Assignment 3

From the data set `assign3.dta`:

The study of production function assumes the model follows CES production function:

$$y = \gamma\left[\delta K^{-\rho} + (1-\delta)L^{-\rho}\right]^{-\frac{\nu}{\rho}} + \varepsilon \qquad (1)$$

where:

y = Output
K = Capital Input
L = Labor Input
gamma γ = Efficiency Parameter
delta δ = Distribution Parameter
nu ν = Parameter
rho ρ = Substitution Parameter
ε = Disturbance Term

Elasticity of Substitution can be computed from: $\sigma = \dfrac{1}{1-\rho}$

The model can then be transformed as:

$$\ln y = \ln\gamma - \frac{\nu}{\rho}\ln\left[\delta K^{-\rho} + (1-\delta)L^{-\rho}\right] + \varepsilon \qquad (2)$$

b1

a. Estimate the model (1) using NLS estimation method using initial values of γ=4, δ=0, ρ= –1, ν=1. Determine the estimated value of efficiency parameter (γ), distribution parameter (δ), parameter (ν), and substitution parameter (ρ), and elasticity of substitution (σ). Perform F-test to test whether δ=0, ρ=0, and ν=0.

b. Estimate the model (2) using NLS estimation method initial values of lnγ=4, δ=0, ρ= –1, ν=1. Determine the estimated value of efficiency parameter (γ), distribution parameter (δ), parameter (ν), and substitution parameter (ρ), and elasticity of substitution (σ). Perform F-test to test whether δ=0, ρ=0, and ν=0.

c. From (a), if we change initial values to be γ=55, δ=0, ρ= –1, ν=1, what will happen to the estimated result? Interpret the estimated result and why do we get this kind of result? (Make comparison between previous result and the new result)

d. From (a), if we change convergence value from default of 0.00001 or (1e-5) to (i) 0.1 or (1e-1) and (ii) (1e-15) with maximum iteration of 100, what will happen to the estimated result? Interpret the estimated result and why do we get this kind of result? (Make comparison between previous result and the new result)

e. From (b), if we change initial values to be lnγ=55, δ=0, ρ= –1, ν=1, what will happen to the estimated result? Interpret the estimated result and why do we get this kind of result? (Make comparison between previous result and the new result)

f. From (b), if we change convergence value from default of 0.00001 or (1e-5) to (i) 0.1 or (1e-1) and (ii) (1e-15) with maximum iteration of 100, what will happen to

the estimated result? Interpret the estimated result and why do we get this kind of result? (Make comparison between previous result and the new result)

g. Make comparison of the estimated results of model (1) and model (2). Which estimated result should be used in this case? Why?

a) Estimate the model (1) using NLS estimation method using initial values of γ=4, δ=0, ρ= –1, ν=1. Determine the estimated value of efficiency parameter (γ), distribution parameter (δ), parameter (ν), and substitution parameter (ρ), and elasticity of substitution (σ). Perform F-test to test whether δ=0, ρ=0, and ν=0.

The estimated value of efficiency parameter(γ) = 2.89e-17

The estimated value of distribution parameter (δ) = 0.8017609

The estimated value of parameter (ν) = 3.39589

The estimated value of substitution parameter (ρ) = -1.88296

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho}$

$= 0.3468657213$ //

H_0: $\delta = \rho = \nu = 0$

H_1: H_0 is not true

$F(3, 796) = 7383.35$

It can reject the null hypothesis will show that (δ), (ρ), (ν) are jointly statistically significant

b) Estimate the model (2) using NLS estimation method initial values of lnγ=4, δ=0, ρ= –1, ν=1. Determine the estimated value of efficiency parameter (γ), distribution parameter (δ), parameter (ν), and substitution parameter (ρ), and elasticity of substitution (σ). Perform F-test to test whether δ=0, ρ=0, and ν=0.

The estimated value of efficiency parameter(γ) = 44.64759

The estimated value of distribution parameter (δ) = 0.2351024

The estimated value of parameter (ν) = 0.9727292

The estimated value of substitution parameter (ρ) = -0.8079834

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho}$

$= 0.5531024234$

H_0: $\delta = \rho = \nu = 0$

H_1: H_0 is not true

$F(3, 796) = 366.55$

It can reject the null hypothesis will show that (δ), (ρ), (ν) are jointly statistically significant

c) From (a), if we change initial values to be γ=55, δ=0, ρ= –1, ν=1, what will happen to the estimated result? Interpret the estimated result and why do we get this kind of result? (Make comparison between previous result and the new result)

The estimated value of efficiency parameter(γ) = 15.24071

The estimated value of distribution parameter (δ) = 0.0549096

The estimated value of parameter (ν) = 1.063501

The estimated value of substitution parameter (ρ) = -38.85704

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho} = 0.0250896$

It implies that it is in a negative slope as all of parameters are less than in(a).

