

# LAB 1: Context-Conditionality, (Inter)Dependence, & Endogeneity

use "C:\Work\WPDOCS\Syllabi\PS 699\PS699 Data\debt\_699.dta", clear

**OMITTED VARIABLE BIAS, three true regressors, 2 included, 1 omitted:**

**True:** reg debtx growth ue enop if debtx~=.

**OV Biased:** reg debtx growth ue if debtx~=.

**Omitted on Included:** reg enop growth ue if debtx~=.

**OVBiasdCoeff=ExclTrue\*ExclOnIncl+TrueCoeff (g):**

display -1.014774\*-.0211177-.4737356

**OVBiasdCoeff=ExclTrue\*ExclOnIncl+TrueCoeff (u):**

display -1.014774\*-.0404972+2.019045

**OMITTED VARIABLE BIAS, four true regressors, 2 included, 2 omitted:**

**True:** reg debtx growth ue enop cog if debtx~=.

**OV Biased:** reg debtx growth ue if debtx~=.

**Omitted on Included 1:**

reg enop growth ue if debtx~=.

**Omitted on Included 2:**

reg cog growth ue if debtx~=.

**Recall formula here to right:**

$$\begin{bmatrix} \hat{\beta}_{grow}^{OVB} \\ \hat{\beta}_{unem}^{OVB} \end{bmatrix} = \begin{bmatrix} \hat{\beta}_{grow}^{true} \\ \hat{\beta}_{unem}^{true} \end{bmatrix} + \begin{bmatrix} \hat{\beta}_{grow}^{enop} & \hat{\beta}_{grow}^{cog} \\ \hat{\beta}_{unem}^{enop} & \hat{\beta}_{unem}^{cog} \end{bmatrix} \begin{bmatrix} \hat{\beta}_{enop}^{true} \\ \hat{\beta}_{cog}^{true} \end{bmatrix}$$

Reg's @ Om on all Inc

$$\hat{\beta}_{grow}^{OVB} = \hat{\beta}_{grow}^{true} + \hat{\beta}_{grow}^{enop} \hat{\beta}_{enop}^{true} + \hat{\beta}_{grow}^{cog} \hat{\beta}_{cog}^{true}$$

display -.5395289-.0211177\*-1.03081+.1042465\*.6278835

$$\hat{\beta}_{unem}^{OVB} = \hat{\beta}_{unem}^{true} + \hat{\beta}_{unem}^{enop} \hat{\beta}_{enop}^{true} + \hat{\beta}_{unem}^{cog} \hat{\beta}_{cog}^{true}$$

display 2.030808-.0404972\*-1.03081-.0197694\*.6278835

**MEASUREMENT ERROR, bivariate case:**

$$\text{TRUTH: } y = x^* \beta + \varepsilon$$

$$\text{ESTIMATE: } y = x \hat{b} + u, \text{ with } x = x^* + \omega, \omega = \text{white noise}$$

```
gen xstar=rnormal()  
gen omega=rnormal()  
gen x=xstar+omega  
gen y=xstar+rnormal()  
reg y xstar  
reg y x
```

**MEASUREMENT ERROR, trivariate case:**

$$\text{TRUTH: } y = \alpha x^* + z \gamma + \varepsilon$$

$$\text{ESTIMATE: } y = \hat{a}x + \hat{g}z + u, \text{ with } x = x^* + \omega, \omega = \text{white noise}$$

**Case with z & x uncorrelated:**

```
drop y  
gen z=2*rnormal()  
gen y=xstar+z+rnormal()  
reg y xstar z  
reg y x z
```

**Case with z & x correlated:**

```
drop y z  
gen z=xstar+2*rnormal()  
gen y=xstar+z+rnormal()  
reg y xstar z  
reg y x z
```

**SIMULTANEITY BIAS, 2x2 case:**

TRUTH:  $y = .5x + z + \varepsilon_y$   
 $x = .5y + w + \varepsilon_x$

```
drop x y z
gen err_y=rnormal()
gen err_x=rnormal()
gen z=rnormal()
gen w=rnormal()
```

TRUTH: 
$$\begin{aligned} y = .5x + z + \varepsilon_y &\Rightarrow y = .5(.5y + w + \varepsilon_x) + z + \varepsilon_y = (1 - .25)^{-1} \left[ .5(w + \varepsilon_x) + z + \varepsilon_y \right] \\ x = .5y + w + \varepsilon_x &\Rightarrow x = .5(.5x + z + \varepsilon_y) + w + \varepsilon_x = (1 - .25)^{-1} \left[ .5(z + \varepsilon_y) + w + \varepsilon_x \right] \end{aligned}$$

```
gen y=(1/(1-.25))*(.5*w+.5*err_x+z+err_y)
gen x=(1/(1-.25))*(.5*z+.5*err_y+w+err_x)
reg y x z
reg x y w
```

**Generalized (Normal) Linear-Regression Model:**

```
. reg debtx growth ue enop cog if debtx~=.  
. predict LSresids , res  
. reg LSresids us ja ge fr it uk ca au be de fi gr ir ne no po sp sw sz al nz
```

**Unit Heterogeneity; Try Fixed Effects:**

```
. reg debtx us ja ge fr it uk ca au be de fi gr ir ne no po sp sw sz al nz growth ue  
enop cog  
. drop LSresids  
. predict LSresids, res  
. gen LSresids2=LSresids^2  
. reg LSresids2 us ja ge fr it uk ca au be de fi gr ir ne no po sp sw sz al nz
```

**Still lot of panel heteroskedasticity; return primary model to memory:**

```
. reg debtx us ja ge fr it uk ca au be de fi gr ir ne no po sp sw sz al nz growth ue  
enop cog
```

```
. help hetttest
```

**Cook-Wesiberg:**

```
. estat hetttest
```

**Augmented Cook-Weisberg:**

```
. estat hetttest, rhs
```

**White's General test:**

```
. help whitetst [install if needed]
```

```
. whitetst
```

```
. reg debtx us ja ge fr it uk ca au be de fi gr ir ne no po sp sw sz al nz growth ue  
enop cog, vce(robust)
```

```
xtset ctry year
```

```
xtgls debtx us ja ge fr it uk ca au be de fi gr ir ne no po sp sw sz al nz growth ue  
enop cog, p(h)
```