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 | 0.00009 | 0.0004303 | 0.00128 | 0.0029297 | 0.00567 | 0.0097541 |

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^n1*(1-p)^n-n1 then log likelihood is n1log(p) + (n-n1)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

| Coefficient | Std. Err. | z    | P>|z| | [95% Conf. Interval] |
|-------------|-----------|------|------|---------------------|
| _cons       | 0.8       | 0.1788854 | 4.47 | 0.000 | 0.4493909 | 1.150609 |

Can see maximum likelihood estimator is again 0.8