to choose the language, = 0:= language of first column, = 1:= language of second column.

zi : last two digits of years to be listed, up to a maximum of 10 years

yi xi : pair of years between which growth rates should be calculated and printed, up to a maximum of 10 pairs

ix : position of final demand element in device LU2 (modoutbin). This is fixed for all elements and should not be changed, otherwise you will not get the right figures.
The positons are:

1	government 1
2	government 2
:	:
ngov	government ngov
ngov+1	export
ngov+2	private consumption (pce)
ngov+3	import
ngov+4	inventory change
ngov+5	capital investment
ngov+6	employment
ngov+7	gross production
ngov+8	exogeneous variables (assumptions)

ngov+9 gross national product

iy : flag for printing, = 1:= figures for that element will be printed, = 0:= figures for that element will **not** be printed.

text : text to be used for that element of final demand, again here one can have two languages, the second starting at column 46.

Final demand figures are printed in the order the lines "ix iy text" are arranged in *sumprintdat*. If e.g.the line for imports is listed before the line for pce, then imports are written first, independent of their appearance in LU2 *(modoutbin)*.

Exogeneous variables and gross national product are always printed in the last position, no matter where you specify them, and they are also printed for iy = 0 (no printing).

A sample *sumprintdat* and the corresponding output can be found in Appendix A6.

6.3. MATLIS- Matrix Listing

Similar to MFIXRD, MATLIS consists of two programs which have to be run together, but for the sake of clearness we explain them separately.

6.3.1. WRITAB - Write A, B, and BR Matrix

Compilation: writab, atran

Input: device 5 = matlisdat (control input)
device 11 = Mass-BM-New
device 12 = Mass-AM-New
device 15 = Mass-BR-New

Output: device LU4 = matbin (random access file with selected parts of A, B, and BR matrices)

With this program some parts of the A, B, and BR matrices are selected, according to the input in MATLISDAT, and stored in a random access file for further output with MATLIS.

6.3.2. MATLIS - Matrix Listing

Compilation: matlis, headm, growth, engl1, engl4, engl6

Input: device 5 = matlisdat (control file for the printing)
device LU2 = modoutbin
device LU4 = matbin (created by WRITAB)
device LU5 = titbin (created by MAKTIT)

Output: device 6 = matpf (listing of the results)

When using MATLIS you will get a listing of the contribution of the intermediate sectors to the different final demand sectors. Also here you get absolute values and growth rates, with the restriction that you have to specify *exactly five years and five pairs of years*, otherwise the listing does not make much sense.

Similar to *sumprintdat* the control input file *matlisdat* drives the output of the program MATLIS.

The format of the file is as follows:

line	variable	format
1	numyr,jahrb,ng,nlinmx,nengp	8(6x,i4)
2	z1 z2 .. z5	20i4
3	y1 x1 y2 x2 .. y5 x5	20i4
4	head 1 1 head 1 2	5a4,24x,5a4
5	head 2 1 head 2 2	5a4,24x,5a4
6	head 3 1 head 3 2	....
7	head 4 1 head 4 2	....
8	:	
9	:	
10	:	
11	:	
12	:	
13	head 10 1 head 10 2	....
13+1	text 1 1 text 1 2	5a4,24x,5a4
13+2	text 2 1 text 2 2	:
:		
:		
13+ngov+8	text ...	5a4,24x,5a4
13+ngov+8+1	numsec,valmi	6x,i4,6x,f4.0
13+ngov+8+2	comment card (dummy)	
13+ngov+8+3	s1 s2 s3 ..sns	20i3
13+ngov+8+4	s. s.	

head i : standard headings which have to be inputted in any case. The second language can be written starting at column 45.

text i : titles of the different sectors, written in the order in which they are stored in *modoutbin*, and this is:

gov 1
gov 2
:
:
gov ngov
exports
imports
inventory
investment
employment
gross production
assumption

(This is the same order as in *sumprintdat*, only that gross national product is missing and will not be printed).

numyr : number of years to be printed, has to be 5 in all cases

jahrb : base year of the forecast

ng : number of growth rate pairs to be printed, has to be 5 in all cases.

nlinmx : maximum number of lines that fit on a priting page (e.g.55)

nengp : flag to control the language used, = 0:= language of column 1, = 1:= language of column 2.

zi : last 2 digits of the five years to be printed yi xi : last 2 digits for each pair of years for which the growth rates should be calculated.

numsec : number of sectors which should be printed (at most ns)

valmi : minimum value below which no figures should be printed.

si : sector i for which a printing should be produced. The order of the sectors determine the order of printing.

In the same way as in SUMPRINT you can input two columns of text in order to produce output in two different languages. The parameter *nengp* in the input file drives the language. In Appendix 6 a sample input and the resulting output can be seen.

7. Use of exogeneous variables

In the programs of SLIMFORP as they are now, a maximum of *nx* exogeneous variables can be read in, but they are not being processed or updated. This section of the guide is meant to show the user where these variables are stored so that he or she can use them whenever required.

The exogeneous variables are stored in the array xog(nx) which is an element of:

```
common/comain/ kontrl(10),ncfdv,niter,nt,nyr,date,dinpc,fin,
* kurz,lasyr(nname),neco(5),xog(nx),title(10),jahra,jahrz,
* idum(ns1)
```

This common is transmitted to the different main program by storing it in the first record of the random access file LU1 = fixbin (created with define file).

The content of this first record is:

nwc, kntrl(i),i=1,nwc

nwc = number of words in common, calculated in FIXRED, and with kntrl(i) stores the whole content of common /comain/.

The exogeneous variables are initialized only in FIXRED and written to LU1 for the first time.

In the random access file LU2 = modoutbin the exogeneous variables are stored in the location:

1 + (nt*ngov) + 8

i.e. the last item after government, final demand and employment. These exogeneous parameters are first written to LU2 = modoutbin in the subroutine EXOG (in BEGIN). In each year of the forecast the set of exogeneous parameters is written out to LU2 = modoutbin, so that a complete series is available after the end of the forecast.

8. Use of more complicated equations

As you may recall, the name SLIMFORP stems from SLIM-Forecast-Program. SLIM has the connotation of simple in the sense that unless fixes are imposed externally, the final demand sectors simply grow exponentially with 5%. Nevertheless the user can specify more complicated growth patterns (i.e. change the existing patterns) of the economy. One way of doing this is to impose fixes on intermediate sectors, as well as on the final demand sectors.

Another solution would be to change the equation parameters and also to change the equations. The program OTM is written in such a way that it generates the equation parameters for final demand, creating only one parameter, the initial value of final demand in the base year. The parameters resulting from OTM are stored in the file EQS and the program EQRED then makes several mass storage files out of these parameters. You can either change OTM to generate other parameters (the ones you prefer), or you can change the file EQS manually (in the editor).

At the same time you must take care of the program-parameters which refer to the equation parameters of the different final demand sectors.

The next step is to look then at the programs (or subroutines) where the equation parameters are used and make there the changes which correspond to your representation of the economy of the country you are modelling.

In the subroutine EXOG (program BEGIN, or FORE, if you have merged all programs together) the equations for personal consumption expenditure (pce), exports and government are solved.

The capital equations are in subroutine INVEST (program FDVEC of FORE).

In the program IOCOMP (or program FORE) the imports and inventory changes are dealt with. The exact place in the code where the equations are calculated can easily be found.

Finally the employment equations are to be found in the program EMPLOY (or subroutine EMPLOY in program FORE).

The input/output coefficients can be addressed to and changed in MFIXRD, at a later stage there is no "entry" to them.

It is now up to the user as to how the equations of the final demand sectors are dealt with. The data handling routines in SLIMFORP are designed so that one can store the equation parameters for all years of the forecast for later use, or to be printed (with routines that the user has to write). By studying the programming code the user can easily find how this is done and so design his or her own pieces.

1. Appendix 1: Organisation of Random Files

1.1. Random access file LU1 (fixbin) , created in FIXRED.

```
define file LU1 (nrlu1,nwlu1,u,m1)
nrlu1 = 3*npmax+40
nwlu1 = nfxmax*nif
```

record nr.	variable name	contents
1	kontrl(10)	size of common, nr.of final demand fixes, nr. of employment fixes
2	modfio(1-ns,1-2)	mode of fixes of sectors in imports (1) and inventory (2)
3	isign(1-nfxmax)	position of name of that fix (for xog only 1 and 2)
4 5 : : : 32 33	isg(1-nfxmax)	group 1 to group 30 of fixes (no groups allowed for inventory and imports)
34	modes(1-nfxmax)	type of fix for each of the fixes 1: rest 2: constant 3: multiplication 4: kode = xog
35	is(1-nfxmax)	position of element to be fixed (in gov(1-ns,1-ncg)), negative for groups
36 37 : : 36+npmax-1	y(1,1-nfxmax) : y(j,1-nfxmax) : y(npmax,1-nfxmax)	final demand fixes by year
36+npmax	modes(1-nfxmax)	type of employment fixes
36+npmax+1	is(1-nfxmax)	location of element fo be fixed

		(in gov(1-ns,1-2))
38+npmax	y(1,1-nfxmax)	
38+npmax+1	:	
:	y(j,1-nfxmax)	employment fixes by year
:	:	
:	:	
38+2*npmax-1	y(npmax,1-nfxmax)	
38+2*npmax	y1(1,1-ns),y2(1,ns)	
38+2*npmax+1	:	
:	y1(j,1-ns), y2(j,1-ns)	import and inventory fixes by sector
:	:	
38+3*npmax-1	y1(npmax,1-ns), y2(npmax,1-ns)	

