```
/* dur_ex

two maximum likelihood estimators for some "duration" data
first is estimated parameter under negative exponential assumption
second is estimated vector of parameters characterizing Weibull distribution,
   which nests negative exponential    */

output file = ml.out reset;

/* data */

z = { 3 2 .5  1.6 2.4 1.725 1.25 4 2.4 3.2 2.5 .8 5 2.35 .5 .25 1.75 1.65 1.125 2};
z = z';
nr = rows(z);
print meanc(z);
/* maximum likelihood estimate of alpha */
print "mle    " 1/meanc(z);
/* estimate alpha using MAXLIK */
library maxlik;
maxset;
@ set initial guess @
b0 = 1;

/* procedure defining log likelihood function */

proc llf(b,z);
local i,lfvec;
lfvec = zeros(nr,1);
i = 1;
do until i gt nr;
  lfvec[i] = ln(b[1]) - b[1]*z[i];
  i = i+1;
endo;
retp( lfvec );
endp;

vn=1;
{ bmle,f,g,h,retcode } = maxprt(maxlik(z,vn,&llf,b0));

/* example two
    instead of negative exponential distribution, fit Weibull distribution */

fn wpdf(x,m,n) = m*n*x^(n-1) .* exp(-m*x^n);

c0 = {1,1};

proc llf2(c,z);
retp( ln(wpdf(z,c[1],c[2])) );
endp;

{ bmle,f,g,h,retcode } = maxprt(maxlik(z,vn,&llf2,c0));

end;


end;
```

```
================================================================================


   iteration:  1
   algorithm: BFGS         step method: STEPBT
   function:  2.00000      step length:  0.00000      backsteps:  0
--------------------------------------------------------------------------------
   param.      param. value     relative grad.
       1             1.0000            0.5000
================================================================================
 MAXLIK Version 4.0.33                                    11/29/2000   8:50 am
================================================================================

return code =    0
normal convergence

Mean log-likelihood        -1.69315
Number of cases     20

Covariance matrix of the parameters computed by the following method:
Inverse of computed Hessian

Parameters    Estimates     Std. err.  Est./s.e.  Prob.    Gradient
-------------------------------------------------------------------
P01              0.5000        0.1118    4.472   0.0000      0.0000
Correlation matrix of the parameters
   1.000
Number of iterations    1
Minutes to convergence     0.00017

================================================================================


   iteration:  1
   algorithm: BFGS         step method: STEPBT
   function:  2.00000      step length:  0.00000      backsteps:  0
--------------------------------------------------------------------------------
   param.      param. value     relative grad.
       1             1.0000            0.5000
       2             1.0000            0.1247

================================================================================


   iteration:  2
   algorithm: BFGS         step method: STEPBT
   function:  1.78591      step length:  1.00000      backsteps:  0
--------------------------------------------------------------------------------
   param.      param. value     relative grad.
       1             0.5000            0.1122
       2             0.8753            0.4906

================================================================================


   iteration:  3
   algorithm: BFGS         step method: STEPBT
   function:  1.61511      step length:  1.00000      backsteps:  0
--------------------------------------------------------------------------------
   param.      param. value     relative grad.
       1             0.4164            0.0723
```

2	1.1506	0.3477

==========

iteration: 4
algorithm: BFGS step method: STEPBT
function: 1.51313 step length: 1.00000 backsteps: 0

param.	param. value	relative grad.
1	0.3189	0.0149
2	1.4928	0.1550

==========

iteration: 5
algorithm: BFGS step method: STEPBT
function: 1.50268 step length: 0.46685 backsteps: 1

param.	param. value	relative grad.
1	0.2647	0.1880
2	1.5946	0.1856

==========

iteration: 6
algorithm: BFGS step method: STEPBT
function: 1.49168 step length: 0.39731 backsteps: 1

param.	param. value	relative grad.
1	0.2531	0.0644
2	1.7381	0.0079

==========

iteration: 7
algorithm: BFGS step method: STEPBT
function: 1.49110 step length: 1.00000 backsteps: 0

param.	param. value	relative grad.
1	0.2359	0.0235
2	1.7748	0.0094

==========

iteration: 8
algorithm: BFGS step method: STEPBT
function: 1.49107 step length: 1.00000 backsteps: 0

param.	param. value	relative grad.
1	0.2385	0.0015
2	1.7725	0.0001

==========

iteration: 9
algorithm: BFGS step method: STEPBT
function: 1.49106 step length: 1.00000 backsteps: 0

```
-------------------------------------------------------------------------------
   param.      param. value     relative grad.
       1            0.2382            0.0000
       2            1.7733            0.0000

===============================================================================
 MAXLIK Version 4.0.33                                  11/29/2000   8:50 am
===============================================================================

return code =    0
normal convergence

Mean log-likelihood        -1.49106
Number of cases     20

Covariance matrix of the parameters computed by the following method:
Inverse of computed Hessian

Parameters    Estimates     Std. err.  Est./s.e.  Prob.    Gradient
-------------------------------------------------------------------
P01              0.2382        0.0940    2.535   0.0112     -0.0000
P02              1.7733        0.3114    5.694   0.0000     -0.0000

Correlation matrix of the parameters
   1.000  -0.824
  -0.824   1.000

Number of iterations    9
Minutes to convergence     0.00117
```