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From the given data set (`assign5-1.dta`):

a. Estimate the interest rate structure models applying all 9 models using GMM. Also perform Overidentification Test. (Hint: command for generating $\Delta r_t = r_{t+1} - r_t$ is `gen dr=f.r-r`)

b. Determine the most appropriated model using Wald Test.

```
. use "C:\Users\user\Documents\BE TU\Year2\EE426\HW5\assign5-1.dta"

. do "C:\Users\user\AppData\Local\Temp\STD03000000.tmp"

. gen dr=f.r-r
(1 missing value generated)
```

a) Estimate unrestricted model & perform overidentification test ↴

```
. gmm (dr-{alpha}-{beta}*r) ((dr-{alpha}-{beta}*r)*r) ((dr-{alpha}-{beta}*r)^2-
> {sigma2}*r^(2*{gamma})) (((dr-{alpha}-{beta}*r)^2-{sigma2}*r^(2*{gamma}))*r)
> winitial(identity)nolog
note: 1 missing value returned for equation 1 at initial values
note: 1 missing value returned for equation 2 at initial values
note: 1 missing value returned for equation 3 at initial values
note: 1 missing value returned for equation 4 at initial values
numerical derivatives are approximate
flat or discontinuous region encountered

Final GMM criterion Q(b) =    4.10e-18

note: model is exactly identified

GMM estimation

Number of parameters =     4
Number of moments    =     4
Initial weight matrix:   Identity                  Number of obs   =         1,334
GMM weight matrix:       Robust
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/alpha	-.0023725	.0011574	-2.05	0.040	-.0046409	-.0001041
/beta	.0004291	.0002873	1.49	0.135	-.000134	.0009922
/sigma2	.0005043	.000324	1.56	0.120	-.0001307	.0011393
/gamma	.0985177	.1823933	0.54	0.589	-.2589666	.456002

```
Instruments for equation   1: _cons
Instruments for equation   2: _cons
Instruments for equation   3: _cons
Instruments for equation   4: _cons

. estat overid

  Test of overidentifying restriction:

  Hansen's J chi2( 0) = 5.5e-15 (p =      .)

Note: test cannot be performed because there are no
      overidentifying restrictions.

. est store Unrestricted

. Estimate Merton model & perform overidentification test ↴

. gmm (dr-{alpha}) ((dr-{alpha})*r) ((dr-{alpha})^2-{sigma2}) (((dr-{alpha})^2-
> {sigma2})*r) winitial(identity)nolog
note: 1 missing value returned for equation 1 at initial values
note: 1 missing value returned for equation 2 at initial values
note: 1 missing value returned for equation 3 at initial values
note: 1 missing value returned for equation 4 at initial values

Final GMM criterion Q(b) =    .0055237

GMM estimation
```

Number of parameters = **2**
Number of moments   = **4**
Initial weight matrix: **Identity** Number of obs = **1,334**
GMM weight matrix: **Robust**

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/alpha	-.0008137	.0006821	-1.19	0.233	-.0021507	.0005232
/sigma2	.0004277	.0002902	1.47	0.141	-.0001412	.0009965

Instruments for equation 1: **_cons**
Instruments for equation 2: **_cons**
Instruments for equation 3: **_cons**
Instruments for equation 4: **_cons**

```
10 . estat overid

     Test of overidentifying restriction:

     Hansen's J chi2( 2) = 7.36859 (p = 0.0251)

11 . est store Merton
```

Estimate vasicek model & perform overidentification test 2

```
12 .
13 . gmm (dr-{alpha}-{beta}*r) ((dr-{alpha}-{beta}*r)*r) ((dr-{alpha}-{beta}*r)^2-
> {sigma2}) (((dr-{alpha}-{beta}*r)^2-{sigma2})*r) winitial(identity)nolog
note: 1 missing value returned for equation 1 at initial values
note: 1 missing value returned for equation 2 at initial values
note: 1 missing value returned for equation 3 at initial values
note: 1 missing value returned for equation 4 at initial values

