Q1

Output:

```
------------------------------------------------------------
Oscar Martinez   Take-Home 2: Question 1   Metrics III
------------------------------------------------------------
Weibull Model - The dependent variable is: days

Grad:     0.6363    LogL: -2192.8495    Size:   1.000
Grad:     0.7267    LogL: -1986.4985    Size:   1.000
Grad:     0.8283    LogL: -1798.1316    Size:   1.000
Grad:     0.9357    LogL: -1631.6029    Size:   1.000
Grad:     1.0336    LogL: -1490.8103    Size:   1.000
Grad:     1.0907    LogL: -1378.6446    Size:   1.000
Grad:     1.0617    LogL: -1295.2310    Size:   1.000
Grad:     0.9140    LogL: -1236.4924    Size:   1.000
Grad:     0.6690    LogL: -1195.0893    Size:   1.000
Grad:     0.3942    LogL: -1163.6355    Size:   1.000
Grad:     0.1454    LogL: -1137.0129    Size:   1.000
Grad:     0.0591    LogL: -1112.4269    Size:   1.000
Grad:     0.2248    LogL: -1088.5531    Size:   1.000
Grad:     0.3648    LogL: -1064.8436    Size:   1.000
Grad:     0.4930    LogL: -1041.1644    Size:   1.000
Grad:     0.6224    LogL: -1017.6633    Size:   1.000
Grad:     0.7635    LogL:  -994.7860    Size:   1.000
Grad:     0.9177    LogL:  -973.3826    Size:   1.000
Grad:     1.0525    LogL:  -954.7238    Size:   1.000
Grad:     1.0613    LogL:  -939.8889    Size:   1.000
Grad:     0.8367    LogL:  -928.8476    Size:   1.000
Grad:     0.4715    LogL:  -921.7429    Size:   1.000
Grad:     0.1384    LogL:  -918.9711    Size:   1.000
Grad:     0.0832    LogL:  -918.5399    Size:   1.000
Grad:     0.0493    LogL:  -918.5114    Size:   1.000
Grad:     0.0117    LogL:  -918.5101    Size:   1.000
Grad:     0.0015    LogL:  -918.5100    Size:   1.000
Grad:     0.0008    LogL:  -918.5100    Size:   1.000

Regressor  Coefficient  Std. Error   t-stat       Prob>|t|
------------------------------------------------------------
con          -4.60591       0.80675      -5.70920       0.00000
vac          -0.05647       0.17883      -0.31577       0.75241
lap          -0.32446       0.17236      -1.88240       0.06079
beta          1.06906       0.07933      13.47682       0.00000
```

Code:

```
% Computer Take-Home 2: Question 1
% Metrics III
%Oscar Martinez

%Diary
diary Q2_Output_Oscar_Martinez.txt

%Introduction
fprintf('-----------------------------------------------------------------\n')
   ;
fprintf('Oscar Martinez \t Take-Home 2: Question 1 \t Metrics III\n');
fprintf('-----------------------------------------------------------------\n')
   ;

%Exam 2 Question 1:
data='mlsUp3'; bin='sold'; dep='days'; ind='vac     lap     ';
theta=[-3; 0; 0; 1];
theta=weibull(data,dep,bin,ind,theta);

%closing output
diary off
```

Q2

Output:

```
------------------------------------------------------------
Oscar Martinez   Take-Home 2: Question 2   Metrics III
------------------------------------------------------------

lambda =

3.5700

Heckman-Lee Estimates of Tobit Model
The data set is: martins2

Probit Model - The dependent variable is: employ
The data set is: martins2

Grad:     0.4564    LogL: -1386.3792    Size:   1.000
Grad:     0.1241    LogL: -1378.6496    Size:   1.000
```

```
Grad:     0.0071    LogL: -1378.1894    Size:   1.000
Grad:     0.0015    LogL: -1378.1890    Size:   1.000
Grad:     0.0004    LogL: -1378.1890    Size:   1.000
Grad:     0.0001    LogL: -1378.1890    Size:   1.000
```