Due to the law of production function, the parameters fall are caused by diminishing propensity to utility

d. From (a), if we change convergence value from default of 0.00001 or (1e-5) to (i) 0.1 or (1e-1) and (ii) (1e-15) with maximum iteration of 100, what will happen to the estimated result? Interpret the estimated result and why do we get this kind of result? (Make comparison between previous result and the new result)

i) The estimated value of efficiency parameter(γ) = 4.000008

The estimated value of distribution parameter (δ) = $1.29e^{-07}$

The estimated value of parameter (ν) = 1

The estimated value of subsitution parameter (ρ) = −29.02157

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho_i} = 0.03330938$

ii) The estimated value of efficiency parameter(γ) = 4.002498

The estimated value of distribution parameter (δ) = 0.0000248

The estimated value of parameter (ν) = 0.9999955

The estimated value of subsitution parameter (ρ) = −19.15877

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho_i} = 0.0496062$

e. From (b), if we change initial values to be lnγ=55, δ=0, ρ= –1, ν=1, what will happen to the estimated result? Interpret the estimated result and why do we get this kind of result? (Make comparison between previous result and the new result)

The estimated value of efficiency parameter(γ) = 44.64759

The estimated value of distribution parameter (δ) = 0.2351024

The estimated value of parameter (ν) = 0.9727292

The estimated value of subsitution parameter (ρ) = −0.8079833

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho_i} = 0.553109454$

f. From (b), if we change convergence value from default of 0.00001 or (1e-5) to (i) 0.1 or (1e-1) and (ii) (1e-15) with maximum iteration of 100, what will happen to the estimated result? Interpret the estimated result and why do we get this kind of result? (Make comparison between previous result and the new result)

The estimated value of efficiency parameter(γ) = 44.55486

The estimated value of distribution parameter (δ) = 0.23475

The estimated value of parameter (ν) = 0.9797697

The estimated value of subsitution parameter (ρ) = -0.8163215

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho_i} = 0.5508666$

The estimated value of efficiency parameter(γ) = 44.64759

The estimated value of distribution parameter (δ) = 0.2381024

The estimated value of parameter (ν) = 0.9797992

The estimated value of subsitution parameter (ρ) = -0.8079839

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho_i} = 0.5531022704$

g. Make comparison of the estimated results of model (1) and model (2). Which estimated result should be used in this case? Why?

The estimated value of efficiency parameter(γ) = $2.89e^{-17}$

The estimated value of distribution parameter (δ) = 0.8017609

The estimated value of parameter (ν) = 3.39589

The estimated value of subsitution parameter (ρ) = -1.88296

The estimated value of elasticity of substitution (σ): $\sigma = \frac{1}{1-\rho}$

$= 0.346865721$ //

```
           Prob > F =    0.0000
      name:  <unnamed>
       log:  C:\Users\Pongpanot\Downloads\assignment3_NLS.smcl
  log type:  smcl
 opened on:  11 Feb 2021, 03:06:37

1 . use "C:\Users\Pongpanot\Downloads\assign3 (1).dta", clear

2 . nl ( y = {gamma}*(({delta}*k^(-{rho}))+((1-{delta})*l^(-{rho})))^(-{nu}/{rho})), init(gamma 4 de
(obs = 800)
```

Source	SS	df	MS		
Model	2.363e+20	4	5.9080e+19	Number of obs =	800
Residual	9.271e+18	796	1.1647e+16	R-squared =	0.9622
				Adj R-squared =	0.9621
Total	2.456e+20	800	3.0699e+17	Root MSE =	1.08e+08
				Res. dev. =	31861.36