Final GMM criterion Q(b) =    .0002049

GMM estimation

Number of parameters =  3
Number of moments    =  4
Initial weight matrix:  Identity  Number of obs  =  1,334
GMM weight matrix:  Robust
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/alpha	-.0026994	.0009734	-2.77	0.006	-.0046072	-.0007915
/beta	.0005368	.0001999	2.69	0.007	.000145	.0009286
/sigma2	.0005887	.0002977	1.98	0.048	5.20e-06	.0011722

Instruments for equation 1: **_cons**
Instruments for equation 2: **_cons**
Instruments for equation 3: **_cons**
Instruments for equation 4: **_cons**

```
14 . estat overid

     Test of overidentifying restriction:

     Hansen's J chi2( 1) = .273315 (p = 0.6011)

15 . est store Vasicek
```

16 . Estimate CIR SR model & perform overidentification test ↓

```
17 . gmm (dr-{alpha}-{beta}*r) ((dr-{alpha}-{beta}*r)*r) ((dr-{alpha}-{beta}*r)^2-
> {sigma2}*r) (((dr-{alpha}-{beta}*r)^2-{sigma2}*r)*r) winitial(identity)nolog
note: 1 missing value returned for equation 1 at initial values
note: 1 missing value returned for equation 2 at initial values
note: 1 missing value returned for equation 3 at initial values
note: 1 missing value returned for equation 4 at initial values

Final GMM criterion Q(b) =     .001642

GMM estimation

Number of parameters =     3
Number of moments    =     4
Initial weight matrix:   Identity                  Number of obs   =         1,334
GMM weight matrix:       Robust
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/alpha	-.0010252	.0007112	-1.44	0.149	-.0024191	.0003686
/beta	.0002288	.0002532	0.90	0.366	-.0002675	.000725
/sigma2	.0000917	.0000646	1.42	0.156	-.000035	.0002183

```
Instruments for equation   1: _cons
Instruments for equation   2: _cons
Instruments for equation   3: _cons
Instruments for equation   4: _cons

18 . estat overid

  Test of overidentifying restriction:

  Hansen's J chi2( 1) = 2.19038 (p = 0.1389)

19 . est store CIR_SR
```

20 . Estimate Dothan model & perform overidentification test ↓

```
21 . gmm (dr)(dr*r)(dr^2-{sigma2}*r^2)((dr^2-{sigma2}*r^2)*r) winitial(identity)no
> log
note: no parameters in equation 1
note: no parameters in equation 2
note: 1 missing value returned for equation 1 at initial values
note: 1 missing value returned for equation 2 at initial values
note: 1 missing value returned for equation 3 at initial values
note: 1 missing value returned for equation 4 at initial values

Final GMM criterion Q(b) =     .003444

GMM estimation

Number of parameters =     1
Number of moments    =     4
Initial weight matrix:   Identity                  Number of obs   =         1,334
GMM weight matrix:       Robust
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/sigma2	.0000162	7.20e-06	2.25	0.025	2.08e-06	.0000303

```
Instruments for equation   1: _cons
Instruments for equation   2: _cons
Instruments for equation   3: _cons
Instruments for equation   4: _cons
```

```
22 . estat overid

     Test of overidentifying restriction:

     Hansen's J chi2( 3) = 4.59432 (p = 0.2040)

23 . est store Dothan
```

Estimate GBM model & perform overidentification test J

```
24 .
25 . gmm (dr-{beta}*r)((dr-{beta}*r)*r)((dr-{beta}*r)^2-{sigma2}*r^2)(((dr-{beta}*
   > r)^2-{sigma2}*r^2)*r) winitial(identity)nolog
   note: 1 missing value returned for equation 1 at initial values
   note: 1 missing value returned for equation 2 at initial values
   note: 1 missing value returned for equation 3 at initial values
   note: 1 missing value returned for equation 4 at initial values

   Final GMM criterion Q(b) =    .0034254

   GMM estimation

   Number of parameters =     2
   Number of moments    =     4
   Initial weight matrix:   Identity                  Number of obs   =         1,334
   GMM weight matrix:       Robust
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/beta	.0000248	.0001265	0.20	0.844	-.000223	.0002727
/sigma2	.0000154	8.33e-06	1.84	0.065	-9.60e-07	.0000317