Regressor	Coefficient	Std. Error	t-stat	Prob>|t|
Con	-0.58845	0.17882	-3.29068	0.00101
edu	0.12722	0.00981	12.97394	0.00000
pexp	0.03854	0.01384	2.78353	0.00542
pexp2	-0.00108	0.00027	-4.00210	0.00006
pexpchd	-0.01351	0.00365	-3.69861	0.00022
pexpch2	0.00031	0.00010	2.95627	0.00315

OLS Coefficients - The dependent variable is: lwage2

Regressor	Coefficient	Std. Error	t-stat	Prob>|t|
Con	1.13123	0.09118	12.40620	0.00000
edu	0.10306	0.00408	25.28947	0.00000
pexp	0.00772	0.00749	1.03174	0.30237
pexp2	0.00012	0.00016	0.73849	0.46034
pexpchd	0.00424	0.00221	1.91628	0.05553
pexpch2	-0.00013	0.00007	-2.01065	0.04455
Ln(Sig)	-0.61670			
LogL	-1120.13392			

Heckman-Lee Coefficients - The dependent variable is: lwage2
Uncorrected Standard Errors

Regressor	Coefficient	Std. Error	t-stat	Prob>|t|
Con	-1.78801	0.35442	-5.04484	0.00000
edu	0.25397	0.01818	13.97311	0.00000
pexp	0.08243	0.01142	7.21847	0.00000
pexp2	-0.00188	0.00028	-6.71127	0.00000
pexpchd	-0.01550	0.00317	-4.89216	0.00000
pexpch2	0.00030	0.00008	3.68844	0.00023
Mills	2.65040	0.31149	8.50882	0.00000
Ln(Sig)	0.67175			