1.2. Random access file LU2 (modoutbin) , used in the forecast.

```
define file LU2 (nrlu2,nwlu2,u,m1)
nrlu2 = npmax*(ngov+8)+1
nwlu2 = nsmax*nif
```

record nr.	variable name	content	
1	jahra,np, title(20)	beginning year,nr.of years, title	
2	gov(1-ns,1)	government-1	(yr 1)
3	:	:	:
:	:	:	:
:	:	:	:
1+ngov	gov(1-ns,ngov)	government-ngov	:
1+ngov +1	exp(1-ns)	exports	:
1+ngov +2	pce(1-npceb)	pce (private cons. exp.)	:
1+ngov +3	:	imports	
1+ngov +4	ven(1-ns)	inventory (final demand slot)	
1+ngov +5	v(1-ncaps)	investment (capital)	
1+ngov +6	:	employment	
1+ngov +7	:	output (gross production)	:
1+ngov +8	xog(1-nx)	xog (assumptions)	(yr 1)
1+(ngov+8) +1	gov(1-ns,1)	government-1	(yr 2)
1+(ngov+8) +2	:	government-2	:
:	:	:	
:	:	:	:
1+(ngov+8)*2	xog(1-ns,1)	xog (assumptions)	(yr 2)
1+(ngov+8)* (npmax-1)+1		government-1	(yr npmax)
:	:	:	:
:	:	:	:
:	:	:	:
1+(ngov+8)*npmax		xog (assumptions)	(year npmax)

1.3. Random access file LU3 (fdvbin) , created by FDVRED.

```
define file LU3 (nrlu3,nwlu3,u,m1)
nrlu3 = (ngov+6)*npmax+1
nwlu3 = nxmax*nif
```

record nr.	variable name	content	
1	jahr1,ncfdv, lasyr(1-ncfdv)	base yr, nr.of vectors, last yr for which vector is available	
2	gov(1-nsmax,1)	fd for gov-1	(yr 1)
	gov(1-nsmax,2)	fd for gov-2	:
:	:	:	
:			
1+ngov	gov(1-nsmax,ngov)	fd for gov-ngov	
1+ngov+1	gov(1-nsmax,ngov+1)	exports	
:	:	pce	
:	:	imports	
:	:	inventory	
:	:	investment	:
1+ngov+6	gov(1-nsmax,ncg)	employment	(yr 1)
1+(ngov+6)+1	gov1	:	(yr 2)
:	:	:	:
:	:	:	:
1+(ngov+6)*2	emp	:	(yr 2)
1+(ngov+6)* (npmax-1)+1	gov1	:	(yr npmax)
:	:	:	:
:	:	:	:
1+(ngov+6)*npmax	emp	:	(yr npmax)

1.4. Random File LU2F (matfixbin) , created in MFIXRD and used in FIXMAT.

define file LU2F (nrlu2f,nwlu2f,u,m1)
nrlu2f = npmax*nmatrx + 7 + 100
nwlu2f = matfxm*nif

record nr.	variable name	contents
1	nfixes(1-nmatrx)	nr. of fixes for all matrices
2	irow(1-nfix)	rows of fixes in B-Matrix
3	jcol(1-nfix)	columns of fixes in B-Matrix
4	irow(1-nfix)	rows of fixes in A-Matrix
5	jcol(1-nfix)	columns of fixes in A-Matrix
6	irow(1-nfix)	rows of fixes in BR-Matrix
7	jcol(1-nfix)	columns of fixes in BR-Matrix
7+1	y(1,1-nfix)	
:	:	
:	:	fixes of B-Matrix for every year
:	:	
7+npmax	y(npmax,1-nfix)	
7+npmax+1	y(1,1-nfix)	
:	:	fixes of A-matrix for every year
7+2*npmax	y(npmax,1-nfix)	
7+nmatrx*2+1	y(1,1-nfix)	
:	:	fixes of BR-Matrix for every year
7+nmatrx*npmax	y(npmax,1-nfix)	
7+nmatrx*npmax+1	ne,nsg(1-ne)	group-1 of fixes
:	:	:
7+nmatrx*npmax+100	ne,nsg(1-ne)	group-100 of fixes

1.5. Random access file LU5 (titbin) , created by MAKTIT.

```
define file LU5 (nrlu5,nwlu5,u,m1)
nrlu5 = ns+ncaps+npceb+nemps+nx+10
nwlu5 = 20
```

record nr.	variable name	contents
1	title(1-10),etitle(1-10	tit-1 language1, tit-1 language2
2	title(1-10),etitle(1-10	tit-2 language1, tit-2 language2
:	:	:
nrlu5	title(1-10),etitle(1-10	tit-nrlu5 language1, tit-nrlu5 language2

1.6. Random access file LU4 (matbin) , created by WRITAB and used in MATLIS.

```
define file LU4 (nrlu4,nwlu4,u,lay)
nrlu4 = ns*nmatrx*nyrmax
nwlu4 = nsmax*nif
```

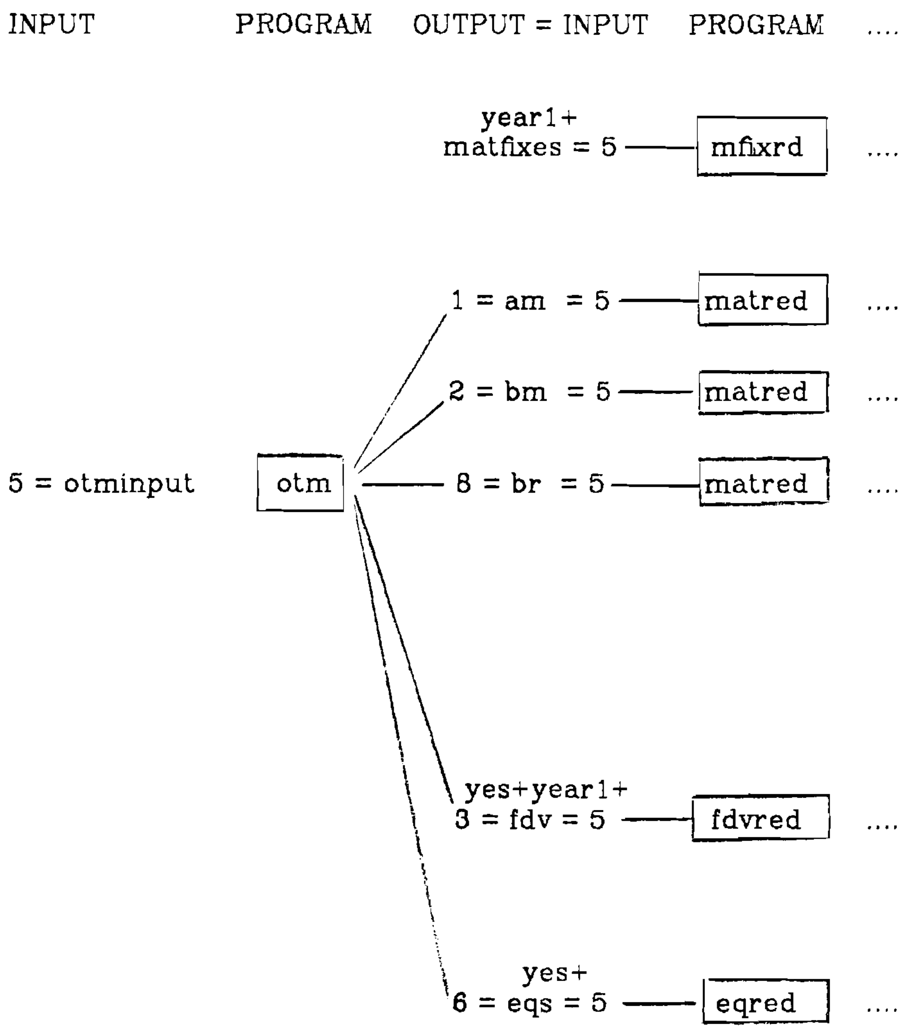
record nr	variable name	content	
1 : ns	a(1,1-ncaps) : a(ns,1-ncaps)	Mass-BM-New	
ns+1 : 2*ns	a(1,1-nca) : a(ns,1-nca)	Mass-AM-New	year1
2*ns+1 : 3*ns	a(1,1-npceb) : a(ns,1-npceb)	Mass-BR-New	
3*ns+1 : 4*ns	a(1,1-ncaps) : a(ns,1-ncaps)	Mass-BM-New	
4*ns+1 : 5*ns	a(1,1-nca) : a(ns,1-nca)	Mass-AM-New	year2
5*ns+1 : 6*ns	a(1,1-npceb) : a(ns,1-npceb)	Mass-BR-New	
: : :			
(numyr-1)*3*ns+1 : (numyr-1)*ns	a(1,1-ncaps) : a(ns,1-ncaps)	Mass-BM-New	
:	:	Mass-AM-New	year-numyr
: numyr*3*ns	: (ns,1-npceb)	Mass-BR-New	