```
   Instruments for equation   1: _cons
   Instruments for equation   2: _cons
   Instruments for equation   3: _cons
   Instruments for equation   4: _cons

26 . estat overid

     Test of overidentifying restriction:

     Hansen's J chi2( 2) = 4.56951 (p = 0.1018)

27 . est store GBM
```

Estimate Brennan & Schwartz model & perform overidentification test J

```
28 .
29 . gmm (dr-{alpha}-{beta}*r) ((dr-{alpha}-{beta}*r)*r) ((dr-{alpha}-{beta}*r)^2-
   > {sigma2}*r^2) (((dr-{alpha}-{beta}*r)^2-{sigma2}*r^2)*r) winitial(identity)no
   > log
   note: 1 missing value returned for equation 1 at initial values
   note: 1 missing value returned for equation 2 at initial values
   note: 1 missing value returned for equation 3 at initial values
   note: 1 missing value returned for equation 4 at initial values

   Final GMM criterion Q(b) =    .0025923

   GMM estimation

   Number of parameters =     3
   Number of moments    =     4
   Initial weight matrix:   Identity                  Number of obs   =         1,334
   GMM weight matrix:       Robust
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/alpha	-.0008979	.0008413	-1.07	0.286	-.0025469	.000751
/beta	.0002882	.0002774	1.04	0.299	-.0002555	.0008319
/sigma2	8.91e-06	.0000103	0.87	0.387	-.0000113	.0000291

Instruments for equation 1: _cons
Instruments for equation 2: _cons
Instruments for equation 3: _cons
Instruments for equation 4: _cons

```
30 . estat overid

  Test of overidentifying restriction:

  Hansen's J chi2( 1) = 3.45819 (p = 0.0629)

31 . est store Brennan_Schwartz
```

Estimate CIR VR model & perform overidentification test J

```
32 .
33 . gmm (dr)(dr*r)(dr^2-{sigma2}*r^3) ((dr^2-{sigma2}*r^3)*r) winitial(identity)n
> olog
note: no parameters in equation 1
note: no parameters in equation 2
note: 1 missing value returned for equation 1 at initial values
note: 1 missing value returned for equation 2 at initial values
note: 1 missing value returned for equation 3 at initial values
note: 1 missing value returned for equation 4 at initial values

Final GMM criterion Q(b) =    .0038055

GMM estimation

Number of parameters =     1
Number of moments    =     4
Initial weight matrix:  Identity                  Number of obs   =         1,334
GMM weight matrix:      Robust
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/sigma2	2.70e-06	1.26e-06	2.15	0.032	2.35e-07	5.16e-06

Instruments for equation 1: _cons
Instruments for equation 2: _cons
Instruments for equation 3: _cons
Instruments for equation 4: _cons

```
34 . estat overid

  Test of overidentifying restriction:

  Hansen's J chi2( 3) = 5.07654 (p = 0.1663)

35 . est store CIR_VR
```

Estimate CEV model & perform overidentification test J

```
36 .
37 . gmm (dr-{beta}*r) ((dr-{beta}*r)*r) ((dr-{beta}*r)^2-{sigma2}*r^(2*{gamma}))
> (((dr-{beta}*r)^2-{sigma2}*r^(2*{gamma}))*r) winitial(identity)nolog
note: 1 missing value returned for equation 1 at initial values
note: 1 missing value returned for equation 2 at initial values
note: 1 missing value returned for equation 3 at initial values
note: 1 missing value returned for equation 4 at initial values
numerical derivatives are approximate
flat or discontinuous region encountered

Final GMM criterion Q(b) =    .0031388

GMM estimation
```

```
Number of parameters =     3
Number of moments    =     4
Initial weight matrix:  Identity                  Number of obs   =         1,334
GMM weight matrix:      Robust
```

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
/beta	-.0000453	.0001702	-0.27	0.790	-.0003789	.0002883
/sigma2	.0000881	.0001436	0.61	0.539	-.0001933	.0003696
/gamma	.5717551	.3668112	1.56	0.119	-.1471817	1.290692

```
Instruments for equation  1: _cons
Instruments for equation  2: _cons
Instruments for equation  3: _cons
Instruments for equation  4: _cons