Tobit Model - The dependent variable is: lwage2
The data set is: martins2

```
Grad:     1.4521    LogL: -3452.5899    Size:   0.500
Grad:     0.5195    LogL: -3425.3926    Size:   0.250
Grad:     0.4281    LogL: -3417.9811    Size:   0.500
Grad:     0.3289    LogL: -3410.6604    Size:   0.250
Grad:     0.2992    LogL: -3407.7637    Size:   0.250
Grad:     0.1011    LogL: -3405.6837    Size:   0.250
Grad:     0.1490    LogL: -3405.5492    Size:   0.500
Grad:     0.2158    LogL: -3403.6044    Size:   0.250
Grad:     0.1635    LogL: -3402.8549    Size:   0.250
Grad:     0.0792    LogL: -3402.3696    Size:   0.250
Grad:     0.0753    LogL: -3402.0902    Size:   0.250
Grad:     0.0300    LogL: -3401.9125    Size:   0.250
Grad:     0.0348    LogL: -3401.8469    Size:   0.500
Grad:     0.0551    LogL: -3401.7197    Size:   0.250
Grad:     0.0422    LogL: -3401.6572    Size:   0.250
Grad:     0.0209    LogL: -3401.6216    Size:   0.250
Grad:     0.0185    LogL: -3401.6008    Size:   0.250
Grad:     0.0075    LogL: -3401.5972    Size:   0.500
Grad:     0.0241    LogL: -3401.5809    Size:   0.250
Grad:     0.0131    LogL: -3401.5727    Size:   0.250
Grad:     0.0102    LogL: -3401.5684    Size:   0.250
Grad:     0.0049    LogL: -3401.5660    Size:   0.250
Grad:     0.0045    LogL: -3401.5645    Size:   0.250
Grad:     0.0017    LogL: -3401.5639    Size:   0.500
Grad:     0.0057    LogL: -3401.5629    Size:   0.250
Grad:     0.0030    LogL: -3401.5624    Size:   0.250
Grad:     0.0024    LogL: -3401.5621    Size:   0.250
Grad:     0.0011    LogL: -3401.5620    Size:   0.250
Grad:     0.0011    LogL: -3401.5619    Size:   0.500
Grad:     0.0018    LogL: -3401.5618    Size:   0.250
Grad:     0.0013    LogL: -3401.5618    Size:   0.250
Grad:     0.0007    LogL: -3401.5617    Size:   0.250
Grad:     0.0006    LogL: -3401.5617    Size:   0.250
Grad:     0.0002    LogL: -3401.5617    Size:   0.500
Grad:     0.0007    LogL: -3401.5617    Size:   0.250
Grad:     0.0004    LogL: -3401.5617    Size:   0.250
Grad:     0.0003    LogL: -3401.5617    Size:   0.250
Grad:     0.0001    LogL: -3401.5617    Size:   0.250
Grad:     0.0001    LogL: -3401.5617    Size:   0.250
Grad:     0.0000    LogL: -3401.5617    Size:   0.500

Regressor  Coefficient  Std. Error   t-stat       Prob>|t|
------------------------------------------------------------
Con          -0.94189       0.24209      -3.89069       0.00010
edu           0.21239       0.01499      14.16795       0.00000
```

```
pexp          0.07146       0.01841       3.88082       0.00011
pexp2        -0.00168       0.00036      -4.65441       0.00000
pexpchd      -0.01488       0.00478      -3.11657       0.00185
pexpch2       0.00031       0.00013       2.28637       0.02232
lnsig         0.47007       0.03788      12.40952       0.00000
Sigma         1.60011
Common Threshold Model (based on Transformed lwage)Tobit Model - The dependent variable
The data set is: martins2

Grad:     0.0002    LogL: -3401.5617    Size:   0.250
Grad:     0.0001    LogL: -3401.5617    Size:   0.250
Grad:     0.0001    LogL: -3401.5617    Size:   0.250

Regressor  Coefficient  Std. Error   t-stat       Prob>|t|
-------------------------------------------------------------
Con          -0.94185       0.24209      -3.89052       0.00010
edu           0.21238       0.01499      14.16737       0.00000
pexp          0.07146       0.01841       3.88073       0.00011
pexp2        -0.00168       0.00036      -4.65424       0.00000
pexpchd      -0.01488       0.00478      -3.11637       0.00185
pexpch2       0.00031       0.00013       2.28622       0.02233
Sigma         1.60006       0.06061      26.39906       0.00000


-----------Part A---------------
---Confidence Interval---
(0.1830,0.2418)

-----------Part B---------------
---Variance-Covariance Matrix---

vc =

0.0586   -0.0019   -0.0035    0.0001    0.0001   -0.0000   -0.0033
-0.0019    0.0002    0.0001   -0.0000   -0.0000    0.0000    0.0005
-0.0035    0.0001    0.0003   -0.0000   -0.0000    0.0000    0.0003
0.0001   -0.0000   -0.0000    0.0000    0.0000   -0.0000   -0.0000
0.0001   -0.0000   -0.0000    0.0000    0.0000   -0.0000   -0.0001
-0.0000    0.0000    0.0000   -0.0000   -0.0000    0.0000    0.0000
-0.0033    0.0005    0.0003   -0.0000   -0.0001    0.0000    0.0037

Alpha      Beta     Delta     Gamma     Theta     Lambda     Sigma

---Median Values---
MEDout =
```

```
2.0000   25.0000    6.0000    5.7000  298.8674

child     pexp        edu     lwage     wage

---Marginal Effect---
MargEff =

-3.4433


---Std Err---
MargSD =

1.3303