1.7. Order of print-elements in SUMPRINT and MATLIS

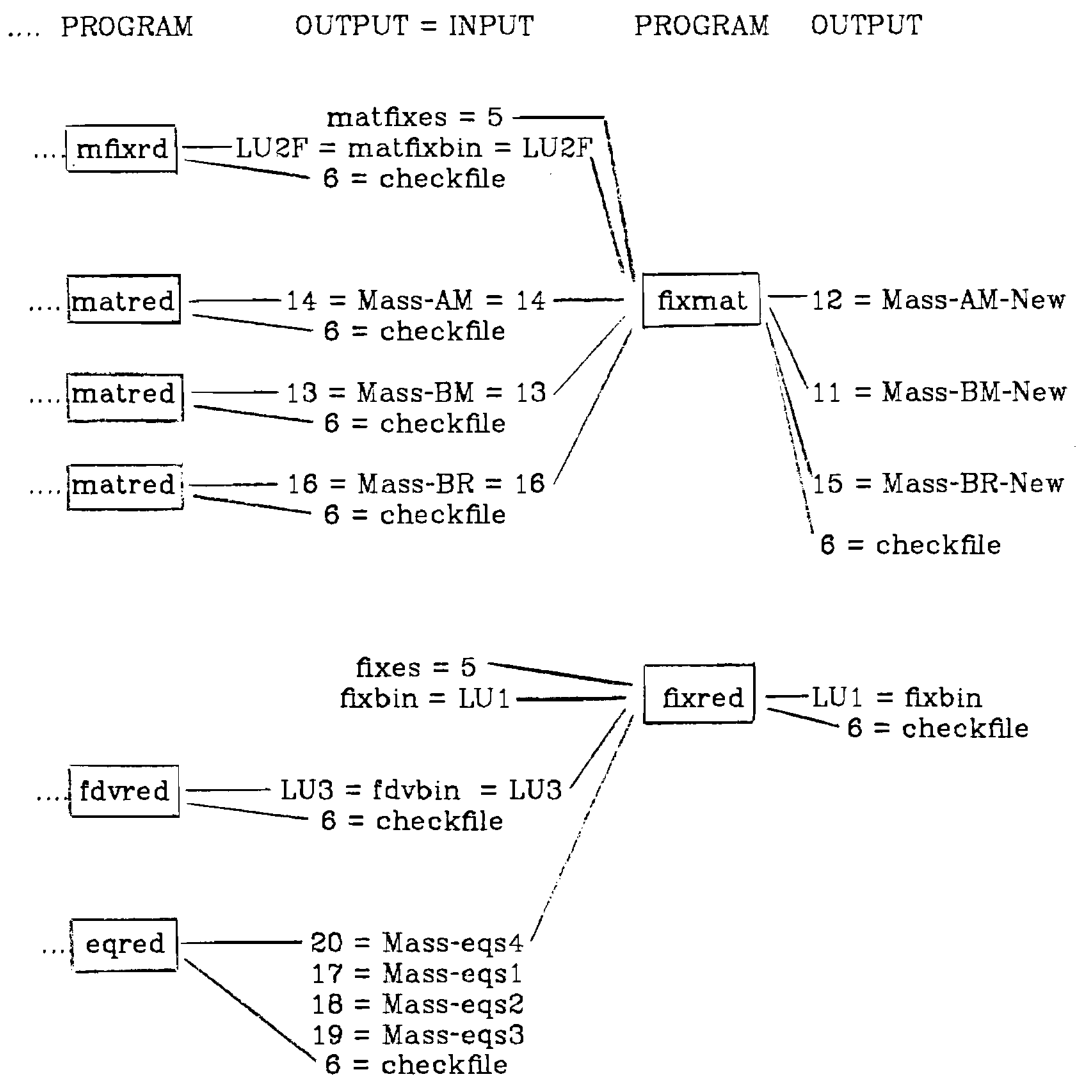
1	gov1
2	gov2
:	:
:	:
ngov	govn
ngov+1	exports
ngov+2	pce
ngov+3	imports
ngov+4	inventory
ngov+5	investment
ngov+6	employment
ngov+7	gross production (output)
ngov+8	exogenous (assumptions) [default]
ngov+9	GNP (gross national production [default]

2. Appendix 2: Connection of Input and Output Files

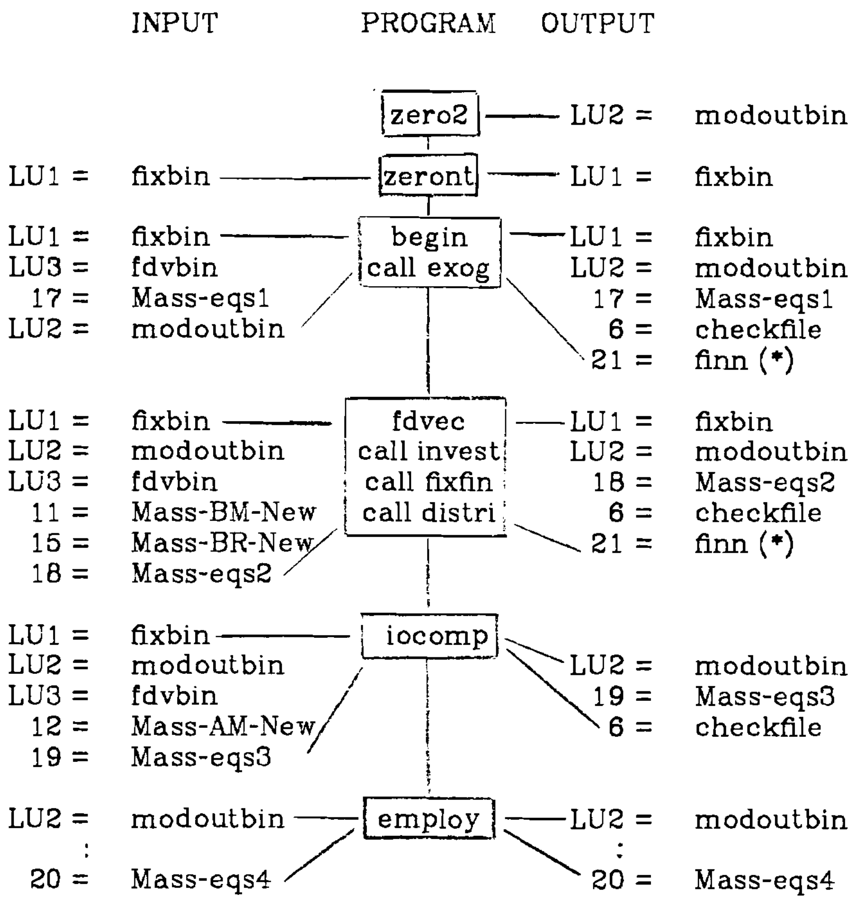
PREPARATION (1)



PREPARATION (2)

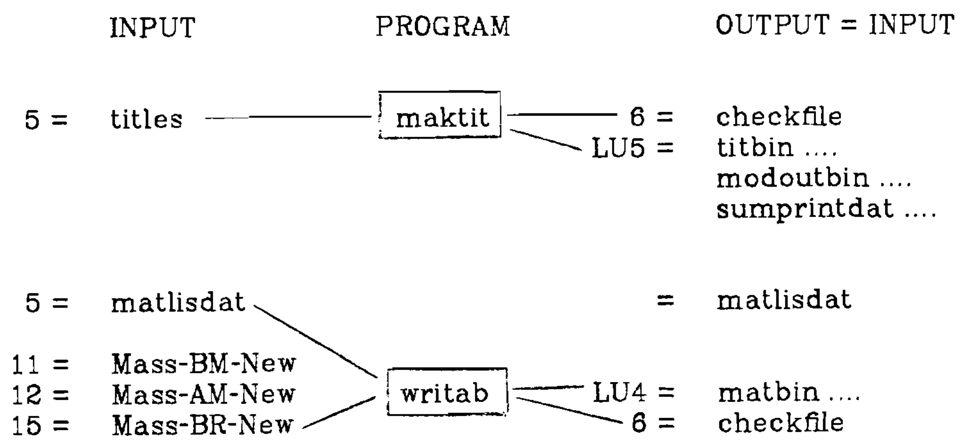


FORECAST

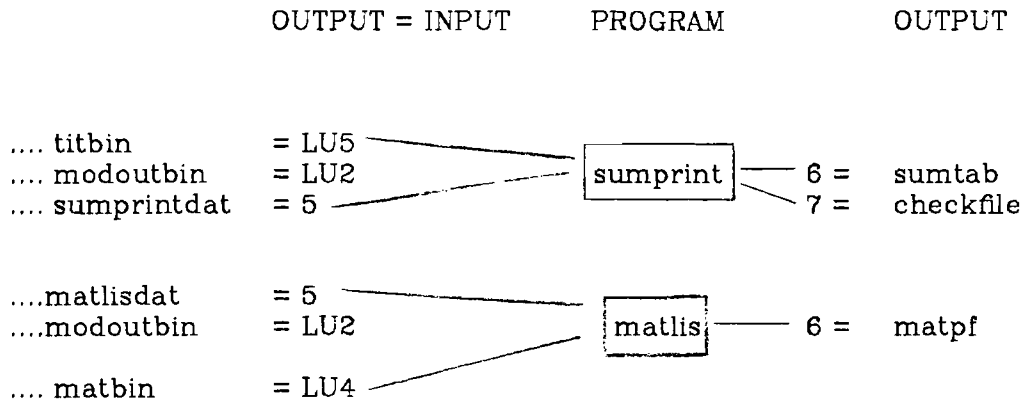


(*) UNIX-solution

PRINTING (1)


INPUT
PROGRAM
OUTPUT = INPUT
5 = titles
maktit
6 = checkfile
LU5 = titbin ....
modoutbin ....
sumprintdat ....
5 = matlisdat
= matlisdat
11 = Mass-BM-New
12 = Mass-AM-New
15 = Mass-BR-New
writab
LU4 = matbin ....
6 = checkfile

PRINTING (2)



Notes:

xxxbin : random access file created with define file
Mass-xxx : mass storage file to be accessed with ATRAN
checkfile : file with control information

3. Appendix 3: Main Programs and Subroutines

Loop	Programs	Subroutines
	otm	setots (only necessary for UNIX) punch5
	matred	atran
	fdvred	-
	eqred	atran tuck
	mfixrd	linint
	fixmat	atran
	fixred linint atran	prefix
fore:		
	zero2	
	zeront	
	begin	exog atran
	fdvec	invest fixfin distri atran
	iocomp	atran
	employ	atran

In case the whole forecast part is **one** program, *fore* is the main program and all main programs in it become subroutines.

	maktit	
	sumprint	nelm growth headr

	engl1
	engl2
	engl3
	engl5
writab	atran
matlis	growth
	headm
	engl1
	engl4
	engl6

4. Appendix 4: Short Sequence of actions

4.1. Definitions

RUNxxx: Actions for the program xxx.
xxx: name of main program, or name of first program in a set, or name of a set of programs

Comment: Some explanations.

Compilation: Main program (subprogram1, subprogram2,...) to be compiled prior to execution.