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
/gamma	2.89e-17	6.45e-17	0.45	0.654	-9.77e-17	1.55e-16
/delta	.8017609	.0319332	25.11	0.000	.7390776	.8644442
/rho	-1.88296	.2889715	-6.52	0.000	-2.450196	-1.315724
/nu	3.39589	.1261608	26.92	0.000	3.148243	3.643538

```
3 . test (_b[/delta]=0) (_b[/rho]=0) (_b[/nu]=0)

 ( 1)  [delta]_cons = 0
 ( 2)  [rho]_cons = 0
 ( 3)  [nu]_cons = 0

       F(  3,   796) = 7383.35
            Prob > F =    0.0000

4 . nl (lny = ln({gamma})-({nu}/{rho})*ln(({delta}*k^(-{rho}))+(1-{delta})*l^(-{rho}))), init(gamma
(obs = 800)

Iteration 0:  residual SS =  3626.776
Iteration 1:  residual SS =  3624.651
Iteration 2:  residual SS =  3609.757
Iteration 3:  residual SS =  3592.952
Iteration 4:  residual SS =  3563.352
Iteration 5:  residual SS =  3522.416
Iteration 6:  residual SS =  3383.926
Iteration 7:  residual SS =  3146.368
Iteration 8:  residual SS =  1553.779
Iteration 9:  residual SS =  1317.161
Iteration 10:  residual SS =  832.8988
Iteration 11:  residual SS =  820.3631
Iteration 12:  residual SS =  819.9941
Iteration 13:  residual SS =  819.9926
Iteration 14:  residual SS =  819.9925
Iteration 15:  residual SS =  819.9925
Iteration 16:  residual SS =  819.9925
Iteration 17:  residual SS =  819.9925
Iteration 18:  residual SS =  819.9925
Iteration 19:  residual SS =  819.9925
```

Source	SS	df	MS		
				Number of obs =	800
Model	976.20485	3	325.401616	R-squared =	0.5435
Residual	819.99246	796	1.03014129	Adj R-squared =	0.5418
				Root MSE =	1.014959
Total	1796.1973	799	2.24805671	Res. dev. =	2290.048

lny	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
/gamma	44.64759	18.9046	2.36	0.018	7.538832	81.75635
/nu	.9727292	.0317774	30.61	0.000	.9103518	1.035107
/rho	-.8079834	.2186231	-3.70	0.000	-1.237129	-.3788375
/delta	.2351024	.0328464	7.16	0.000	.1706267	.2995782

Parameter gamma taken as constant term in model & ANOVA table

```
5 . test (_b[/delta]=0) (_b[/rho]=0) (_b[/nu]=0)

 ( 1)  [delta]_cons = 0
 ( 2)  [rho]_cons = 0
 ( 3)  [nu]_cons = 0

       F(  3,   796) =  366.55
            Prob > F =    0.0000

6 . nl ( y = {gamma}*(({delta}*k^(-{rho}))+((1-{delta})*l^(-{rho})))^(-{nu}/{rho})), init(gamma 55 d
(obs = 800)

Iteration 0:  residual SS =  1.65e+20
Iteration 1:  residual SS =  1.62e+20
Iteration 2:  residual SS =  1.62e+20
Iteration 3:  residual SS =  1.62e+20
Iteration 4:  residual SS =  1.61e+20
Iteration 5:  residual SS =  1.42e+20
Iteration 6:  residual SS =  1.42e+20
Iteration 7:  residual SS =  1.42e+20
Iteration 8:  residual SS =  1.41e+20
Iteration 9:  residual SS =  1.41e+20
Iteration 10:  residual SS =  1.41e+20
Iteration 11:  residual SS =  1.38e+20
Iteration 12:  residual SS =  1.36e+20
Iteration 13:  residual SS =  1.35e+20
Iteration 14:  residual SS =  1.35e+20
Iteration 15:  residual SS =  1.35e+20
Iteration 16:  residual SS =  1.35e+20
Iteration 17:  residual SS =  1.35e+20
Iteration 18:  residual SS =  1.35e+20
```

Source	SS	df	MS		
				Number of obs =	800
Model	1.105e+20	4	2.7613e+19	R-squared =	0.4497
Residual	1.351e+20	796	1.6977e+17	Adj R-squared =	0.4470
				Root MSE =	4.12e+08
Total	2.456e+20	800	3.0699e+17	Res. dev. =	34004.88

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
/gamma	15.24071	9.37733	1.63	0.105	-3.166506	33.64793
/delta	.0549096	2.023112	0.03	0.978	-3.916356	4.026175
/rho	-38.85704	533.7257	-0.07	0.942	-1086.533	1008.819
/nu	1.063501	.0348929	30.48	0.000	.9950082	1.131994

```
7 . nl ( y = {gamma}*(({delta}*k^(-{rho}))+((1-{delta})*l^(-{rho})))^(-{nu}/{rho})), init(gamma 4 de
(obs = 800)

Iteration 0:  residual SS =  2.35e+20
Iteration 1:  residual SS =  2.35e+20
```