38 . estat overid

  Test of overidentifying restriction:

  Hansen's J chi2( 1) = 4.18715 (p = 0.0407)

39 . est store CEV

40 .
end of do-file

b) 41 . *Wald Test

42 . est restore Unrestricted
(results Unrestricted are active now)

43 . *Test Unrestricted vs Merton

44 . test (_b[/beta]=0)(_b[/gamma]=0)

 ( 1)  [beta]_cons = 0
 ( 2)  [gamma]_cons = 0

           chi2(  2) =      7.92
         Prob > chi2 =      0.0191

45 . *Test Unrestricted vs Vasicek

46 . test (_b[/gamma]=0)

 ( 1)  [gamma]_cons = 0

           chi2(  1) =      0.29
         Prob > chi2 =      0.5891

47 . *Test Unrestricted vs CIR_SR

48 . test (_b[/gamma]=0.5)

 ( 1)  [gamma]_cons = .5

           chi2(  1) =      4.85
         Prob > chi2 =      0.0277
```

Conducting Wald test, I found that Vasicek is the most appropriated model as its p-value is 0.5891, which can be interpreted that Ho can't be rejected at 1%, 5% and 10% level. #

```
49 . *Test Unrestricted vs Dothan

50 . test (_b[/alpha]=0)(_b[/beta]=0)(_b[/gamma]=1)

 ( 1)  [alpha]_cons = 0
 ( 2)  [beta]_cons = 0
 ( 3)  [gamma]_cons = 1

           chi2(  3) =    34.04
         Prob > chi2 =     0.0000

51 . *Test Unrestricted vs GBM

52 . test (_b[/alpha]=0)(_b[/gamma]=1)

 ( 1)  [alpha]_cons = 0
 ( 2)  [gamma]_cons = 1

           chi2(  2) =    27.48
         Prob > chi2 =     0.0000

53 . *Test Unrestricted vs Brennan_Schwartz

54 . test (_b[/gamma]=1)

 ( 1)  [gamma]_cons = 1

           chi2(  1) =    24.43
         Prob > chi2 =     0.0000

55 . *Test Unrestricted vs CIR_VR

56 . test (_b[/alpha]=0)(_b[/beta]=0)(_b[/gamma]=1.5)

 ( 1)  [alpha]_cons = 0
 ( 2)  [beta]_cons = 0
 ( 3)  [gamma]_cons = 1.5

           chi2(  3) =    95.71
         Prob > chi2 =     0.0000

57 . *Test Unrestricted vs CEV

58 . test (_b[/alpha]=0)

 ( 1)  [alpha]_cons = 0

           chi2(  1) =     4.20
         Prob > chi2 =     0.0404

59 . est table Unrestricted Merton Vasicek CIR_SR Dothan GBM Brennan_Schwartz CIR_
   > VR CEV, star(0.1 0.05 0.01)
```

Variable	Unrestricted
alpha	
_cons	**-.00237253****
beta	
_cons	**.00042912**
sigma2	
_cons	**.00050427**
gamma	
_cons	**.09851773**

legend: * p<.1; ** p<.05; *** p<.01

Variable	Merton
alpha	
_cons	**-.00081372**
beta	
_cons	
sigma2	
_cons	**.00042766**
gamma	
_cons	

legend: * p<.1; ** p<.05; *** p<.01

Variable	Vasicek
alpha	
_cons	**-.00269937*** **
beta	
_cons	**.00053681*** **
sigma2	
_cons	**.00058872** **
gamma	
_cons	

legend: * p<.1; ** p<.05; *** p<.01

Variable	CIR_SR
alpha	
_cons	**-.00102525**
beta	
_cons	**.00022877**
sigma2	
_cons	**.00009168**
gamma	
_cons	

legend: * p<.1; ** p<.05; *** p<.01

Variable	Dothan
alpha	
_cons	
beta	
_cons	
sigma2	
_cons	**.00001618** **
gamma	
_cons	

legend: * p<.1; ** p<.05; *** p<.01

Variable	GBM
alpha	
_cons	
beta	
_cons	**.00002483**
sigma2	
_cons	**.00001536***
gamma	
_cons	

legend: * p<.1; ** p<.05; *** p<.01

Variable	Brennan_Sch~z
alpha	
_cons	**-.00089794**
beta	
_cons	**.0002882**
sigma2	
_cons	**8.909e-06**
gamma	
_cons	

legend: * p<.1; ** p<.05; *** p<.01

Variable	CIR_VR
alpha	
_cons	
beta	
_cons	
sigma2	
_cons	**2.698e-06****
gamma	
_cons	

legend: * p<.1; ** p<.05; *** p<.01

Variable	CEV
alpha	
_cons	
beta	
_cons	**-.00004534**
sigma2	
_cons	**.00008815**
gamma	
_cons	**.57175507**

legend: * p<.1; ** p<.05; *** p<.01