Call: How to execute the program.
< filename: device5 = filename = standard input
> filename: device6 = filename = standard output
cat f1 f2...|...: merge of f1 f2 ... = device5 = standard input
xxx.out: compiled program and subroutine (call by name)

Input: device number and name of input files

Output: device number and name of output files

Action: What to look for in the preparation phase;
Default actions needed for all programs are:
* change parameters which are country specific
* check for computer specific commands
* check for the correct assignment of input and output devices
* check fdvnames (data name(nname))
* change data statement in atran
* change directory names in the runfiles

4.2. Programs

RUNOTM

Comment: Makes the model table.

Compilation: otm (punch5)

Call: otm.out < otminput > eqs

Input: device 5 = otminput

Output: device 1 = am (A-matrix)
device 2 = bm (B-matrix)
device 3 = fdv (final demand)
device 6 = eqs (equations)
device 8 = br (BR-matrix)

Action: Prepare the file otminput, check that format 52 is big enough for you figures. If you change it, then format 25 in fdvred should be changed as well.

RUN...MATRED (A, B, BR)

Comment: Reads the formatted A, B, and BR matrices and makes mass storage files out of each of them.

Compilation: matred (atran)

Call: matred.out <am
matred.out <bm
matred.out <br

Input: device 5 = am
device 5 = bm
device 5 = br

Output: device 6 = checkfile
device 13 = Mass-BM (capital flow)
device 14 = Mass-AM (intermediate flow)
device 16 = Mass-BR (bridge matrix)

RUNFDVRED

Comment: Reads the final demand vectors for the base year and any values known beforehand for the future,it then makes a random accessfile out of them.

Compilation: fdvred

Call: cat yes year1 fdv | fdvred.out

Input: device 5 = yes+year1+fdv

Output: device 6 = checkfile
device LU3 = fdvbin (random access)

Action: Add possible future values for the final demand in fdv; if you had changed format 52 in otm you should change format 25 here.

RUNEQRED

Comment: Reads the equation parameters created in otm and writes them on mass storage files.

Compilation: eqred (tuck, atran)

Call: cat yes eqs | eqred.out

Input: device 5 = yes+eqs

Output: device 17 = Mass-eqs1 (equations for gov, pce, exp and xog)
device 18 = Mass-eqs2 (capital investment)
device 19 = Mass-eqs3 (imports, inventory, triang.order)
device 20 = Mass-eqs4 (employment, sizes of common-parts)

Action: Possible changes in the equations parameters, or in general a different eqs file (not the one from otm)

RUNMFIXRD

Comment: Prepares and makes coefficient changes on AM, BM and BR matrices.

Compilation: mfixrd (linint)
fixmat (atran)

Call: cat year1 matfixes |mfixrd.out
fixmat.out

Input: for mfixrd: device 5 = year1+matfixes

Output: for mfixrd: device 6 = checkfile
device LU2F = random acces fixes and modes

Input: for fixmat: device LU2F = random access fixes and modes
device 13 = Mass- BM
device 14 = Mass- AM
device 16 = Mass- BR

Output: for fixmat: device 6 = checkfile
device 11 = Mass-BM-New
device 12 = Mass-AM-New
device 15 = Mass-BR-New

Action: Prepare the inputfile matfixes which determines the development of the coefficients of the matrices.

Important: You have to run this program in all cases, even if there are no fixes, as all other years of the matrices also are set.

RUNFIXRED

Comment: Sets up fixes for the forecast years for the final demand vectors (exp, imp, ven, cap, gov, pce, emp) and initializes the exogeneous vectors (xog).

Compilation: fixred (prefix, linint, atran)

Call: fixred.out < fixes

Input: device 5 = fixes (title of run and fixes)
device LU1 = previous fixes (not allowed)
device LU3 = fdvbin (created in fdvred), with last year dates and fdv in the base year.
device 20 = Mass-eqs4 (size of equations in common)

Output: device 6 = checkfile
device LU1 = fixbin (title and dates, types of fixes and fixes)

Action: Prepare the fixes for final demand.

Important: This program has to be executed even if there are no fixes,because the file fixbin will be accessed in the forecast and has to be created here.

RUNLOOP

Comment: This is the actual forecasting part. It is set up as a shell loop due to the PDP restrictions, but can be solved differently on different machines (see later).

Compilation: zero2
zeront
begin (exog, atran)
fdvec (invest, fixfin, distri, atran)
iocomp (atran)
employ (atran)

Call: zero2.out
zeront.out
: top

```
begin.out
if -w /tmp/nyhus/swef/finn goto quit
: inv
fdvec.out
iocomp.out
if ! -w /tmp/nyhus/swef/finn/ goto inv
rm /tmp/nyhus/swef/finn
employ.out
goto top
: quit
```

Input:
device LU1 = fixbin
device LU2 = modoutbin (forecast for the next year)
device LU3 = fdvbin
device 11 = Mass-BM-New
device 12 = Mass-AM-New
device 15 = Mass-BR-New
device 17 = Mass-eqs1
device 18 = Mass-eqs2
device 19 = Mass-eqs3
device 20 = Mass-eqs4

Output:
device LU1 = fixbin
device LU2 = modoutbin
device 17 = Mass-eqs1 (n-th year)
device 18 = Mass-eqs2 (n-th year)
device 19 = Mass-eqs3 (n-th year)
device 20 = Mass-eqs4 (n-th year)

Action: Check for the correct implementation of the loop on your computer.

Note:

In case RUNLOOP is just *one* program you have to use RUNFORE

RUNFORE

Comment: Main forecast program, has all actions of runloop in it.

Compilation: fore(zero2,zeront,begin,exog,atran,fdvec,invest,
fixfin,distri,iocomp,employ)

Call: fore.out

Input:
device LU1 = fixbin
device LU2 = modoutbin
device LU3 = fdvbin
device 11 = Mass-BM-New
device 12 = Mass-AM-New
device 15 = Mass-BR-New
device 17 = Mass-eqs1
device 18 = Mass-eqs2
device 19 = Mass-eqs3
device 20 = Mass-eqs4

Output:
device LU1 = fixbin
device LU2 = modoutbin

device 17 = Mass-eqs1
device 18 = Mass-eqs2
device 19 = Mass-eqs3
device 20 = Mass-eqs4

Action: Check that fore really fits on your computer, it might be too large.

RUNMAKTIT

Comment: Makes a random access files out of the titles for the different sectors

Compilation: maktit

Call: maktit.out < titles

Input: device 5 = titles

Output: device LU5 = titbin (random access titles)

Action: Prepare all titles.

RUNSUMPRINT

Comment: Makes summary listing of the forecast.

Compilation: sumprint (headr, growth, atran, nelm, engl1, engl2, engl3, engl5)

Call: sumprint.out < sumprintdat >/tmp/nyhus/swef/sumtab

Input: device 5 = sumprintdat (parameters for sumprint)
device LU2 = modoutbin
device LU5 = titbin

Output: device 6 = sumtab (listing)
device 7 = checkfile

Action: Prepare input for sumprint (sumprintdat).

RUNMATLIS

Comment: Prints final demand vectors by sector of the economy.

Compilation: writab (atran)
matlis (growth, headm, engl1, engl4, engl6)

Call: writab.out<matlisdat
matlis.out<matlisdat>/tmp/nyhus/swef/matpf

Input: for writab: device 5 = matlisdat (parameters for the programs)
device 11 = Mass-BM-New
device 12 = Mass-BM-New
device 15 = Mass-BR-New

Output: for writab: device LU4 = matbin (transposed matrices)
device 6 = checkfile

Input: for matlis: device 5 = matlisdat (parameters for the programs)
device LU2 = modoutbin (forecast)
device LU4 = transposed matrices

Output: for matlis: device 6 = matpf (listing)

Action: Prepare input for writab and matlis (matlisdat).

4.3. Description of each part in Runloop

ZERO2

Comment:	Sets to zero the model output (modoutbin)
Compilation:	zero2
Input:	none
Output:	device LU2 = modoutbin (forecast)

ZERONT

Comment:	set first year to zero
Compilation:	zeront
Input:	device LU1 = fixbin
Output:	device LU1 = fixbin

BEGIN

Comment:	Starts the forecast. Calculates government, export and pce demands, initailizes the exogeneous variable and gives known future values to government.
Compilation:	begin (exog, atran)
Input:	device LU1 = fixbin device LU3 = fdvbin
Output:	device LU1 = fixbin device LU2 = modoutbin device 17 = Mass-eqs1

FDVEC

Comment:	Calculate investment, and if available take future values. Put fixes on government, export, pce and investment and if available future values for government, export, pce and investment. Distribution of pce, final demand and capital to the different sectors
Compilation:	fdvec (invest, fixfin, distri, atran)
Input:	device LU1 = fixbin device LU2 = modoutbin device LU3 = fdvbin device 11 = Mass-BM-New device 15 = Mass-BR-New device 18 = Mass-eqs2
Output:	device LU2 = modoutbin device 18 = Mass-eqs2

IOCOMP

Comment: Makes input-output calculations. Puts fixes on imports and inventory. Takes future values if available for imports and inventory.

Compilation: iocomp (atran)

Input: device LU1 = fixbin
device LU2 = modoutbin
device LU3 = fdvbin
device 12 = Mass-AM-New
device 19 = Mass-eqs3

Output: device LU2 = modoutbin
device 19 = Mass-eqs3

EMPLOY

Comment: Calculates employment.

Compilation: employ (atran)

Input: device 20 = Mass-eqs4
device LU2 = modoutbin

Output: device LU2 = modoutbin
device 20 = Mass-eqs4

5. Appendix 5: Sequence of Actions on the PDP 11/70 under UNIX

(1) Change the parameters according to your country in param and printparam

(2) Change the names of the output files data statement in atran to match your own directory /tmp/..../....

(3) Check if your directory name is specified in all the run-files.