Source	SS	df	MS		
Model	1.043e+19	4	2.6070e+18	Number of obs =	800
Residual	2.352e+20	796	2.9543e+17	R-squared =	0.0425
				Adj R-squared =	0.0376
Total	2.456e+20	800	3.0699e+17	Root MSE =	5.44e+08
				Res. dev. =	34448.06

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
/gamma	4.000008	15.19032	0.26	0.792	-25.8178	33.81782
/delta	1.29e-07	.0001605	0.00	0.999	-.0003149	.0003152
/rho	-29.02157	2409.787	-0.01	0.990	-4759.309	4701.266
/nu	1	.2149768	4.65	0.000	.5780116	1.421988

```
      name:  <unnamed>
       log:  C:\Users\Pongpanot\Downloads\assignment3_NLS.smcl
  log type:  smcl
 opened on:  11 Feb 2021, 09:46:01

1 . use "C:\Users\Pongpanot\Downloads\assign3 (1).dta", clear

2 . nl ( y = {gamma}*(({delta}*k^(-{rho}))+((1-{delta})*l^(-{rho})))^(-{nu}/{rho})), init(gamma 4 de
(obs = 800)

Iteration 0:  residual SS =  2.35e+20
Iteration 1:  residual SS =  2.35e+20
Iteration 2:  residual SS =  2.35e+20
Iteration 3:  residual SS =  2.35e+20
Iteration 4:  residual SS =  2.35e+20
Iteration 5:  residual SS =  2.35e+20
Iteration 6:  residual SS =  2.35e+20
Iteration 7:  residual SS =  2.35e+20
Iteration 8:  residual SS =  2.35e+20
Iteration 9:  residual SS =  2.35e+20
Iteration 10:  residual SS =  2.35e+20
Iteration 11:  residual SS =  2.35e+20
Iteration 12:  residual SS =  2.35e+20
Iteration 13:  residual SS =  2.35e+20
Iteration 14:  residual SS =  2.35e+20
Iteration 15:  residual SS =  2.35e+20
Iteration 16:  residual SS =  2.35e+20
Iteration 17:  residual SS =  2.35e+20
Iteration 18:  residual SS =  2.35e+20
Iteration 19:  residual SS =  2.35e+20
Iteration 20:  residual SS =  2.35e+20
Iteration 21:  residual SS =  2.35e+20
Iteration 22:  residual SS =  2.35e+20
Iteration 23:  residual SS =  2.35e+20
Iteration 24:  residual SS =  2.35e+20
Iteration 25:  residual SS =  2.35e+20
Iteration 26:  residual SS =  2.35e+20
Iteration 27:  residual SS =  2.35e+20
Iteration 28:  residual SS =  2.35e+20
Iteration 29:  residual SS =  2.35e+20
Iteration 30:  residual SS =  2.35e+20
Iteration 31:  residual SS =  2.35e+20
Iteration 32:  residual SS =  2.35e+20
Iteration 33:  residual SS =  2.35e+20
Iteration 34:  residual SS =  2.35e+20
Iteration 35:  residual SS =  2.35e+20
Iteration 36:  residual SS =  2.35e+20
Iteration 37:  residual SS =  2.35e+20
Iteration 38:  residual SS =  2.35e+20
Iteration 39:  residual SS =  2.35e+20
Iteration 40:  residual SS =  2.35e+20
Iteration 41:  residual SS =  2.35e+20
Iteration 42:  residual SS =  2.35e+20
Iteration 43:  residual SS =  2.35e+20
Iteration 44:  residual SS =  2.35e+20
Iteration 45:  residual SS =  2.35e+20
Iteration 46:  residual SS =  2.35e+20
Iteration 47:  residual SS =  2.35e+20
Iteration 48:  residual SS =  2.35e+20
Iteration 49:  residual SS =  2.35e+20
Iteration 50:  residual SS =  2.35e+20
Iteration 51:  residual SS =  2.35e+20
Iteration 52:  residual SS =  2.35e+20
Iteration 53:  residual SS =  2.35e+20
Iteration 54:  residual SS =  2.35e+20
Iteration 55:  residual SS =  2.35e+20
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```
Iteration 56:  residual SS =  2.35e+20
Iteration 57:  residual SS =  2.35e+20
Iteration 58:  residual SS =  2.35e+20
Iteration 59:  residual SS =  2.35e+20
Iteration 60:  residual SS =  2.35e+20
Iteration 61:  residual SS =  2.35e+20
Iteration 62:  residual SS =  2.35e+20
Iteration 63:  residual SS =  2.35e+20
Iteration 64:  residual SS =  2.35e+20
Iteration 65:  residual SS =  2.35e+20
Iteration 66:  residual SS =  2.35e+20
Iteration 67:  residual SS =  2.35e+20
Iteration 68:  residual SS =  2.35e+20
Iteration 69:  residual SS =  2.35e+20
Iteration 70:  residual SS =  2.35e+20
Iteration 71:  residual SS =  2.35e+20
Iteration 72:  residual SS =  2.35e+20
Iteration 73:  residual SS =  2.35e+20
Iteration 74:  residual SS =  2.35e+20
Iteration 75:  residual SS =  2.35e+20
Iteration 76:  residual SS =  2.35e+20
Iteration 77:  residual SS =  2.35e+20
Iteration 78:  residual SS =  2.35e+20
Iteration 79:  residual SS =  2.35e+20
Iteration 80:  residual SS =  2.35e+20
Iteration 81:  residual SS =  2.35e+20
Iteration 82:  residual SS =  2.35e+20
Iteration 83:  residual SS =  2.35e+20
Iteration 84:  residual SS =  2.35e+20
Iteration 85:  residual SS =  2.35e+20
Iteration 86:  residual SS =  2.35e+20
Iteration 87:  residual SS =  2.35e+20
Iteration 88:  residual SS =  2.35e+20
Iteration 89:  residual SS =  2.35e+20
Iteration 90:  residual SS =  2.35e+20
Iteration 91:  residual SS =  2.35e+20
Iteration 92:  residual SS =  2.35e+20
Iteration 93:  residual SS =  2.35e+20
Iteration 94:  residual SS =  2.35e+20
Iteration 95:  residual SS =  2.35e+20
Iteration 96:  residual SS =  2.35e+20
Iteration 97:  residual SS =  2.35e+20
Iteration 98:  residual SS =  2.35e+20
Iteration 99:  residual SS =  2.35e+20
```

