

Computer Exercise 6 Answers: Introduction to maximum likelihood

```
set more 1

/* ensure program keeps going when output fills screen without waiting for
scroll bar */

set obs 1
obs was 0, now 1          /* ensures non-empty data set*/

local n=5                 /* sample size */
local n1=4                /* observed number of 1's */

local i=0

while `i'<=1 {

local j=round(`i'*100,1)

g L`j'=(`i'^`n1')*( (1-`i')^(`n'-`n1') )

local i=`i'+0.05

}
```

So counter starts at zero, calculates likelihood function with i equal to zero, counter is adjusted by 0.05, and loop repeats with i now equal to 0.05 and so on until $i=1$ after which loop ends and calculations stop
Remember i = the proportion of ones

```
list L*          /* display likelihood function at different values of p */
```

L0	L5	L10	L15	L20	L25	L30	L35
0	5.94e-06	.00009	.0004303	.00128	.0029297	.00567	.0097541
L40	L45	L50					
.01536	.0225534	.03125					
L55	L60	L65	L70	L75	L80	L85	
.0411778	.05184	.0624772	.07203	.0791016	.08192	.0783009	
L90	L95	L100					
.06561	.0407253	0					

To graph these data, need to "reshape" the data (type "help reshape" in stata for more on this)

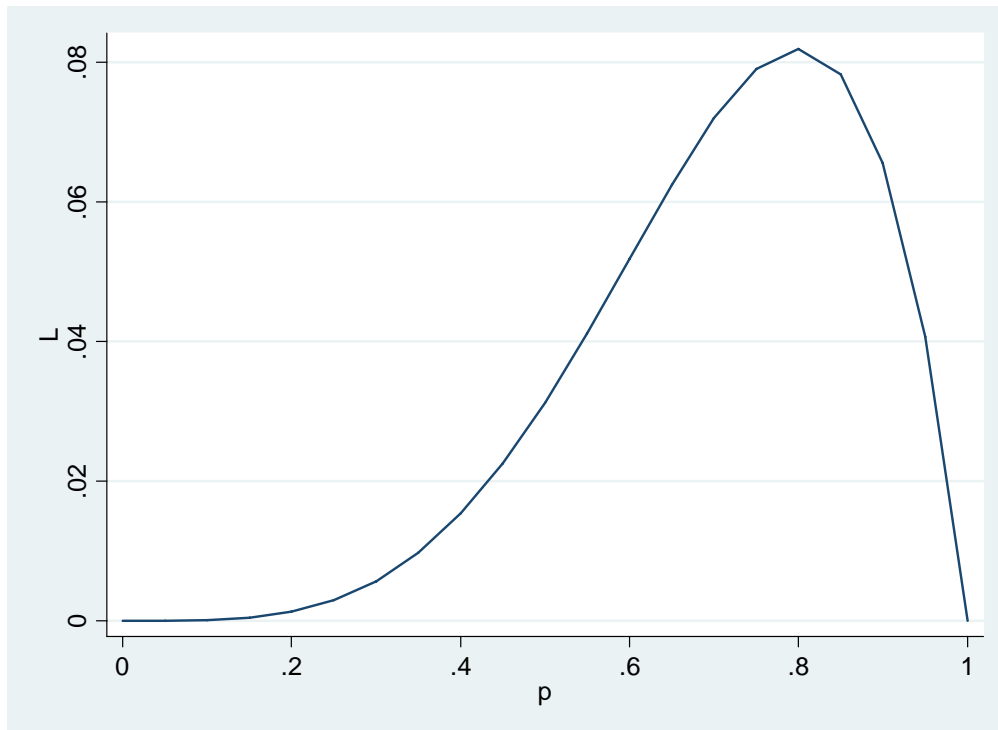
```
g id=1

reshape long L , i(id) j(p)          /* transpose data set */

replace p=p/100                    /* just re-scale the data so goes from 0 to 1
rather than 0 to 100 */
```

```
/* now graph data */
```

```
twoway (line L p)
```



Can see likelihood function reaches a maximum at 0.8 (as it should)

```
clear
```

```
u c:\ec3327\cex7
```

```
program drop _all
```

```
program define mylike
```

```
    version 7.0
```

```
    args l p
```

```
    replace `l' =ln(`p') if $ML_y1==1
```

```
    replace `l' =ln((1-`p')) if $ML_y1==0
```

```
end
```

```
/* If likelihood =  $p^{n_1}(1-p)^{n-n_1}$  then log likelihood is  $n_1\log(p) + (n-n_1)\log(1-p)$   
which is what the above commands will do */
```

```
ml model lf mylike (X=)
```

```
/* tell stata to estimate maximum likelihood based on likelihood function  
outlined in "mylike" */
```

```

ml maximize          /* tell stata to go and maximize */
Iteration 3:  log likelihood = -2.5020121
                                     Number of obs   =           5
                                     Wald chi2(0)     =           .
Log likelihood = -2.5020121          Prob > chi2    =           .
-----+-----
      X |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----+-----
   _cons |          .8   .1788854     4.47  0.000     .4493909    1.150609
-----+-----

```

Can see maximum likelihood estimator is again 0.8