(4) Prepare otminput to be used as input for otm (this is executed immediately after compilation)

(5) Set the correct names in fdvnames

(6) Compile all programs with FORALL.
This shellfile calls a number of other shells which can also be executed separately.
The set of commands in FORALL is:

```
for punch5 -c
for otm atran -c
mapotm  (* this includes runotm)
for matred -c
mapmatred
for fdvred -c
map fdvred
for eqred -c
for tuck -c
mapeqred
for fixred -c
mapfixred
for fixmat -c
map fixmat
for prefix -c
for linint -c
for mfixrd -c
mapmfixrd
for zeront -c
map zeront
for zero2 -c
map zero2
for begin -c
for exog -c
mapbegin
for fdvec invest -c
for distri fixfin -c
mapfdvec
for iocomp -c
map iocomp
for employ -c
map employ
for maktit headm -c
for headr sumprint -c
for engl1 engl2 -c
for engl3 engl4 -c
for engl5 engl6 -c
for nelm growth -c
map maktit
```

```
mapsumprint
for writab matlis -c
map writab
mapmatlis
```

The command FOR is a shell:

```
f4p -i -id -tr:all -li:2 $1 $2 $3
```

MAP is the shell:

```
linker $1.obj atran.obj -i -l
```

(7) Prepare the file year1 which is the last two digits of the base year of you forecast

(8) Prepare fixes for MFIXRD and FIXRED.
Prepare the titles for the sectors (MAKTIT).
Prepare input for SUMPRINT.
Prepare input for WRITAB.

(9) Run the whole set of programs with RUNALL. This shell file has a number of shell files which can be executed separately (similar to mapall). They are:

```
runamatred
runbmatred
runbrmatred
runfdvred
runeqred
runmfixrd
runfixred
runloop
runmaktit
runsumprint
p -raw -pri:lp /tmp/nyhus/swef/sumtab
runmatlis
p -raw -pri:lp /tmp/nyhus/swef/matpf
```

Normally the programs from RUNAMATRED to RUNEQRED need only to be executed once.
RUNMFIXRD and RUNFIXRED generate the different scenarios.
RUNLOOP is the forecast.
Different inputs to MAKTIT and SUMPRINT generate different listings.

The actions in each RUNxxx command can be seen when actually using the shell programs at IIASA.

(10) The following explanations are meant for computer users who are not familiar with UNIX. Files called F1.OBJ are compiled, unlinked fortran programs (F1 = main program) or subroutine).
Files called F1.OUT are compiled and linked fortran programs. In this case F1 can only be the name of a main program.
Files called FOR00n.DAT , n=1,2,... are input or output files required by the fortran programs when reading/writing from/to devices 1,2,... (not 5 or 6).
Files called xxx/yyy/.../F1 are just specially long file names for internal use in UNIX (the PDP operating system) and have no special meaning.

The meaning of some symbols and commands:

cp F1 F2	make an identical copy of F1, name it F2
mv F1 F2	move or rename F1 to F2
rm F1 F2 ...	remove or delete F1, F2, ...
chmod nnn F1	change mode of file F1 (internal use)
command < F1	command takes input from F1 (device 5)
command > F2	command writes output to F2 (device 6)
cat F1 F2 ...	merge F1, F2, ... to one file (this is used in connection with other commands, e.g.
cat F1 F2 | command	merge F1 and F2 and feed it as input (device 5) to command
p -xxx -yyy F1 F2	print on the line printer F1 and F2 observing switches xxx yyy
f4p -xxx -yyy F1 F2	call of the fortran compiler with options xxx, yyy
linker F1 F2 -xxx	call of the linker with option xxx

6. Appendix 6: Sample inputs and outputs

6.1. Sample input for SUMPRINT

```
prognos for:       prognosis for:
prognos for:       forecast for:
serier:            series:
sektor             sector
totalt             total
tillvaxttakt for:  growth rates for:
total gnp          total gnp

----
nlinmx 55jahrb  75nengp   1
*** years to be listed
 75  76
*** growth rate pairs
 75  76
***fd vectors in order to be listed. 1st # is psn in lu...

32   1brutto produktion                     gross production
 1   1offentliga investionen                public investment
 2   0allmanna offentliga tjanster          government services
 3   0ratts och polisvasen                  police and safety
 4   0forsvar                               defense
 5   0utbildning                            education
 6   0halso och sjukvard                    health care & hospit
 7   0socialvard                            social care
 8   0socialforsakring                      social insurance
 9   0bostadspolitik och samhallsplane      housing & planning m
10   0kultor och rekreation                 culture and recreati
11   0naringslivets framjande               no translation
12   0vag och gatuvasen                     roads
13   0ofordelat                             other government
14   0allmanna offentliga tjanster          local government ser
15   0ratts och polisvasen                  local police and saf
16   0forsvar                               local defense
17   0utbildning                            local education spen
18   0halso och sjukvard                    local social insuran
19   1socialvard                            local social care
20   0bostadspolitik och samhallsplaner     local planning
21   0kultur och rekreation                 local culture & recr
22   0naringslivets framjande               local no translation
23   0vag och gatuvasen                     local- roads
24   0ofordelat                             local - all other
25   0statistisk residual                   statistical residual
27   1privat konsumtion                     private consumption
26   1export                                exports
28   1import                                imports
29   1lagerinvestering                      change in inventorie
30   1privata investeringar                 private investment
```

31	0sysselsattning	employment
33	1antaganden	assumptions
34	1brutto national produkt	gross national produ

*** exogenous items to be listed, in order for listing....

1	1exogenous #1	exogenous #1

6.2. Sample input for MATLIS

```
numyr   5jahrb  75ng     5nlinmx 55nengp   0
 75 76 77 78 80
 75 76 76 77 77 78 78 80 75 80
prognos for:                  forecast for:
tillvaxttakt for:             growth rates for
inkop - intermediara          sales - intermed
summa: intermediara           sum: intermediat
inkop - investeringar         sales to investm
summa:investeringar           sum: investment
inkop - konsumtion            sales to consump
summa: konsumtion             sum: consumption
inkop - slutlig efterfragan   sales to other f
summa: slutlig efterfragan    sum : other fd s
offentliga investeringar      public investmen
201allm. off. tjanster        government servi
202ratts och polisvasen       police and safet
:
:
60naringslivets framjande     local no transla
261vag och gatuvasen          local roads
262ofordelat                  local-all other
statistisk residual           statistical resi
export                        exports
privata konsumtion            private consumpt
import                        imports
lagerinvestering              change in invent
investeringar                 investment
syssel                        employment
bruttoproduktion              domestic product
assumptions                   assumptions
numsec  6valmi  1.0
----****
 1 13 19 18 12 10  7  8  9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
```

6.3. Sample Output for MATLIS

****
1 JORDBRUK OCH JAKT
****

PROGNOS FOR:	SWEDEN - SCENARIO 1					TILLVAXTTAKT FOR:				
	1975	1976	1977	1978	1980	75-76	76-77	77-78	78-80	75-80
	INKOP - INTERMEDIARA									
1 JORDBRUK OCH JAKT	460.	535.	612.	690.	770.	15.18	13.33	12.10	5.44	10.30
5 SKYDDAD LIVSMEDELSIN	5450.	6396.	7437.	8578.	10736.	16.01	15.07	14.28	11.22	13.56
6 KONKURR. LIVSMEDELSI	1717.	1947.	2197.	2460.	2958.	12.57	12.06	11.33	9.21	10.88
7 DRYCKES OCH TOBAKSVA	256.	269.	283.	297.	328.	4.98	4.98	4.98	4.97	4.97
8 TEXTIL BEKLADN, LADE	68.	72.	75.	79.	88.	5.12	5.11	5.10	5.04	5.08
9 TRAVARUINDUSTRI	2.	2.	2.	2.	2.	6.36	6.16	5.98	1.13	4.15
12 PLASTVARU OCH KEMISK	8.	9.	9.	10.	12.	7.95	7.69	7.47	8.89	8.18
14 GUMMIVARUINDUSTRI	40.	42.	43.	45.	51.	3.78	3.85	3.91	6.62	4.96
21 ANNAN TILLVERKNINGSI	2.	2.	2.	2.	3.	5.20	5.16	5.13	3.98	4.69
24 BYGGNADSINDUSTRI	51.	56.	61.	66.	61.	8.99	8.38	7.87	-3.36	3.71
25 PARTI OCH DETALJHAND	16.	17.	17.	18.	20.	3.97	3.88	3.80	4.59	4.16
26 RESTAURANG OCH HOTEL	189.	199.	208.	219.	242.	4.91	4.90	4.89	4.98	4.93
27 SAMFARDSEL	51.	54.	56.	59.	62.	4.94	4.80	4.68	2.56	3.91
30 BOSTADSFORVALTNING	41.	43.	45.	48.	53.	5.00	5.00	5.00	5.00	5.00
31 ANNAN FASTIGH.FORVAL	7.	7.	8.	8.	9.	4.90	4.84	4.79	4.43	4.68
33 OVRIGA PRIVATA TJANS	87.	91.	96.	101.	112.	5.04	5.03	5.01	4.97	5.01
SUMMA: INTERMEDIARA	8445.	9740.	11152.	12683.	15506.	14.27	13.54	12.86	10.05	12.15
	INKOP - INVESTERINGA									
1 INVESTERINGAR	166.	173.	179.	187.	202.	3.88	3.89	3.90	3.92	3.90
SUMMA:INVESTERINGAR	166.	173.	179.	187.	202.	3.88	3.89	3.90	3.92	3.90
	INKOP - KONSUMTION									
1 BROD	3.	3.	3.	3.	4.	5.00	5.00	5.00	5.00	5.00
2 KOTT	89.	94.	98.	103.	114.	5.00	5.00	5.00	5.00	5.00
4 MJOLKPRODUKTER	736.	709.	675.	633.	519.	-3.72	-4.93	-6.47	-9.88	-6.97
6 FRUKT, GRONSAKER	2864.	3385.	3822.	4217.	4955.	16.71	12.15	9.83	8.06	10.96
7 POTATISN	660.	694.	729.	767.	847.	5.00	5.00	5.00	5.00	5.00
10 ANDRA LIVSMEDEL	46.	48.	51.	53.	59.	5.00	5.00	5.00	5.00	5.00
49 FORSTRDELSE ARTIKLAR	1561.	1641.	1725.	1814.	2004.	5.00	5.00	5.00	5.00	5.00
SUMMA: KONSUMTION	5959.	6574.	7104.	7591.	8503.	9.82	7.76	6.62	5.68	7.11
	INKOP - SLUTLIG EFTE									
201ALLM. OFF. TJANST	3.	3.	3.	3.	4.	5.00	5.00	5.00	5.00	5.00
202RATTS OCH POLISVA	4.	4.	4.	5.	5.	5.00	5.00	5.00	5.00	5.00
203FORSVAR	9.	9.	10.	10.	12.	5.00	5.00	5.00	5.00	5.00
204UTBILDNING	2.	2.	2.	2.	3.	5.00	5.00	5.00	5.00	5.00
205HALSO OCH SJUKVAR	3.	3.	3.	3.	4.	5.00	5.00	5.00	5.00	5.00
210NARINGSLIVETS FRA	3.	3.	3.	3.	4.	5.00	5.00	5.00	5.00	5.00
211VAG OCH GATUVASEN	2.	2.	2.	2.	3.	5.00	5.00	5.00	5.00	5.00
251ALLM. OFF. TJANST	2.	2.	2.	2.	3.	5.00	5.00	5.00	5.00	5.00
254UTBILDNING	41.	43.	45.	48.	53.	5.00	5.00	5.00	5.00	5.00
255HALSO OCH SJUKVAR	63.	66.	70.	73.	81.	5.00	5.00	5.00	5.00	5.00
256SOCIALVARD	17.	18.	19.	20.	22.	5.00	5.00	5.00	5.00	5.00
259KULTUR OCH REKREA	2.	2.	2.	2.	3.	5.00	5.00	5.00	5.00	5.00
STATISTISK RESIDUAL	63.	66.	70.	73.	81.	5.00	5.00	5.00	5.00	5.00
EXPORT	1156.	1541.	1927.	2312.	1156.	28.77	22.31	18.23	-34.66	0.00