---Confidence Interval---
(-6.0507,-0.8360)

-----------Part C---------------
Tobit Model - The dependent variable is: wage2
The data set is: martins2

Grad:     0.0001    LogL: -5920.1049    Size:   1.000

Regressor  Coefficient  Std. Error   t-stat       Prob>|t|
-------------------------------------------------------------
Con        -13.90854       1.44897      -9.59891       0.00000
edu          2.00114       0.06246      32.03723       0.00000
pexp         0.38796       0.10927       3.55059       0.00039
pexp2       -0.00726       0.00217      -3.35333       0.00081
pexpchd     -0.04597       0.03170      -1.45009       0.14717
pexpch2      0.00068       0.00091       0.74116       0.45867
Sigma       10.33038       0.14686      70.34180       0.00000
---Confidence Interval---
(1.8787,2.1236)

-----------Part D---------------

gmwage =

3.8730


---Geometrically Scaled Wages---
```

```
Iteration Limit Exceeded in PD
Iteration Limit Exceeded in PD
Iteration Limit Exceeded in PD

Common Threshold Model (based on Transformed swage)
Tobit Model - The dependent variable is: gswage
The data set is: martins2

Grad:     8.7110    LogL: -4927.4116    Size:   0.500
Grad:    11.2640    LogL: -4114.9475    Size:   1.000
Grad:     0.3296    LogL: -4037.0659    Size:   1.000
Grad:     0.6883    LogL: -4027.2845    Size:   1.000
Grad:     0.2088    LogL: -4025.1593    Size:   1.000
Grad:     0.0829    LogL: -4024.6870    Size:   1.000
Grad:     0.0183    LogL: -4024.5574    Size:   1.000
Grad:     0.0071    LogL: -4024.5110    Size:   1.000
Grad:     0.0043    LogL: -4024.4923    Size:   1.000
Grad:     0.0035    LogL: -4024.4844    Size:   1.000
Grad:     0.0028    LogL: -4024.4810    Size:   1.000
Grad:     0.0020    LogL: -4024.4796    Size:   1.000
Grad:     0.0013    LogL: -4024.4790    Size:   1.000
Grad:     0.0009    LogL: -4024.4788    Size:   1.000
Grad:     0.0006    LogL: -4024.4787    Size:   1.000
Grad:     0.0004    LogL: -4024.4786    Size:   1.000
Grad:     0.0002    LogL: -4024.4786    Size:   1.000
Grad:     0.0002    LogL: -4024.4786    Size:   1.000
Grad:     0.0001    LogL: -4024.4786    Size:   1.000
Grad:     0.0001    LogL: -4024.4786    Size:   1.000

Regressor  Coefficient  Std. Error   t-stat       Prob>|t|
-------------------------------------------------------------
Con          -3.59134       0.37410      -9.59998       0.00000
edu           0.51670       0.01613      32.03960       0.00000
pexp          0.10019       0.02821       3.55156       0.00039
pexp2        -0.00188       0.00056      -3.35441       0.00081
pexpchd      -0.01187       0.00818      -1.45046       0.14707
pexpch2       0.00017       0.00024       0.74149       0.45847
Sigma         2.66724       0.03791      70.34793       0.00000

-----------

---Geometrically Scaled Log-Wages---
Iteration Limit Exceeded in PD
Iteration Limit Exceeded in PD
Iteration Limit Exceeded in PD
```

```
Common Threshold Model (based on Transformed lgwage)
Tobit Model - The dependent variable is: lgwage
The data set is: martins2

Grad:     8.9935    LogL: -4914.8767    Size:   0.500
Grad:    14.4850    LogL: -4071.6009    Size:   0.500
Grad:     6.4257    LogL: -2518.4323    Size:   1.000
Grad:     0.0692    LogL: -2392.5370    Size:   1.000
Grad:     0.0504    LogL: -2354.7076    Size:   1.000
Grad:     0.0375    LogL: -2346.8652    Size:   1.000
Grad:     0.0491    LogL: -2344.5035    Size:   1.000
Grad:     0.0314    LogL: -2343.7956    Size:   1.000
Grad:     0.0176    LogL: -2343.6064    Size:   1.000
Grad:     0.0073    LogL: -2343.5607    Size:   1.000
Grad:     0.0056    LogL: -2343.5509    Size:   1.000
Grad:     0.0021    LogL: -2343.5505    Size:   1.000
Grad:     0.0038    LogL: -2343.5462    Size:   0.500
Grad:     0.0006    LogL: -2343.5460    Size:   1.000
Grad:     0.0012    LogL: -2343.5457    Size:   0.500
Grad:     0.0002    LogL: -2343.5456    Size:   1.000
Grad:     0.0004    LogL: -2343.5456    Size:   0.500
Grad:     0.0001    LogL: -2343.5456    Size:   1.000

Regressor  Coefficient  Std. Error   t-stat       Prob>|t|
------------------------------------------------------------
Con          -0.97134       0.11959      -8.12244       0.00000
edu           0.14008       0.00611      22.93052       0.00000
pexp          0.03328       0.00885       3.76006       0.00017
pexp2        -0.00067       0.00017      -3.82255       0.00014
pexpchd      -0.00464       0.00247      -1.88020       0.06021
pexpch2       0.00008       0.00007       1.12471       0.26083
Sigma         0.80155       0.01984      40.39400       0.00000
```