```
60 . log close
      name:  <unnamed>
       log:  C:\Users\user\Documents\BE TU\Year2\EE426\HW5\5.9.smcl
  log type:  smcl
 closed on:  23 Feb 2021, 12:37:27
```

2. From the model:

$$y_i = \alpha + \beta x_i + u_i$$

where: y_i is dependent variable
x_i is explanatory variable
u_i is stochastic error term
$E(u_i) = 0$ but $E(x_i u_i) \neq 0$.

From the given data set (assign5-2.dta):

a. Estimate model (3) using OLS.
b. Based on z_1, z_2, z_3, z_4, determine the best set of instrumental variables, then, estimate model (3) using GMM.

a) 4 . reg y x → estimating the model using OLS

Source	SS	df	MS
Model	132481.702	1	132481.702
Residual	146722.774	498	294.624043
Total	279204.475	499	559.528007

Number of obs	500
F(1, 498)	449.66
Prob > F	0.0000
R-squared	0.4745
Adj R-squared	0.4734
Root MSE	17.165

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
x	5.431333	.2561312	21.21	0.000	4.928102	5.934564
_cons	-33.31333	2.673868	-12.46	0.000	-38.56678	-28.05988

b) 5 . ivregress gmm y (x = z1 z2)

Instrumental variables (GMM) regression

Number of obs	500
Wald chi2(1)	36.13
Prob > chi2	0.0000
R-squared	0.3136
Root MSE	19.577

GMM weight matrix: Robust

y	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
x	2.269419	.3775527	6.01	0.000	1.529429	3.009409
_cons	-1.848121	3.763999	-0.49	0.623	-9.225423	5.529182

Instrumented: x
Instruments: z1 z2

The best set of instrumental variables is z_1 and z_4 because both of them are highly correlate with x (rank 1st and 2nd). Moreover, when using the J-test, H_0 can't be rejected. Thus, the over-identified moment are satisfied.

```
6 . ivregress gmm y ( x = z1 z3 )

Instrumental variables (GMM) regression         Number of obs   =        500
                                                Wald chi2(1)    =     412.16
                                                Prob > chi2     =     0.0000
                                                R-squared       =     0.4692
GMM weight matrix: Robust                       Root MSE        =     17.217

------------------------------------------------------------------------------
             |               Robust
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           x |    5.902412   .2907357    20.30   0.000     5.332581    6.472244
       _cons |   -37.03774   3.094795   -11.97   0.000    -43.10343   -30.97206
------------------------------------------------------------------------------
Instrumented:  x
Instruments:   z1 z3

7 . ivregress gmm y ( x = z1 z4 )

Instrumental variables (GMM) regression         Number of obs   =        500
                                                Wald chi2(1)    =      40.88
                                                Prob > chi2     =     0.0000
                                                R-squared       =     0.3031
GMM weight matrix: Robust                       Root MSE        =     19.727

------------------------------------------------------------------------------
             |               Robust
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           x |    2.167043   .3389432     6.39   0.000     1.502726    2.831359
       _cons |   -.6716121   3.395567    -0.20   0.843    -7.326801    5.983577
------------------------------------------------------------------------------
Instrumented:  x
Instruments:   z1 z4

8 . ivregress gmm y ( x = z2 z3 )

Instrumental variables (GMM) regression         Number of obs   =        500
                                                Wald chi2(1)    =     336.01
                                                Prob > chi2     =     0.0000
                                                R-squared       =          .
GMM weight matrix: Robust                       Root MSE        =     26.192