1 JORDBRUK OCH JAKT

PROGNOS FOR:	SWEDEN - SCENARIO 1					TILLVAXTTAKT FOR:				
	1975	1976	1977	1978	1980	75-76	76-77	77-78	78-80	75-80
IMPORT	-2728.	-2868.	-3015.	-3169.	-3503.	5,00	5,00	5,00	5,00	5,00
LAGERINVESTERING	43.	43.	43.	43.	43.	0,00	0,00	0,00	0,00	0,00
SUMMA: SLUTLIG EFTER	-1315.	-1059.	-809.	-566.	-2029.	-21,69	-26,92	-35,71	63,85	8,67
BRUTTOPRODUKTION	13255.	15428.	17627.	19894.	22182.	15,18	13,33	12,10	5,44	10,30

13 PETROLEUMRAFFINADERI

PROGNOS FOR:	SWEDEN - SCENARIO 1					TILLVAXTTAKT FOR:				
	1975	1976	1977	1978	1980	75-76	76-77	77-78	78-80	75-80
	INKOP - INTERMEDIARA									
1 JORDBRUK OCH JAKT	598.	585.	541.	467.	200.	-2,25	-7,81	-14,73	-42,33	-21,89
2 SKOGSBRUK	256.	227.	194.	156.	61.	-11,96	-15,76	-21,55	-46,98	-28,64
3 FISKE OCH FISKEVARD	52.	49.	44.	37.	14.	-6,69	-11,15	-17,53	-49,35	-26,81
4 GRUVOR OCH MINERALBR	143.	127.	106.	82.	4.	-12,00	-17,72	-25,32	-155,16	-73,07
5 SKYDDAD LIVSMEDELSIN	155.	139.	120.	98.	41.	-10,96	-14,76	-20,56	-43,71	-26,74
6 KONKURR. LIVSMEDELSI	66.	63.	57.	49.	23.	-4,87	-9,07	-15,50	-38,57	-21,31
7 DRYCKES OCH TOBAKSVA	36.	32.	27.	22.	9.	-12,46	-16,15	-21,85	-42,80	-27,21
8 TEXTIL BEKLADN, LADE	117.	103.	88.	71.	30.	-12,32	-16,02	-21,73	-42,73	-27,11
9 TRAVARUINDUSTRI	140.	125.	108.	88.	34.	-11,07	-14,97	-20,84	-46,65	-28,04
10 MASSA PAPPER OCH PAP	627.	547.	460.	365.	151.	-13,72	-17,32	-22,93	-44,15	-28,45
11 GRAFISK IND., FORLAG	44.	39.	33.	27.	11.	-12,47	-16,19	-21,91	-43,02	-27,32
12 PLASTVARU OCH KEMISK	701.	638.	557.	459.	211.	-9,49	-13,44	-19,36	-38,88	-24,01
13 PETROLEUMRAFFINADERI	512.	456.	391.	315.	125.	-11,56	-15,52	-21,51	-46,10	-28,16
14 GUMMIVARUINDUSTRI	33.	29.	24.	19.	8.	-13,66	-17,29	-22,92	-41,16	-27,23
16 JORD OCH STENVARUIND	371.	339.	297.	245.	90.	-8,96	-13,18	-19,32	-49,98	-28,28
17 JARN STAL, METALLVER	1297.	1125.	942.	746.	332.	-14,21	-17,77	-23,34	-40,41	-27,22
18 OVRIG VERKSTADSINDUS	565.	479.	393.	305.	152.	-16,44	-19,86	-25,26	-34,81	-26,24
19 ELEKTROINDUSTRI	101.	93.	82.	69.	31.	-8,16	-12,15	-18,11	-40,27	-23,79
20 SKEPPSVARV, BATBYGGE	48.	42.	36.	28.	12.	-13,13	-16,83	-22,53	-44,54	-28,31
21 ANNAN TILLVERKNINGSI	14.	12.	11.	9.	4.	-12,23	-15,97	-21,70	-43,79	-27,50
22 RLP, HUSHALLSVAROR,	98.	87.	74.	60.	25.	-11,90	-15,71	-21,49	-43,90	-27,38
23 EL GAS VARME OCH VAT	1231.	1088.	926.	745.	314.	-12,34	-16,09	-21,83	-43,24	-27,35
24 BYGGNADSINDUSTRI	2532.	2327.	2049.	1695.	610.	-8,44	-12,75	-18,96	-51,13	-28,48
25 PARTI OCH DETALJHAND	1867.	1632.	1373.	1091.	460.	-13,47	-17,25	-23,03	-43,19	-28,03
26 RESTAURANG OCH HOTEL	155.	137.	116.	93.	40.	-12,53	-16,23	-21,93	-42,79	-27,25
27 SAMFARDSEL	2348.	2072.	1760.	1410.	571.	-12,49	-16,33	-22,15	-45,21	-28,28
28 POST OCH TELEVERK	84.	74.	63.	51.	22.	-12,38	-16,10	-21,82	-42,97	-27,25
29 BANKER FINANS OCH FO	92.	81.	69.	56.	24.	-12,24	-15,99	-21,74	-43,06	-27,22
30 BOSTADSFORVALTNING	398.	351.	299.	240.	102.	-12,44	-16,13	-21,83	-42,78	-27,19

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13 PETROLEUMRAFFINADERI

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PROGNOS FOR:	SWEDEN - SCENARIO 1					TILLVAXTTAKT FOR:				
	1975	1976	1977	1978	1980	75-76	76-77	77-78	78-80	75-80
31 ANNAN FASTIGH.FORVAL	72.	64.	54.	43.	18.	-12.53	-16.29	-22.04	-43.34	-27.51
32 UPPDRAGSV. MASKINUTH	79.	70.	60.	49.	20.	-11.54	-15.39	-21.23	-44.99	-27.63
33 OVRIGA PRIVATA TJANS	319.	282.	240.	193.	82.	-12.39	-16.11	-21.81	-42.80	-27.18
SUMMA: INTERMEDIARA	15151.	13515.	11595.	9383.	3830.	-11.43	-15.32	-21.17	-44.80	-27.51
INKOP - KONSUMTION										
18 BRUTTO HYRUR	10.	11.	11.	12.	13.	5.00	5.00	5.00	5.00	5.00
21 GAS	7.	7.	8.	8.	9.	5.00	5.00	5.00	5.00	5.00
22 FLYTANDE BRANSLE	2451.	2577.	2709.	2848.	3147.	5.00	5.00	5.00	5.00	5.00
23 ANNAT BRANSLE	94.	99.	104.	109.	121.	5.00	5.00	5.00	5.00	5.00
43 BENSIN	3837.	4034.	4241.	4458.	4927.	5.00	5.00	5.00	5.00	5.00
SUMMA: KONSUMTION	6399.	6727.	7072.	7435.	8216.	5.00	5.00	5.00	5.00	5.00
INKOP - SLUTLIG EFTE										
201ALLM. OFF. TJANST	46.	48.	51.	53.	59.	5.00	5.00	5.00	5.00	5.00
202RATTS OCH POLISVA	14.	15.	15.	16.	18.	5.00	5.00	5.00	5.00	5.00
203FORSVAR	131.	138.	145.	152.	168.	5.00	5.00	5.00	5.00	5.00
204UTBILDNING	19.	20.	21.	22.	24.	5.00	5.00	5.00	5.00	5.00
205HALSO OCH SJUKVAR	4.	4.	4.	5.	5.	5.00	5.00	5.00	5.00	5.00
206SOCIALVARD	6.	6.	7.	7.	8.	5.00	5.00	5.00	5.00	5.00
209KULTUR OCH REKREA	7.	7.	8.	8.	9.	5.00	5.00	5.00	5.00	5.00
210NARINGSLIVETS FRA	20.	21.	22.	23.	26.	5.00	5.00	5.00	5.00	5.00
211VAG OCH GATUVASEN	32.	34.	35.	37.	41.	5.00	5.00	5.00	5.00	5.00
251ALLM. OFF. TJANST	50.	53.	55.	58.	64.	5.00	5.00	5.00	5.00	5.00
252RATTS OCH POLISVA	6.	6.	7.	7.	8.	5.00	5.00	5.00	5.00	5.00
254UTBILDNING	155.	163.	171.	180.	199.	5.00	5.00	5.00	5.00	5.00
255HALSO OCH SJUKVAR	126.	132.	139.	146.	162.	5.00	5.00	5.00	5.00	5.00
256SOCIALVARD	39.	41.	43.	45.	50.	5.00	5.00	5.00	5.00	5.00
258BOSTADSPOLITIK OC	4.	4.	4.	5.	5.	5.00	5.00	5.00	5.00	5.00
259KULTUR OCH REKREA	66.	69.	73.	77.	85.	5.00	5.00	5.00	5.00	5.00
261VAG OCH GATUVASEN	62.	65.	69.	72.	80.	5.00	5.00	5.00	5.00	5.00
262OFORDELAT	5.	5.	6.	6.	6.	5.00	5.00	5.00	5.00	5.00
STATISTISK RESIDUAL	365.	384.	403.	424.	469.	5.00	5.00	5.00	5.00	5.00
EXPORT	1135.	1193.	1254.	1319.	1457.	5.00	5.00	5.00	5.00	5.00
IMPORT	-8666.	-9110.	-9577.	-10068.	-11127.	5.00	5.00	5.00	5.00	5.00
LAGERINVESTERING	-197.	-197.	-197.	-197.	-197.	0.00	0.00	0.00	0.00	0.00
SUMMA: SLUTLIG EFTER	-6571.	-6898.	-7241.	-7603.	-8381.	4.85	4.86	4.87	4.88	4.87
BRUTTOPRODUKTION	14979.	13344.	11426.	9215.	3665.	-11.56	-15.52	-21.51	-46.10	-28.16