Code:

```
% Computer Take-Home 2: Question 2
% Metrics III
%Oscar Martinez

%Diary
diary Q1_Output_Oscar_Martinez.txt

```

```
%Introduction
fprintf('------------------------------------------------------------------------\n')
    ;
fprintf('Oscar Martinez \t Take-Home 2: Question 2 \t Metrics III\n');
fprintf('------------------------------------------------------------------------\n')
    ;

clear
clc
load martins;
% shorten length of pexpchd2;
pexpch2=pexpchd2;
save martins1;
clear;

% Now identify common threshold and transform lwage
load martins1;
nemploy=(employ==0);
nobs=size(employ,1);

% create vector of maximums ;
mins=ones(nobs,1).*max(lwage);
lwage2=lwage.*employ+mins.*nemploy;
% generate lambda;
lambda=min(lwage2)
% create transformed dependent variable as lwage2;
% lwage2 equals lwage minus the minimum of non-zero ;
% values when employ=1 and 0 otherwise;
lwage2=(lwage2-lambda).*employ;
wage2=exp(lwage2);
clear lambda nobs ans;
save martins2;
clear;

%define text strings for tobit models;
data='martins2';
dep2='lwage2';
ind='edu     pexp    pexp2   pexpchd pexpch2 ';
bin='employ';

% Use HL to generate startingvalues;
[s1b,s2b]=tobit_hl(data,dep2,bin,ind);
theta=tobit2a(data,dep2,bin,ind,s2b);
theta(7)=exp(theta(7));
fprintf('Common Threshold Model (based on Transformed lwage)');
```

```
[theta, vc,stderr]=tobit3(data,dep2,bin,ind,theta);

%95% Confidence Interval
BCo=theta(2);
BErr=stderr(2);
LBCI=BCo-1.96*BErr;   %Lower CI
HBCI=BCo+1.96*BErr;   %Upper CI
fprintf('\n');
fprintf('\n----------Part A---------- \n');
fprintf('---Confidence Interval---\n');
fprintf('(%2.4f,%2.4f)',LBCI, HBCI);

%Part B
fprintf('\n');
fprintf('\n----------Part B---------- \n');
fprintf('---Variance-Covariance Matrix---\n');
vc
fprintf('    Alpha      Beta     Delta     Gamma     Theta     Lambda
   Sigma \n');

% get stats needed for marginal effect
load martins
lwage(lwage==0)=NaN;
M=[child, pexp, edu, lwage];
fprintf('\n---Median Values---');
MED=nanmedian(M);
MWAGE=exp(MED(1,4)); MPEXP=MED(1,2); MCHD=MED(1,1); MEDU=MED(1,3);
MEDout=[MED MWAGE]
fprintf('    child     pexp        edu     lwage     wage\n');


fprintf('\n---Marginal Effect---');
%Marginal Effect
M1=theta(3)+2*theta(4)*MPEXP+theta(5)*MCHD+2*theta(6)*MPEXP*MCHD; %Marginal
    Effect w/o lwage
MargEff=M1*MWAGE

%Variances
fprintf('\n---Std Err---');
VB=vc(2,2); VD=vc(3,3); VG=vc(4,4); VT=vc(5,5); VL=vc(6,6); CDG=vc(3,4);
   CDT=vc(3,5);
CDL=vc(3,6); CGT=vc(4,5); CGL=vc(4,6); CTL=vc(5,6);

%Could've combined them all into one equation but this is easier to error
