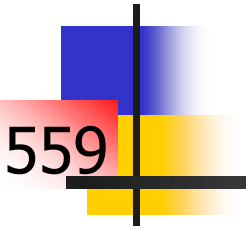
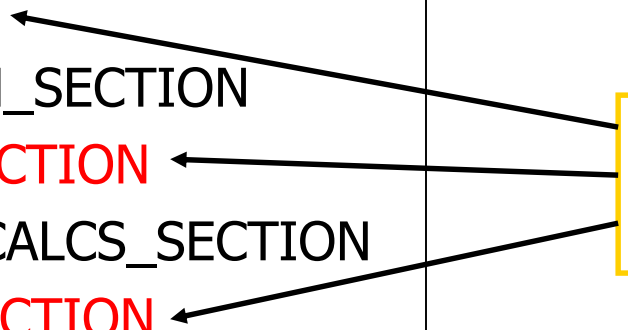


ADMB Sections

Fish 559; Lecture 15

All the Sections

DATA_SECTION
INITIALIZATION_SECTION
PARAMETER_SECTION
PRELIMINARY_CALCS_SECTION
PROCEDURE_SECTION
FUNCTION
REPORT_SECTION
RUNTIME_SECTION
TOP_OF_MAIN_SECTION
GLOBALS_SECTION



These sections are required

Optional sections control ADMB and improve readability

The DATA_SECTION-I

- This section declares the data to be read in from the DAT file, and any static variables:
  - Use the "init_" prefix to indicate that a variable is to be read in.

```
init_int Count;                 // Counter
init_vector X(1,Count);         // Data vector
vector ZZ(1,10)                 // Storage
```

Read from a file

A static variable

Limits of vectors can be variables or pre-specified values

The DATA_SECTION-II

- The default data file is “PROGRAM.DAT”.
  - To change this default at runtime, type the command “PROGRAM –ind ALT.DAT”.
  - To change the data file in the DATA_SECTION, add the line:

!!ad_comm::change_datafile_name(“new name”).

Exercise
(The DATA Section)

```
DATA_SECTION
 init_int Nyear;
 init_int Nage;
 init_number Mval;
 init_vector Wght(0,Nage);
 init_number SigCatch;
 init_number SigCPUE;
 init_number Omega;
 init_matrix CatchCpue(1,Nyear,0,2);
 init_matrix Propn(1,Nyear,-1,Nage);

 vector Catch(1,Nyear);
 vector CPUE(1,Nyear);

 !! Catch = column(CatchCpue,1);
 !! CPUE = column(CatchCpue,2);
```

Variables in which to store the catch and CPUE data

Use the "column" function to extract the catch and CPUE data

The PARAMETER_SECTION-I

- Specifying the parameters of the model:
  - Add a prefix ("init_"), i.e. "init_number a" in the PARAMETER_SECTION indicates that the variable "a" is an estimated parameter (what would it mean if this statement was in the DATA_SECTION?)
  - You can limit the range of an estimated parameter by adding "bounded", e.g. "init_bounded_number a(1,5)" estimates "a" and forces its estimate to lie between 1 and 5 – why do we need this feature?
  - You can "stage" your minimization by using "phases" (e.g. init_number a(2) – means that "a" will be treated as "free" in "phase 2"). What does phase "-1" mean?
  - The estimated parameters MUST be real numbers!

The PARAMETER_SECTION-II

- Other aspects of the PARAMETER_SECTION.
  - There MUST be a line that lists the variable that will be minimized:
    - Objective_function_value ZZZZ
  - Include any temporary variables in this section (without the "init_" prefix and without phases / bounded).
  - Sometimes you want the sum of a vector of parameters to be 0 – use the "dev" option (e.g. init_dev_vector ZZ(1,10))

The PARAMETER_SECTION-III

- To set phases and bounds for a matrix or vector use:
  - init_bounded_number_vector
  - init_bounded_number_matrix
- This is a relatively new feature of ADMB and programs which use this construct cannot be compiled using an old version of the compiler.

The PARAMETER_SECTION-IV

- The PIN File:
  - A file of initial parameter values (the order of the variables in the PIN file must be the same as that of the variables in the TPL file).
  - Hint-1: run ADMB without a PIN file and use the resultant PAR file as a proforma.
  - Hint-2: You can change the default PIN file by running with the –ainp option (i.e. PROGRAM –ainp MY.PIN).
- INITIALIZATION_SECTION
  - Statements like "a 10" (no punctuation) can be included in this section to override the default value assigned to a parameter.
  - This is NOT very flexible.

The PARAMETER_SECTION-V

- To execute some code (such as projections) only in a given phase add the following code:

```
if (current_phase() == 2)
    { Code; }
```

- Or

```
if (last_phase())
    { Code; }
```

The PRELIMINARY_CALCS_SECTION-I

- Comes after the PARAMETER_SECTION
- Only executed once (not part of the function to be minimized)
- Used to do "housekeeping" of the input data, e.g.:
  - Convert from tonnes to kgs.
  - Convert data from one format to another, e.g. if the data was read in as a matrix but you want it in the form of vectors, use:
    - "vec =column(data,colno)"

The PRELIMINARY_CALCS_SECTION-II

- Alternatives to a PCS:
  - Add lines to the DATA and PARAMETER SECTIONS preceded by !! (e.g.

```
!! Vec = column(data,5);
```

  - Include a LOCAL_CALCS Section in the middle of the DATA_SECTION.

The REPORT_SECTION

- Formatted output:

```
report << setw(15) << setfixed() << setprecision(10) << Initial_F << endl;
```

- This outputs “Initial_F” over 15 characters, 10 of which are after the decimal place.
- Output from cout can also be formatted.

- Output to an alternative file:

```
ofstream f1("Param.Est");
f1 << SigmaR << endl;
f1 << Steep << endl;
```

- Note: “<<“ concatenates and “endl” moves to a new line.

The RUNTIME_SECTION

Some programs just need a little more help. Tricky models and data can cause problems

- Allows you to control some aspects of how ADMB operates:

maximum_function_evaluations phase 1, phase 2, phase 3
convergence_criteria phase 1, phase 2, phase 3

E.g.

maximum_function_evaluations 3100,150,300,4000
convergence_criteria 01,.0001,1e-7

The TOP_OF_MAIN_SECTION

```
TOP_OF_MAIN_SECTION
  gradient_structure::set_MAX_NVAR_OFFSET(1000);
  gradient_structure::set_NUM_DEPENDENT_VARIABLES(800);
  gradient_structure::set_GRADSTACK_BUFFER_SIZE(100000);
  gradient_structure::set_CMPDIF_BUFFER_SIZE(1000000);
  arrmblsize=900000;
```

This is all very geeky stuff. If you really want to know about this stuff, read the AutoDiff manual! However, you may find that you get an error message from ADMB indicating you don't have enough storage – this is when you need a TOP_OF_MAIN_SECTION and may need to increase the values in parenthesis!

The GLOBALS_SECTION

Sometimes there are things that no one else has thought of, or perhaps needs

- Have some C code that you really want to use – this is the place for it.

```
GLOBALS_SECTION
// some C++ compilers don't supply this!
  int mymax(int x,int y)
  {
  if (x>y)
    return x;
  else
    return y;
  }
```

Some Command Line Options

- -ainp NAME: Change the PIN file
- -est: Only do the estimation – saves time when you are developing models.
- -maxph N: Change the maximum number of phases to N.
- -nox: don’t show parameter and gradient values.
- -? / -help: list of available options.