Source	SS	df	MS		
				Number of obs =	800
Model	1.044e+19	4	2.6110e+18	R-squared =	0.0425
Residual	2.351e+20	796	2.9541e+17	Adj R-squared =	0.0377
				Root MSE =	5.44e+08
Total	2.456e+20	800	3.0699e+17	Res. dev. =	34448.01

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
/gamma	4.002498	14.72681	0.27	0.786	-24.90547	32.91047
/delta	.0000248	.0071879	0.00	0.997	-.0140847	.0141342
/rho	-19.15877	594.8618	-0.03	0.974	-1186.842	1148.524
/nu	.9999955	.20826	4.80	0.000	.5911918	1.408799

convergence not achieved

r(430);

```
3 . nl (lny = ln({gamma})-({nu}/{rho})*ln(({delta}*k^(-{rho}))+(1-{delta})*l^(-{rho}))), init(gamma
(obs = 800)

Iteration 0:  residual SS =  1139.711
Iteration 1:  residual SS =  1110.203
Iteration 2:  residual SS =  1067.118
Iteration 3:  residual SS =  1045.374
Iteration 4:  residual SS =  1022.428
Iteration 5:  residual SS =  1010.578
Iteration 6:  residual SS =  955.9229
Iteration 7:  residual SS =  925.3166
Iteration 8:  residual SS =  906.8437
Iteration 9:  residual SS =  828.8922
Iteration 10:  residual SS =  820.6582
Iteration 11:  residual SS =  819.9951
Iteration 12:  residual SS =  819.9926
Iteration 13:  residual SS =  819.9925
Iteration 14:  residual SS =  819.9925
Iteration 15:  residual SS =  819.9925
Iteration 16:  residual SS =  819.9925
Iteration 17:  residual SS =  819.9925
Iteration 18:  residual SS =  819.9925

      Source |       SS           df       MS
-------------+----------------------------------   Number of obs =       800
       Model |  976.20485          3  325.401616   R-squared     =    0.5435
    Residual |  819.99246        796  1.03014129   Adj R-squared =    0.5418
-------------+----------------------------------   Root MSE      =  1.014959
       Total |  1796.1973        799  2.24805671   Res. dev.     =  2290.048

------------------------------------------------------------------------------
         lny |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      /gamma |   44.64759   18.9046     2.36   0.018     7.538836    81.75635
         /nu |   .9727292   .0317774    30.61   0.000     .9103518    1.035107
        /rho |  -.8079833   .2186232    -3.70   0.000    -1.237129   -.3788372
      /delta |   .2351024   .0328464     7.16   0.000     .1706267    .2995782
------------------------------------------------------------------------------

  Parameter gamma taken as constant term in model & ANOVA table

4 . nl (lny = ln({gamma})-({nu}/{rho})*ln(({delta}*k^(-{rho}))+(1-{delta})*l^(-{rho}))), init(gamma
(obs = 800)

Iteration 0:  residual SS =  3626.776
Iteration 1:  residual SS =  3624.651
Iteration 2:  residual SS =  3609.757
Iteration 3:  residual SS =  3592.952
Iteration 4:  residual SS =  3563.352
Iteration 5:  residual SS =  3522.416
Iteration 6:  residual SS =  3383.926
Iteration 7:  residual SS =  3146.368
Iteration 8:  residual SS =  1553.779
Iteration 9:  residual SS =  1317.161
Iteration 10:  residual SS =  832.8988
Iteration 11:  residual SS =  820.3631
Iteration 12:  residual SS =  819.9941

      Source |       SS           df       MS
-------------+----------------------------------   Number of obs =       800
       Model |  976.20317          3  325.401057   R-squared     =    0.5435
    Residual |  819.99414        796  1.03014339   Adj R-squared =    0.5418
-------------+----------------------------------   Root MSE      =   1.01496
       Total |  1796.1973        799  2.24805671   Res. dev.     =   2290.05
```

