```
. *a)
. reg loggdp risk
```

Source	SS	df	MS		
Model	36.2163143	1	36.2163143	Number of obs	= 64
Residual	32.9382286	62	.531261752	F(1, 62)	= 68.17
				Prob > F	= 0.0000
				R-squared	= 0.5237
				Adj R-squared	= 0.5160
Total	69.1545429	63	1.09769116	Root MSE	= .72888

loggdp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
risk	.516187	.0625186	8.26	0.000	.3912141	.6411599
_cons	4.687415	.417441	11.23	0.000	3.852962	5.521867

```
. reg risk logmort0
```

Source	SS	df	MS		
Model	37.1754537	1	37.1754537	Number of obs	= 64
Residual	98.7466676	62	1.59268819	F(1, 62)	= 23.34
				Prob > F	= 0.0000
				R-squared	= 0.2735
				Adj R-squared	= 0.2618
Total	135.922121	63	2.15749399	Root MSE	= 1.262

risk	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
logmort0	-.6132892	.1269412	-4.83	0.000	-.8670411	-.3595374
_cons	9.365895	.6105941	15.34	0.000	8.145335	10.58646

```
. ivregress 2sls loggdp (risk=logmort0)

Instrumental variables 2SLS regression          Number of obs   =         64
                                                Wald chi2(1)    =      36.60
                                                Prob > chi2     =     0.0000
                                                R-squared       =     0.1880
                                                Root MSE        =     .93672
```

loggdp	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
risk	.9294897	.1536318	6.05	0.000	.6283768	1.230603
_cons	1.994296	1.007904	1.98	0.048	.0188405	3.969751

```
Instrumented: risk
 Instruments: logmort0
```

d)

```
. *d)
. *Two stage approach for 2sls
. reg risk logmort0
```

Source	SS	df	MS	Number of obs	=	64
				F(1, 62)	=	23.34
Model	37.1754537	1	37.1754537	Prob > F	=	0.0000
Residual	98.7466676	62	1.59268819	R-squared	=	0.2735
				Adj R-squared	=	0.2618
Total	135.922121	63	2.15749399	Root MSE	=	1.262

risk	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
logmort0	-.6132892	.1269412	-4.83	0.000	-.8670411	-.3595374
_cons	9.365895	.6105941	15.34	0.000	8.145335	10.58646

```
. predict risk_hat, xb

. reg loggdp risk_hat
```

Source	SS	df	MS	Number of obs	=	64
				F(1, 62)	=	53.77
Model	32.1177716	1	32.1177716	Prob > F	=	0.0000
Residual	37.0367713	62	.597367279	R-squared	=	0.4644
				Adj R-squared	=	0.4558
Total	69.1545429	63	1.09769116	Root MSE	=	.7729

loggdp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
risk_hat	.9294897	.126763	7.33	0.000	.676094	1.182885
_cons	1.994296	.8316306	2.40	0.020	.3318896	3.656701

Yes, they are the same

f)

```
. reg loggdp risk latitude africa
```

Source	SS	df	MS		
Model	45.8984283	3	15.2994761	Number of obs	= 64
Residual	23.2561146	60	.387601911	F(3, 60)	= 39.47
				Prob > F	= 0.0000
Total	69.1545429	63	1.09769116	R-squared	= 0.6637
				Adj R-squared	= 0.6469
				Root MSE	= .62258

loggdp	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
risk	.3765228	.0608421	6.19	0.000	.2548205	.4982252
latitude	1.382463	.6440401	2.15	0.036	.0941905	2.670735
africa	-.7232696	.1712967	-4.22	0.000	-1.065914	-.3806251
_cons	5.652234	.4152858	13.61	0.000	4.821539	6.482929

The coefficients of latitude and africa are significant. They can be predictive (show causality) if they are backed by theory.