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19 ELEKTROINDUSTRI
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PROGNOS FOR:	1975	1976	1977	1978	1980	75-76	76-77	77-78	78-80	75-80
	SWEDEN - SCENARIO 1					TILLVAXTTAKT FOR:				
	INKOP - INTERMEDIARA									
1 JORDBRUK OCH JAKT	19.	22.	25.	29.	32.	15.18	13.33	12.10	5.44	10.30
2 SKOGSBRUK	5.	5.	6.	6.	6.	5.47	5.38	5.28	0.80	3.55
4 GRUVOR OCH MINERALBR	30.	32.	33.	33.	4.	5.44	3.41	1.51	-107.38	-40.88
5 SKYDDAD LIVSMEDELSIN	18.	19.	20.	22.	24.	6.48	6.37	6.27	4.07	5.45
6 KONKURR. LIVSMEDELSI	4.	5.	5.	6.	7.	12.57	12.06	11.33	9.21	10.88
7 DRYCKES OCH TOBAKSVA	3.	3.	3.	3.	4.	4.98	4.98	4.98	4.97	4.97
8 TEXTIL BEKLADN, LADE	7.	7.	8.	8.	9.	5.12	5.11	5.10	5.04	5.08
9 TRAVARUINDUSTRI	27.	29.	31.	32.	33.	6.36	6.16	5.98	1.13	4.15
10 MASSA PAPPER OCH PAP	57.	59.	61.	64.	69.	3.72	3.81	3.89	3.63	3.74
11 GRAFISK IND., FORLAG	6.	6.	7.	7.	8.	4.97	4.94	4.92	4.76	4.87
12 PLASTVARU OCH KEMISK	71.	77.	83.	89.	107.	7.95	7.69	7.47	8.89	8.18
14 GUMMIVARUINDUSTRI	4.	4.	4.	4.	5.	3.78	3.85	3.91	6.62	4.96
16 JORD OCH STENVARUIND	11.	12.	13.	14.	13.	8.48	7.95	7.50	-2.20	3.90
17 JARN STAL, METALLVER	132.	136.	141.	146.	169.	3.23	3.36	3.49	7.37	4.96
18 OVRIG VERKSTADSINDUS	1144.	1155.	1170.	1189.	1541.	0.99	1.28	1.56	12.96	5.95
19 ELEKTROINDUSTRI	2990.	3281.	3589.	3916.	4550.	9.28	8.98	8.72	7.51	8.40
20 SKEPPSVARV, BATBYGGE	141.	147.	154.	160.	171.	4.31	4.30	4.30	3.24	3.88
21 ANNAN TILLVERKNINGSI	3.	3.	3.	4.	4.	5.20	5.16	5.13	3.98	4.69
22 REP. HUSHALLSVAROR,	133.	141.	148.	157.	169.	5.53	5.43	5.34	3.88	4.81
23 EL GAS VARME OCH VAT	89.	94.	98.	104.	113.	5.10	5.04	5.00	4.54	4.84
24 BYGGNADSINDUSTRI	1431.	1566.	1703.	1842.	1722.	8.99	8.38	7.87	-3.36	3.71
25 PARTI OCH DETALJHAND	24.	25.	26.	27.	30.	3.97	3.88	3.80	4.59	4.16
26 RESTAURANG OCH HOTEL	1.	1.	1.	1.	1.	4.91	4.90	4.89	4.98	4.93
27 SAMFARDSEL	3.	3.	3.	3.	4.	4.94	4.80	4.68	2.56	3.91
28 POST OCH TELEVERK	5.	5.	6.	6.	6.	5.05	5.03	5.01	4.81	4.94
29 BANKER FINANS OCH FO	1.	1.	1.	1.	1.	5.20	5.14	5.09	4.71	4.97
32 UPPDRAGSV' MASKINUTH	1.	1.	1.	1.	1.	5.90	5.74	5.60	2.79	4.56
33 OVRIGA PRIVATA TJANS	67.	70.	74.	78.	86.	5.04	5.03	5.01	4.97	5.01
SUMMA: INTERMEDIARA	6427.	6910.	7418.	7952.	8889.	7.25	7.09	6.95	5.57	6.49
	INKOP - INVESTERINGA									
1 INVESTERINGAR	2869.	3579.	4341.	5158.	6973.	22.11	19.30	17.25	15.08	17.76
SUMMA:INVESTERINGAR	2869.	3579.	4341.	5158.	6973.	22.11	19.30	17.25	15.08	17.76
	INKOP - KONSUMTION									
28 STORRE HUSHALLSMASKI	648.	681.	716.	753.	832.	5.00	5.00	5.00	5.00	5.00
29 REP. STORRE HUSHALLS	152.	160.	168.	177.	195.	5.00	5.00	5.00	5.00	5.00
30 GLAS	130.	152.	173.	195.	130.	15.42	13.35	11.78	-20.27	0.00
42 DACK	100.	105.	111.	116.	128.	5.00	5.00	5.00	5.00	5.00
47 RADIO, TV	1826.	1920.	2018.	2122.	2345.	5.00	5.00	5.00	5.00	5.00
48 FOTOARTIKLAR	15.	16.	17.	17.	19.	5.00	5.00	5.00	5.00	5.00
49 FORSTROELSE ARTIKLAR	71.	75.	78.	82.	91.	5.00	5.00	5.00	5.00	5.00
55 TOALETTARTIKLAR	78.	82.	86.	91.	100.	5.00	5.00	5.00	5.00	5.00
56 JUVELER, UR	2.	2.	2.	2.	3.	5.00	5.00	5.00	5.00	5.00
SUMMA: KONSUMTION	3022.	3192.	3369.	3555.	3843.	5.47	5.41	5.36	3.90	4.81
	INKOP - SLUTLIG EFTE									
OFFENTLIGA INVESTERI	50.	67.	83.	100.	50.	28.77	22.31	18.23	-34.66	-0.00

6.4. Sample Output for SUMPRINT

PROGNOS FOR: SWEDEN - SCENARIO 1 SERIER: BRUTTO PRODUKTIO

SEKTOR		1975	1976	1977	1978	1979	1980
1	JORDBRUK OCH JAKT	13255.	15428.	17627.	19894.	20999.	22182.
2	SKOGSBRUK	8943.	9446.	9968.	10508.	10582.	10677.
3	FISKE OCH FISKEVARD	520.	579.	640.	702.	690.	680.
4	GRUVOR OCH MINERALBR	5079.	5363.	5549.	5633.	3176.	658.
5	SKYDDAD LIVSMEDELSIN	22542.	24050.	25633.	27292.	28406.	29605.
6	KONKURR. LIVSMEDELSI	11874.	13464.	15191.	17013.	18702.	20454.
7	DRYCKES OCH TOBAKSVA	12353.	12983.	13646.	14343.	15073.	15842.
8	TEXTIL BEKLADN, LADE	13816.	14541.	15303.	16103.	16936.	17812.
9	TRAVARUINDUSTRI	17420.	18564.	19744.	20961.	21180.	21440.
10	MASSA PAPPER OCH PAP	21342.	22150.	23010.	23924.	24795.	25725.
11	GRAFISK IND., FORLAG	9570.	10057.	10567.	11099.	11639.	12206.
12	PLASTVARU OCH KEMISK	16303.	17652.	19062.	20541.	22500.	24538.
13	PETROLEUMRAFFINADERI	14979.	13344.	11426.	9215.	6522.	3665.
14	GUMMIVARUINDUSTRI	2129.	2211.	2298.	2389.	2555.	2728.
16	JORD OCH STENVARUIND	6313.	6871.	7440.	8020.	7841.	7674.
17	JARN STAL, METALLVER	19062.	19688.	20361.	21084.	22730.	24432.
18	OVRIG VERKSTADSINDUS	68504.	69188.	70076.	71180.	81593.	92248.
19	ELEKTROINDUSTRI	15238.	16720.	18291.	19957.	21520.	23190.
20	SKEPPSVARV, BATBYGGE	7518.	7849.	8194.	8554.	8832.	9126.
21	ANNAN TILLVERKNINGSI	2308.	2431.	2560.	2695.	2803.	2918.
22	REP. HUSHALLSVAROR,	5313.	5615.	5928.	6253.	6498.	6757.
23	EL GAS VARME OCH VAT	9448.	9942.	10456.	10992.	11501.	12036.
24	BYGGNADSINDUSTRI	47216.	51660.	56177.	60776.	58757.	56829.
25	PARTI OCH DETALJHAND	40178.	41804.	43458.	45140.	47270.	49477.
26	RESTAURANG OCH HOTEL	6704.	7041.	7395.	7766.	8163.	8580.
27	SAMFARDSEL	20487.	21525.	22584.	23666.	24268.	24911.
28	POST OCH TELEVERK	6467.	6802.	7153.	7520.	7890.	8279.
29	BANKER FINANS OCH FO	10537.	11099.	11684.	12294.	12886.	13509.
30	BOSTADSFORVALTNING	24173.	25412.	26715.	28085.	29525.	31039.
31	ANNAN FASTIGH.FORVAL	7922.	8320.	8733.	9161.	9576.	10011.
32	UPPDRAGSV. MASKINUTH	13209.	14011.	14839.	15693.	16126.	16593.
33	OVRIGA PRIVATA TJANS	10775.	11332.	11916.	12529.	13168.	13839.
35	STATLIG FORSALJNING	898.	944.	992.	1043.	1094.	1147.
36	KOMMUNAL FORSALJNING	3316.	3486.	3665.	3853.	4051.	4259.
37	ARBETSHJALP I HEMMET	390.	410.	431.	453.	476.	501.
38	IDEELLA FORENINGAR	1422.	1495.	1572.	1652.	1737.	1826.
	TOTALT	497523.	523479.	550283.	577982.	602061.	627394.

