DTU Aqua: Department of Marine Fisheries

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Should we have factors in AD Model Builder?

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Example

- Consider the model:

$$y_i = \alpha(\text{sex}_i) + \beta(\text{tmt}_i) \cdot x_i + \epsilon_i$$

- Here we have two categorical variables.
- To implement that in ADMB we would possibly do something like:

AD Model Builder implementation

```
1  DATA_SECTION
2    init_table obs
3
4    int R
5    !! R=obs.rowmax();
6    ivector tmt(1,R)
7    !! tmt=(ivector)column(obs,3);
8    ivector sex(1,R)
9    !! sex=(ivector)column(obs,4);
10
11 PARAMETER_SECTION
12   init_vector alpha(1,2)
13   init_vector beta(1,2)
14   init_number logSigma
15   objective_function_value nll
16
17   number pred
18   sdreport_number sigmaSq
19   vector x(1,R)
20   vector y(1,R)
21
22 PRELIMINARY_CALCS_SECTION
23   x=column(obs,2);
24   y=column(obs,1);
25
26 PROCEDURE_SECTION
27   sigmaSq=exp(2.0*logSigma);;
28
29   for(int i=1; i<=R; ++i){
30     pred=alpha(sex(i))+beta(tmt(i))*x(i);
31     nll+=0.5*(log(2*M_PI*sigmaSq)+square(y(i)-pred)/sigmaSq);
32   }
```

Model with covariance

- Could we make it a little simpler?
- Good practice in flex
- Help beginners
- How about something like:

```
init_factor a(tmt)
```

Currently it is here

```
1  DATA_SECTION
2    init_table obs
3    int R
4    !! R=obs.rowmax();
5    ivector tmt(1,R)
6    !! tmt=as_factor(column(obs,3));
7    ivector sex(1,R)
8    !! sex=as_factor(column(obs,4));
9
10 PARAMETER_SECTION
11
12   init_factor aa(sex)
13   init_factor bb(tmt)
14
15   init_number logSigma
16   objective_function_value nll
17
18   number pred
19   sdreport_number sigmaSq
20   vector x(1,R)
21   vector y(1,R)
22
23 PRELIMINARY_CALCS_SECTION
24   x=column(obs,2);
25   y=column(obs,1);
26
27 PROCEDURE_SECTION
28   sigmaSq=exp(2.0*logSigma);
29
30   for(int i=1; i<=R; ++i){
31     pred=aa(i)+bb(i)*x(i);
32     nll+=0.5*(log(2*M_PI*sigmaSq)+square(y(i)-pred)/sigmaSq);
33   }
```

The factor class

```
1  /*
2   * $Id$
3   *
4   * Author: Anders Nielsen <anders@nielsensweb.org>
5   * Copyright (c) 2010-2011 ADMB Foundation
6   */
7  /**
8   * \file
9   * Support functions for factor.
10  */
11
12
13 #ifndef __FACTORS_H__
14 #define __FACTORS_H__
15
16 class factor
17 {
18   int nlevels;
19   ivector idx;
20   dvar_vector levels;
21 public:
22   factor(){nlevels=0;}
23   void allocate(const ivector& v, dvar_vector & par);
24   dvariable operator () (int i);
25 };
26
27 #endif
```

- Take a look at the factors.cpp file and the tpl2cpp.lex script.