------------------------------------------------------------------------------
             |               Robust
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           x |    12.04153   .6569059    18.33   0.000     10.75402    13.32904
       _cons |   -99.72932   6.694597   -14.90   0.000    -112.8505   -86.60815
------------------------------------------------------------------------------
Instrumented:  x
Instruments:   z2 z3

9 . ivregress gmm y ( x = z2 z4 )

Instrumental variables (GMM) regression         Number of obs   =        500
                                                Wald chi2(1)    =      33.24
                                                Prob > chi2     =     0.0000
                                                R-squared       =     0.3176
GMM weight matrix: Robust                       Root MSE        =     19.521

------------------------------------------------------------------------------
             |               Robust
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           x |    2.308142   .4003308     5.77   0.000     1.523508    3.092776
       _cons |   -2.231979   3.988067    -0.56   0.576    -10.04845    5.584488
------------------------------------------------------------------------------
Instrumented:  x
Instruments:   z2 z4
```

```
10 . ivregress gmm y ( x = z3 z4 )

Instrumental variables (GMM) regression          Number of obs   =        500
                                                 Wald chi2(  1)  =     457.33
                                                 Prob > chi2     =     0.0000
                                                 R-squared       =     0.4615
GMM weight matrix: Robust                        Root MSE        =     17.341

------------------------------------------------------------------------------
             |               Robust
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           x |    6.237532   .2916741    21.39   0.000     5.665861    6.809202
       _cons |   -40.18052   3.069851   -13.09   0.000    -46.19731   -34.16372
------------------------------------------------------------------------------
Instrumented:  x
Instruments:   z3 z4

11 . corr
(obs=500)

             |        t        y        x       z1       z2       z3       z4
-------------+---------------------------------------------------------------
           t |   1.0000
           y |   0.0681   1.0000
           x |   0.0517   0.6888   1.0000
          z1 |   0.0661   0.2002   0.7215   1.0000
          z2 |   0.0062   0.1203   0.2352   0.1937   1.0000
          z3 |   0.0387   0.9214   0.5487   0.0918   0.0933   1.0000
          z4 |   0.0143   0.1887   0.6954   0.4738   0.1607   0.0828   1.0000

12 . qui ivregress gmm y ( x = z1 z2 )

13 . estat overid

  Test of overidentifying restriction:

  Hansen's J chi2(1) = 2.55533 (p = 0.1099)

14 . qui ivregress gmm y ( x = z1 z3 )

15 . estat overid

  Test of overidentifying restriction:

  Hansen's J chi2(1) = 159.838 (p = 0.0000)

16 . qui ivregress gmm y ( x = z1 z4 )

17 . estat overid

  Test of overidentifying restriction:

  Hansen's J chi2(1) = .012951 (p = 0.9094)

18 . qui ivregress gmm y ( x = z2 z3 )

19 . estat overid

  Test of overidentifying restriction:

  Hansen's J chi2(1) = 24.2483 (p = 0.0000)
```

```
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20 . qui ivregress gmm y ( x = z2 z4 )

21 . estat overid

     Test of overidentifying restriction:

     Hansen's J chi2( 1) = 2.47701 (p = 0.1155)

22 . qui ivregress gmm y ( x = z3 z4 )

23 . estat overid

     Test of overidentifying restriction:

     Hansen's J chi2( 1) = 148.756 (p = 0.0000)

24 . log close
          name:  <unnamed>
           log:  C:\Users\user\Documents\BE TU\Year2\EE426\HW5\5.93.smcl
     log type:  smcl
    closed on:  23 Feb 2021, 20:17:48
```

c. Determine whether OLS estimated results in (a) or GMM estimated results in (b) is more appropriate using the Hansen's J chi2 statistic test.

c) Through J-test of the model using z_3 and z_4 as instrumental variables, I found that the over-identified moment conditions are true as mentioned the details in (b).

It can be concluded that the GMM estimated results in (b) is more apropriate than the OLS estimated results in (a) because X in the OLS model has an endogeneity $E(x_i u_i) \neq 0$.