Quiz II.

Question 1. In the lab on multicollinearity last week, we examined the case of multiple regression model with two explanatory variables. The four cases were: a) Case 1. Correlation (x1, x2) =0; b) Case 2. Correlation (x1, x2) =0.4; c) Case 3. Correlation (x1, x2) =0.7 and d) Case 4. Correlation (x1, x2) =0.9.

The following Stata commands were issued in each case (this example refers to case 3):

```
clear

mat C=(1,.7\.7,1)

set seed 999

corr2data x1 x2, n(30) corr (C)

generate r=invnorm(uniform())

generate y=.5 + x1 + x2 + r

regress y x1 x2

estat vce, block format(%7.2f)
```

The results below represent the variance-covariance matrix for the four cases when n=30. Can you match the matrixes with the cases?

Hint: Remember that the variance-covariance matrix can be summarized as:

$$Var(\beta)=\sigma^2\begin{bmatrix} s_1^2 & s_{12} & s_{13} & \dots & s_{1j} \\ s_{21} & s_2^2 & s_{23} & \dots & s_{2j} \\ s_{31} & s_{32} & s_3^2 & \dots & s_{3j} \\ \dots & \dots & \dots. & \dots & \\ s_{j1} & s_{j2} & s_{j2} & \dots & s_j^2 \end{bmatrix}$$

such that $s_j^2=\frac{1}{n}\sum_{i=1}^{n}(x_{ij}-\bar{x}_j)^2$ = variance of jth variable

and $s_{jk}=\frac{1}{n}\sum_{i=1}^{n}(x_{ij}-\bar{x}_j)(x_{ik}-\bar{x}_k)$ = covariance of jth and kth variables

and $\bar{x}_j=\frac{1}{n}\sum_{i=1}^{n}x_{ij}$

Hint: Please note that we are creating a data generating process with a positive correlation between X1 and X2. However, in the Variance-Covariance Matrix (VCE) below there are negative covariances reported. This is because if there is positive covariance, the VCE should have a negative sign for the covariance between X1 and X2. This is because when taking the inverse of X’X, the off-diagonal elements switch signs. If the correlation between X1 and X2 was negative in the DGP, the off-diagonal in the VCE would take on a positive sign.

A)

```
Covariance matrix of coefficients of regress model

covariance
```

	x1	x2	_cons
x1	0.06		
x2	-0.04	0.06	
_cons	0.00	0.00	0.03

Case 3. Correlation (x1, x2) =0.7

B)

```
Covariance matrix of coefficients of regress model

covariance
```

	x1	x2	_cons
x1	0.03		
x2	-0.01	0.03	
_cons	0.00	-0.00	0.03

Case 2. Correlation (x1, x2) =0.4

C)

```
Covariance matrix of coefficients of regress model

covariance
```

	x1	x2	_cons
x1	0.15		
x2	-0.14	0.15	
_cons	0.00	0.00	0.03

Case 4. Correlation (x1, x2) =0.9

D)

```
Covariance matrix of coefficients of regress model

covariance
```

	x1	x2	_cons
x1	0.03		
x2	-0.00	0.03	
_cons	0.00	-0.00	0.03

Case 1. Correlation (x1, x2) =0

Question 2. In the lab on multicollinearity last week, we examined the case of multiple regression model with two explanatory variables. The four cases were: a) Case 1. Correlation (x1, x2) =0; b) Case 2. Correlation (x1, x2) =0.4; c) Case 3. Correlation (x1, x2) =0.7 and d) Case 4. Correlation (x1, x2) =0.9.

The following Stata commands were issued in each case:

clear

mat C=(1,.7\.7,1)

set seed 999

corr2data x1 x2, n(30) corr (C)

```
generate r=invnorm(uniform())

generate y=.5 + x1 + x2 + r

regress y x1 x2

estat vce
```

The results below represent the correlation matrix for the four cases when n=30. Can you match the matrixes with the cases?

Hint: Remember that the correlation matrix can be summarized as:

$$R = \begin{matrix} 1 & r_{12} & r_{13} & \dots & r_{1j} \\ r_{21} & 1 & r_{23} & \dots & r_{2j} \\ r_{31} & r_{32} & 1 & \dots & r_{3j} \\ \dots & \dots & \dots. & \dots & \\ r_{j1} & r_{j2} & r_{j2} & \dots & 1 \end{matrix}$$

such that

$$r_{jk} = \frac{s_{jk}}{s_j s_k}$$ or the correlation coefficient between x_j and x_k

A)

```
Correlation matrix of coefficients of regress model

correlation
```

	x1	x2	_cons
x1	1.00		
x2	-0.70	1.00	
_cons	0.00	0.00	1.00

Case 3. Correlation (x1, x2) =0.7

B)

```
Correlation matrix of coefficients of regress model

correlation

             |      x1       x2    _cons
-------------+---------------------------
          x1 |    1.00
          x2 |   -0.40     1.00
       _cons |    0.00    -0.00     1.00
```

Case 2. Correlation (x1, x2) =0.4

C)

```
. estat vce, correlation block format(%7.2f)

Correlation matrix of coefficients of regress model

correlation

             |      x1       x2    _cons
-------------+---------------------------
          x1 |    1.00
          x2 |   -0.90     1.00
       _cons |    0.00     0.00     1.00
```

Case 4. Correlation (x1, x2) =0.9

D)

```
Correlation matrix of coefficients of regress model

correlation

             |      x1       x2    _cons
-------------+---------------------------
          x1 |    1.00
          x2 |   -0.00     1.00
       _cons |    0.00    -0.00     1.00
```

Case 1. Correlation (x1, x2) =0