PROGNOS FOR: SWEDEN - SCENARIO 1 TILLVAXTTAKT FOR: BRUTTO PRODUKTIO

SEKTOR		75-77	78-80	75-80
1	JORDBRUK OCH JAKT	14.25	5.44	10.30
2	SKOGSBRUK	5.42	0.80	3.55
3	FISKE OCH FISKEVARD	10.36	-1.57	5.38
4	GRUVOR OCH MINERALBR	4.42	-107.38	-40.88
5	SKYDDAD LIVSMEDELSIN	6.42	4.07	5.45
6	KONKURR. LIVSMEDELSI	12.32	9.21	10.88
7	DRYCKES OCH TOBAKSVA	4.98	4.97	4.97
8	TEXTIL BEKLADN, LADE	5.11	5.04	5.08

PROGNOS FOR: SWEDEN - SCENARIO 1 TILLVAXTTAKT FOR: BRUTTO PRODUKTIO

SEKTOR		75-77	78-80	75-80
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9	TRAVARUINDUSTRI	6.26	1.13	4.15
10	MASSA PAPPER OCH PAP	3.76	3.63	3.74
11	GRAFISK IND., FORLAG	4.95	4.76	4.87
12	PLASTVARU OCH KEMISK	7.82	8.89	8.18
13	PETROLEUMRAFFINADERI	-13.54	-46.10	-28.16
14	GUMMIVARUINDUSTRI	3.81	6.62	4.96
16	JORD OCH STENVARUIND	8.21	-2.20	3.90
17	JARN STAL, METALLVER	3.30	7.37	4.96
18	OVRIG VERKSTADSINDUS	1.13	12.96	5.95
19	ELEKTROINDUSTRI	9.13	7.51	8.40
20	SKEPPSVARV, BATBYGGE	4.30	3.24	3.88
21	ANNAN TILLVERKNINGSI	5.18	3.98	4.69
22	REP. HUSHALLSVAROR,	5.48	3.88	4.81
23	EL GAS VARME OCH VAT	5.07	4.54	4.84
24	BYGGNADSINDUSTRI	8.69	-3.36	3.71
25	PARTI OCH DETALJHAND	3.92	4.59	4.16
26	RESTAURANG OCH HOTEL	4.90	4.98	4.93
27	SAMFARDSEL	4.87	2.56	3.91
28	POST OCH TELEVERK	5.04	4.81	4.94
29	BANKER FINANS OCH FO	5.17	4.71	4.97
30	BOSTADSFORVALTNING	5.00	5.00	5.00
31	ANNAN FASTIGH.FORVAL	4.87	4.43	4.68
32	UPPDRAGSV. MASKINUTH	5.82	2.79	4.56
33	OVRIGA PRIVATA TJANS	5.03	4.97	5.01
35	STATLIG FORSALJNING	4.99	4.77	4.90
36	KOMMUNAL FORSALJNING	5.01	5.01	5.00
37	ARBETSHJALP I HEMMET	5.00	5.00	5.00
38	IDEELLA FORENINGAR	5.00	5.00	5.00
	TOTALT	5.04	4.10	4.64

PROGNOS FOR: SWEDEN - SCENARIO 1 SERIER: OFFENTLIGA INVES

SEKTOR		1975	1976	1977	1978	1979	1980		
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8	TEXTIL BEKLADN, LADE	10.	13.	17.	20.	15.	10.		
9	TRAVARUINDUSTRI	289.	385.	482.	578.	433.	289.		
18	OVRIG VERKSTADSINDUS	1139.	1519.	1898.	2278.	1708.	1139.		
19	ELEKTROINDUSTRI	50.	67.	83.	100.	75.	50.		
20	SKEPPSVARV, BATBYGGE	99.	132.	165.	198.	148.	99.		
21	ANNAN TILLVERKNINGSI	18.	24.	30.	36.	27.	18.		
24	B	YGGNADSINDUSTRI		7890.	10520.	13150.	15780.	11835.	7890.
	TOTALT	9495.	12660.	15825.	18990.	14242.	9495.		

PROGNOS FOR: SWEDEN - SCENARIO 1 — TILLVAXTTAKT FOR: OFFENTLIGA INVES

SEKTOR		75-77	78-80	75-80
8	TEXTIL BEKLADN, LADE	25.54	-34.66	-0.00
9	TRAVARUINDUSTRI	25.54	-34.66	-0.00
18	OVRIG VERKSTADSINDUS	25.54	-34.66	0.00
19	ELEKTROINDUSTRI	25.54	-34.66	-0.00
20	SKEPPSVARV, BATBYGGE	25.54	-34.66	-0.00
21	ANNAN TILLVERKNINGSI	25.54	-34.66	-0.00
24	BYGGNADSINDUSTRI	25.54	-34.66	-0.00
	TOTALT	25.54	-34.66	0.00

PROGNOS FOR: SWEDEN - SCENARIO 1 — SERIER: PRIVAT KONSUMTIO

SEKTOR		1975	1976	1977	1978	1979	1980
1	BROD	4305.	4526.	4758.	5002.	5258.	5528.
2	KOTT	6682.	7025.	7385.	7763.	8161.	8580.
3	FISK	1784.	1875.	1972.	2073.	2179.	2291.
4	MJOLKPRODUKTER	4083.	4292.	4512.	4744.	4987.	5243.
5	SMOR, MARGARIN	1398.	1470.	1545.	1624.	1708.	1795.
6	FRUKT, GRONSAKER	4670.	4909.	5161.	5426.	5704.	5996.
7	POTATIS	990.	1041.	1094.	1150.	1209.	1271.
8	SOCKER	475.	499.	525.	552.	580.	610.
9	KAFFE	1342.	2411.	3483.	4559.	5639.	6723.
10	ANDRA LIVSMEDEL	2977.	3130.	3290.	3459.	3636.	3823.
11	ALKOHOLFRIA DRYCKER	1081.	1136.	1195.	1256.	1320.	1388.
12	ALKOHOLHALTIGA DRYCK	7336.	7712.	8108.	8523.	8960.	9420.
13	TOBAKSVAROR	3838.	4035.	4242.	4459.	4688.	4928.
14	KLADER	9038.	9501.	9989.	10501.	11039.	11605.
15	REP. KLADER	15.	16.	17.	17.	18.	19.
16	SKOR	1657.	1742.	1831.	1925.	2024.	2128.
17	REP. SKOR	71.	75.	78.	82.	87.	91.
18	BRUTTO HYROR	24302.	25548.	26858.	28235.	29683.	31204.
20	EL, STROM	2378.	2500.	2628.	2763.	2904.	3053.
21	GAS	70.	74.	77.	81.	85.	90.
22	FLYTANDE BRANSLE	2451.	2577.	2709.	2848.	2994.	3147.
23	ANNAT BRANSLE	924.	971.	1021.	1074.	1129.	1186.
24	MOBLER, MATTOR	3219.	3384.	3558.	3740.	3932.	4133.
25	REP. MOBLER	98.	103.	108.	114.	120.	126.
26	HUSHALLSTEXTILIER	1161.	1221.	1283.	1349.	1418.	1491.
28	STORRE HUSHALLSMASKI	1938.	2037.	2142.	2252.	2367.	2488.
29	REP. STORRE HUSHALLS	254.	267.	281.	295.	310.	326.
30	GLAS	1684.	1965.	2245.	2526.	2105.	1684.
32	HUSHALLSARTIKLAR	1271.	1336.	1405.	1477.	1552.	1632.
33	HUSHALLSSYSSLOR	291.	306.	322.	338.	355.	374.
34	LEJDA TJANSTER INOR	390.	410.	431.	453.	476.	501.
35	MEDICINSKA PRODUKTER	2189.	2301.	2419.	2543.	2674.	2811.
36	TERAPEUTISKA HJALPME	194.	204.	214.	225.	237.	249.
37	HALSOVARD	2868.	3015.	3170.	3332.	3503.	3683.
40	BILAR	6108.	6421.	6750.	7096.	7460.	7843.
41	OVRIGA TRANSPORTMEDE	858.	902.	948.	997.	1048.	1102.
42	DACK	3669.	3857.	4055.	4263.	4481.	4711.