g)

```
. ivregress 2sls loggdp latitude africa (risk= logmort0)

Instrumental variables 2SLS regression          Number of obs   =         64
                                                Wald chi2(3)    =      57.55
                                                Prob > chi2     =     0.0000
                                                R-squared       =     0.3922
                                                Root MSE        =     .81039
```

loggdp	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
risk	.799968	.2497417	3.20	0.001	.3104831	1.289453
latitude	-.0553109	1.161701	-0.05	0.962	-2.332203	2.221581
africa	-.3479258	.3062581	-1.14	0.256	-.9481806	.252329
_cons	2.99507	1.581523	1.89	0.058	-.1046587	6.094798

```
Instrumented: risk
 Instruments: latitude africa logmort0

.
```

Now latitude and africa become insignificant.

i)

```
. gen logmort02= (logmort0)^2

. reg risk logmort0 logmort02
```

Source	SS	df	MS	Number of obs	=	64
				F(2, 61)	=	18.42
Model	51.1839123	2	25.5919562	Prob > F	=	0.0000
Residual	84.738209	61	1.38915097	R-squared	=	0.3766
				Adj R-squared	=	0.3561
Total	135.922121	63	2.15749399	Root MSE	=	1.1786

risk	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
logmort0	-2.645684	.6508988	-4.06	0.000	-3.947237	-1.344132
logmort02	.2101141	.066166	3.18	0.002	.077807	.3424211
_cons	13.94859	1.551696	8.99	0.000	10.84579	17.0514

A unit change in logmort0 leads to a **larger** change in risk as compared to the linear reduced form equation.

```
. *structural equation
. ivregress 2sls loggdp (risk=logmort0 logmort02)

Instrumental variables 2SLS regression          Number of obs   =         64
                                                Wald chi2(1)    =      46.68
                                                Prob > chi2     =     0.0000
                                                R-squared       =     0.3948
                                                Root MSE        =     .80865

------------------------------------------------------------------------------
      loggdp | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
        risk |   .7722554   .1130303     6.83   0.000       .55072    .9937908
       _cons |   3.018849   .7434204     4.06   0.000     1.561772    4.475926
------------------------------------------------------------------------------
Instrumented: risk
 Instruments: logmort0 logmort02
```

We see that coefficient reduces a little. R squared value falls.

j)

```
. estat endogenous

 Tests of endogeneity
 H0: Variables are exogenous

 Durbin (score) chi2(1)          =  10.4601  (p = 0.0012)
 Wu-Hausman F(1,61)              =  11.9176  (p = 0.0010)
```

P value is less than 0.05. Thus we reject the null. This implies that there is endogeneity.

k)

```
test logmort0 logmort02

( 1)  logmort0 = 0
( 2)  logmort02 = 0

      F(  2,    61) =   18.42
           Prob > F =    0.0000
```

Instruments are relevant as F value is greater than 10

I)

```
. ivregress 2sls loggdp (risk=logmort0 logmort02)

Instrumental variables 2SLS regression          Number of obs   =         64
                                                Wald chi2(1)    =      46.68
                                                Prob > chi2     =     0.0000
                                                R-squared       =     0.3948
                                                Root MSE        =     .80865

------------------------------------------------------------------------------
      loggdp | Coefficient  Std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
        risk |   .7722554   .1130303     6.83   0.000       .55072    .9937908
       _cons |   3.018849   .7434204     4.06   0.000     1.561772    4.475926
------------------------------------------------------------------------------
Instrumented: risk
 Instruments: logmort0 logmort02

. predict eps_hat, residual

. reg eps_hat logmort0 logmort02

      Source |       SS           df       MS      Number of obs   =        64
-------------+----------------------------------   F(2, 61)        =      2.66
       Model |  3.35810086         2  1.67905043   Prob > F        =    0.0780
    Residual |  38.4926828        61  .631027586   R-squared       =    0.0802
-------------+----------------------------------   Adj R-squared   =    0.0501
       Total |  41.8507836        63  .664298153   Root MSE        =    .79437

------------------------------------------------------------------------------
     eps_hat | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
    logmort0 |   .7516194   .4386953     1.71   0.092     -.125606    1.628845
   logmort02 |  -.0876735   .0445948    -1.97   0.054    -.1768463    .0014993
       _cons |  -1.464118   1.045818    -1.40   0.167    -3.555361    .6271237
------------------------------------------------------------------------------
```