lny	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
/gamma	44.55486	18.41981	2.42	0.016	8.397714	80.71201
/nu	.9727697	.0317789	30.61	0.000	.9103893	1.03515
/rho	-.8153215	.208863	-3.90	0.000	-1.225309	-.4053341
/delta	.23475	.0322157	7.29	0.000	.1715122	.2979879

Parameter nu taken as constant term in model & ANOVA table

```
5 . nl (lny = ln({gamma})-({nu}/{rho})*ln(({delta}*k^(-{rho}))+(1-{delta})*l^(-{rho}))), init(gamma
(obs = 800)

Iteration 0:  residual SS =  3626.776
Iteration 1:  residual SS =  3624.651
Iteration 2:  residual SS =  3609.757
Iteration 3:  residual SS =  3592.952
Iteration 4:  residual SS =  3563.352
Iteration 5:  residual SS =  3522.416
Iteration 6:  residual SS =  3383.926
Iteration 7:  residual SS =  3146.368
Iteration 8:  residual SS =  1553.779
Iteration 9:  residual SS =  1317.161
Iteration 10:  residual SS =  832.8988
Iteration 11:  residual SS =  820.3631
Iteration 12:  residual SS =  819.9941
Iteration 13:  residual SS =  819.9926
Iteration 14:  residual SS =  819.9925
Iteration 15:  residual SS =  819.9925
Iteration 16:  residual SS =  819.9925
Iteration 17:  residual SS =  819.9925
Iteration 18:  residual SS =  819.9925
Iteration 19:  residual SS =  819.9925
Iteration 20:  residual SS =  819.9925
Iteration 21:  residual SS =  819.9925
Iteration 22:  residual SS =  819.9925
Iteration 23:  residual SS =  819.9925
Iteration 24:  residual SS =  819.9925
Iteration 25:  residual SS =  819.9925
Iteration 26:  residual SS =  819.9925
Iteration 27:  residual SS =  819.9925
Iteration 28:  residual SS =  819.9925
Iteration 29:  residual SS =  819.9925
Iteration 30:  residual SS =  819.9925
Iteration 31:  residual SS =  819.9925
Iteration 32:  residual SS =  819.9925
```

Source	SS	df	MS		
Model	222930.73	4	55732.6813	Number of obs =	800
Residual	819.99246	796	1.03014129	R-squared =	0.9963
				Adj R-squared =	0.9963
Total	223750.72	800	279.688397	Root MSE =	1.014959
				Res. dev. =	2290.048

lny	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
/gamma	44.64759	18.90461	2.36	0.018	7.538809	81.75636
/nu	.9727292	.0317774	30.61	0.000	.9103518	1.035107
/rho	-.8079839	.2186225	-3.70	0.000	-1.237129	-.3788392
/delta	.2351024	.0328463	7.16	0.000	.1706267	.2995781

```
6 . log close
      name:  <unnamed>
       log:  C:\Users\Pongpanot\Downloads\assignment3_NLS.smcl
  log type:  smcl
 closed on:  11 Feb 2021, 09:57:25
```