%correct
```

```
VARR1=(VD+4*VG*MPEXP^2+MCHD^2*VT+4*MPEXP^2*MCHD^2*VL);
VARR2=2*2*MPEXP*CDG+2*MCHD*CDT+2*2*MPEXP*MCHD*CDL;
VARR3=2*2*MPEXP*MCHD*CGT+2*2*MPEXP*2*MPEXP*MCHD*CGL;
VARR4=2*MCHD*2*MPEXP*MCHD*CTL;
VSUM=VARR1+VARR2+VARR3+VARR4;
VMARG=MWAGE^2*VSUM;
MargSD=sqrt(VMARG)

%95% Confidence Interval
LBCI2=MargEff-1.96*MargSD;   %Lower CI
HBCI2=MargEff+1.96*MargSD;   %Upper CI
fprintf('---Confidence Interval---\n');
fprintf('(%2.4f,%2.4f)',LBCI2, HBCI2);


fprintf('\n');
fprintf('\n----------Part C---------------- \n');

%Backup Relevant Files
theta1=theta;
vc1=vc;

%define text strings for tobit models;
data='martins2';
dep2='wage2';
ind='edu     pexp    pexp2   pexpchd pexpch2 ';
bin='employ';

% Use HL to generate startingvalues;
[s1b,s2b]=tobit_hl2(data,dep2,bin,ind);
theta=tobit5a(data,dep2,bin,ind,s2b);
theta(7)=exp(theta(7));
%fprintf('Common Threshold Model (based on Transformed wage)\n');
[theta, vc, stderr]=tobit4(data,dep2,bin,ind,theta);

%CI
BCo=theta(2);
BErr=stderr(2);
LBCI=BCo-1.96*BErr;   %Lower CI
HBCI=BCo+1.96*BErr;   %Upper CI
fprintf('---Confidence Interval---\n');
fprintf('(%2.4f,%2.4f)',LBCI, HBCI);

%Part D
fprintf('\n');
```

```
fprintf('\n----------Part D---------- \n');

%Backup Relevant Files
theta2=theta;
vc2=vc;

%Create Geometric scaled wages
load martins2;
gmwage=geomean(wage2)
gswage=(1/gmwage)*wage2;
lgwage=log(gswage);
save martins3;

%define text strings for tobit models;
data='martins3';
dep2='gswage';
ind='edu     pexp    pexp2   pexpchd pexpch2 ';
bin='employ';

fprintf('\n ---Geometrically Scaled Wages--- \n');

% Use HL to generate startingvalues;
[s1b,s2b]=tobit_hl2(data,dep2,bin,ind);
theta=tobitPD(data,dep2,bin,ind,s2b);
theta=tobitPD(data,dep2,bin,ind,theta);
theta=tobitPD(data,dep2,bin,ind,theta);
theta(7)=exp(theta(7));
fprintf('\n Common Threshold Model (based on Transformed swage)\n');
[theta, vc, stderr]=tobit4(data,dep2,bin,ind,theta);

%define text strings for tobit models;
data='martins3';
dep2='lgwage';
ind='edu     pexp    pexp2   pexpchd pexpch2 ';
bin='employ';

fprintf('\n ---------- \n');

fprintf('\n ---Geometrically Scaled Log-Wages--- \n');

% Use HL to generate startingvalues;
[s1b,s2b]=tobit_hl2(data,dep2,bin,ind);
theta=tobitPD(data,dep2,bin,ind,s2b);
theta=tobitPD(data,dep2,bin,ind,theta);
theta=tobitPD(data,dep2,bin,ind,theta);
```

```
theta(7)=exp(theta(7));
fprintf('\n Common Threshold Model (based on Transformed lgwage)\n');
[theta, vc, stderr]=tobit4(data,dep2,bin,ind,theta);

%closing output
diary off
```