Rabbit2

```
> # rabbit2.R
>
> rabbiteye <- read.table(file = "n:/courses/stat8230/Fall11/rabbiteye.dat", header = T)
> rabbiteye$logLens <- log(rabbiteye$Lens)
>
> m2rabbit <- function(x, th1, th2, th3)
+ {
+       th1 - th2/(th3 + x)
+ }
> m2rabbit.nls <- nls(logLens ~ m2rabbit(Age, th1, th2, th3), data = rabbiteye,
+       start = c(th1 = 5.6, th2 = 130, th3 = 38)) #uses numeric derivatives
> m2rabbit.nls
Nonlinear regression model
  model:  logLens ~ m2rabbit(Age, th1, th2, th3)
   data:  rabbiteye
   th1    th2    th3
 5.64 130.58  37.60
 residual sum-of-squares: 0.2692

Number of iterations to convergence: 2
Achieved convergence tolerance: 8.991e-07
> m2rabbit <- deriv( ~ th1 - th2/(th3 + x), namevec = c("th1", "th2", "th3"),
+       function(x, th1, th2, th3) {} )
> m2rabbit
function (x, th1, th2, th3)
{
    .expr1 <- th3 + x
    .value <- th1 - th2/.expr1
    .grad <- array(0, c(length(.value), 3L), list(NULL, c("th1",
        "th2", "th3")))
    .grad[, "th1"] <- 1
    .grad[, "th2"] <- -(1/.expr1)
    .grad[, "th3"] <- th2/.expr1^2
    attr(.value, "gradient") <- .grad
    .value
}
> theta10 <- 5.6
> theta20 <- 130
> theta30 <- 38
> m2rabbit(rabbiteye$Age[1:10], theta10, theta20, theta30)
 [1] 3.147170 3.147170 3.147170 3.278571 3.630303 3.659701 3.866667 3.866667
 [9] 4.014634 4.122727
attr(,"gradient")
      th1        th2       th3
 [1,]   1 -0.01886792 0.04627981
 [2,]   1 -0.01886792 0.04627981
 [3,]   1 -0.01886792 0.04627981
```

```
 [4,]   1 -0.01785714 0.04145408
 [5,]   1 -0.01515152 0.02984389
 [6,]   1 -0.01492537 0.02895968
 [7,]   1 -0.01333333 0.02311111
 [8,]   1 -0.01333333 0.02311111
 [9,]   1 -0.01219512 0.01933373
[10,]   1 -0.01136364 0.01678719
> # now if we repeat the above model fit, m2rabbit.nls <- nls(..., will use
> # analytic derivatives
>
```

Rabbit1.sas:

```
* rabbit1.sas ;

options pageno=1 nodate;

data rabbit;
  infile 'n:\courses\stat8230\Fall11\rabbiteye.dat' firstobs=2;
  input Age Lens;
  loglens=log(Lens);
run;

proc nlin data=rabbit;
  parms th1=5.6 th2=130 th3=38;
  mean=th1-th2/(th3+Age);
  der.th1=1; *these der.parm statements are no longer necessary as of Version
8;
  der.th2=-1/(th3+Age); * by default, SAS now uses analytic derivatives;
  der.th3=th2/(th3+Age)**2;
  model loglens=mean;
run;
```

Rabbit1.lst:

The NLIN Procedure
Dependent Variable loglens
Method: Gauss-Newton

Iterative Phase

Iter	th1	th2	th3	Sum of Squares
0	5.6000	130.0	38.0000	0.3511
1	5.6399	130.6	37.5978	0.2692
2	5.6399	130.6	37.6028	0.2692

NOTE: Convergence criterion met.

Estimation Summary

Method	Gauss-Newton
Iterations	2
R	9.233E-7
PPC(th3)	4.687E-7
RPC(th3)	0.000135
Object	9.655E-7
Objective	0.269247
Observations Read	71
Observations Used	71
Observations Missing	0

Source	DF	Sum of Squares	Mean Square	F Value	Approx Pr > F
Model	2	26.9473	13.4737	3402.86	<.0001
Error	68	0.2692	0.00396		
Corrected Total	70	27.2166			

Parameter	Estimate	Approx Std Error	Approximate 95% Confidence Limits	
th1	5.6399	0.0200	5.6001	5.6798
th2	130.6	5.7250	119.2	142.0
th3	37.6028	2.3230	32.9674	42.2383

Approximate Correlation Matrix

	th1	th2	th3
th1	1.0000000	0.8916688	0.7863936
th2	0.8916688	1.0000000	0.9610177
th3	0.7863936	0.9610177	1.0000000