MAR580: Advanced Population Modeling

Laboratory 1

September 1, 2015

Instructor: Gavin Fay, gfay@umassd.edu

Installation

Install ADMB from http://admb-project.org/downloads
(For those not used to using the shell/command line, installing ADMB-IDE is highly recommended)

First Example: Linear Regression

1. Open `Lab1.tpl`
2. Build the Lab1 program

- IDE users, click the 'Build' icon.
- Shell users, `admb Lab1`

3. Run the Lab1 program

- IDE users, click the 'Run' icon.
- Shell users, either type `Lab1` (Windows), or `./Lab1` (Linux/MacOS).

4. View the output files `Lab1.par`, `Lab1.cor`, `Lab1.std`
5. Open the data file (`Lab1.dat`).
6. Change or add some values. Save and close `Lab1.dat`
7. Re-run the `Lab1` program (step 3, you do not need to recompile).
8. Add a '`cout`' statement to the `PROCEDURE_SECTION` of `Lab1.tpl` to view the predicted values during the estimation.

```
PROCEDURE_SECTION
  ypred = a + b*x;
  cout << ypred << endl;
  obj_fun = norm2(y-ypred);
```

   Recompile the program, run it, and view the output.

9. Add a `REPORT_SECTION` to `Lab1.tpl` to output the final estimated predicted values.

```
REPORT_SECTION
  report << "y" << endl;
  report << y << endl;
  report << "ypred" << endl;
  report << ypred << endl;
```

   Recompile the program, run it, and view the output.

Example 2: Weight-Length Relationships

1. Create a new program that uses the values in wtlen.txt to estimate the weight-length relationship:

$$W = a * L^b$$

$$ln(W) = ln(a) + b * ln(L)$$

   Estimate using residual sums-of-squares on the logged weights.
   Report the values for the parameters a and b.
   Hints: Use `Lab1.tpl` as a starting point. You can add lines of C++ code to the `DATA_SECTION` to perform calculations on the data using `!!`, e.g.

```
!! log_weight = log(weight);
```

   You can also add a `PRELIMINARY_CALCS_SECTION` before the `PROCEDURE_SECTION` to do this.

2. Report the predicted values for Weight associated with Lengths `1,2,3,....,20`.

3. Estimate unique a parameters for each measured individual. i.e. fit the equation:

$$ln(W_i) = ln(a_i) + b * ln(L)$$

   Compare the value for the objective function to that from the model with only 1 a parameter.
   Hints:
   Use a real vector rather than a real number for the a parameter.
   Use a `for` loop to calculate the predicted values so you can index the right a parameter for each observation (bonus - do this using an `ivector` to index the relevant parameters instead of the loop).

4. (bonus bonus) Modify your program to allow you to change between single or multiple a parameters through changes to the data file rather than having to change the `.tpl` file and recompile the program each time.