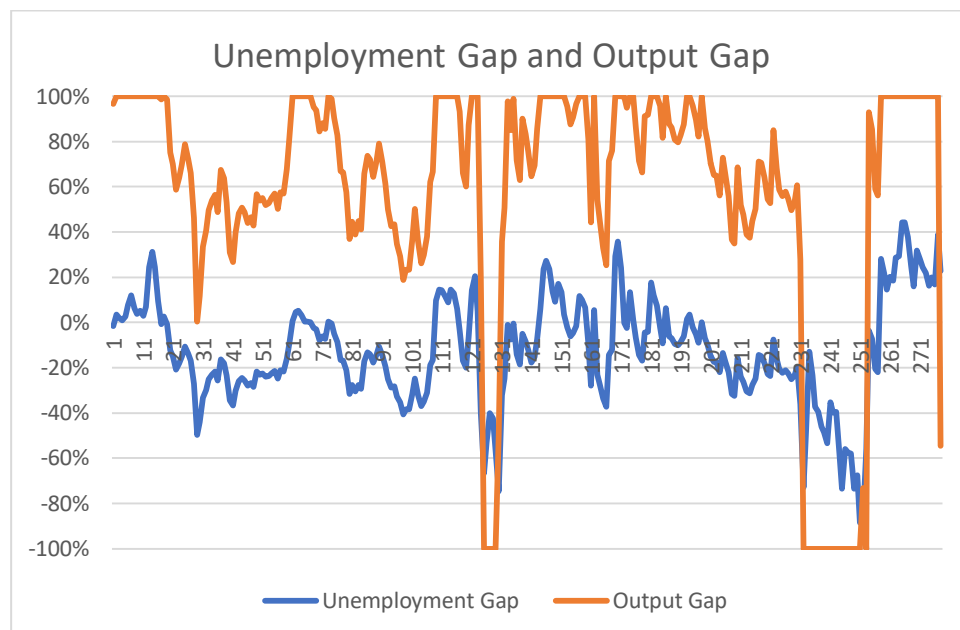


1. a) The direction of fluctuations of unemployment and output is procyclical.

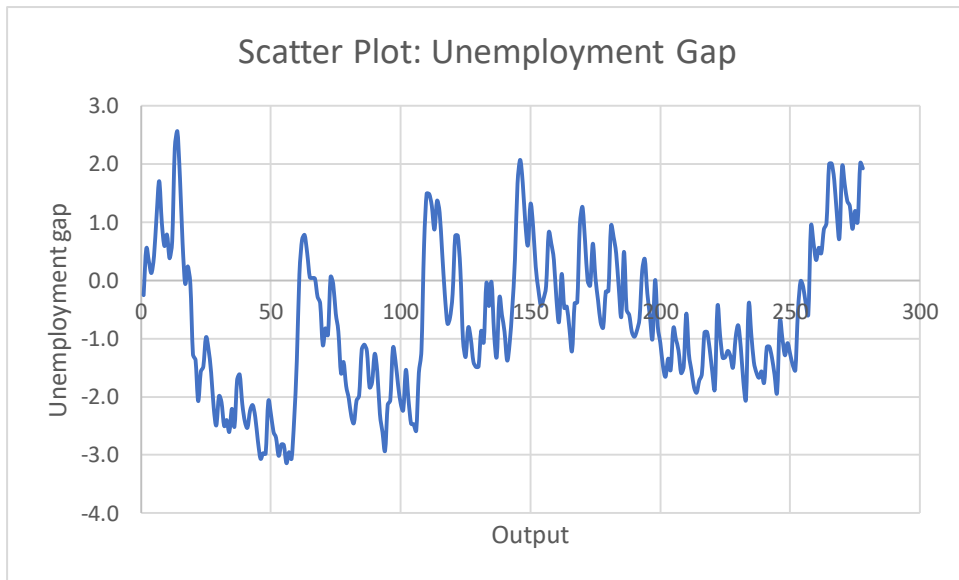
Unemployment usually increases when the output decreases. A decrease in output means that institutions are not utilizing economic resources to their potential. The lack of exploitation limits the job opportunities available thus increased unemployment.

b) When the sign of m is positive, then the variables have a positive relationship. An increase in the independent variable results to an increase in the dependent variable and a decrease in the independent variable results in a decrease in the dependent variable when the cycle is procyclical. In a countercyclical cycle, the sign of m is negative. An increase in the independent variable makes the dependent variable to decrease and a decrease in the independent variable makes the independent variable to increase.

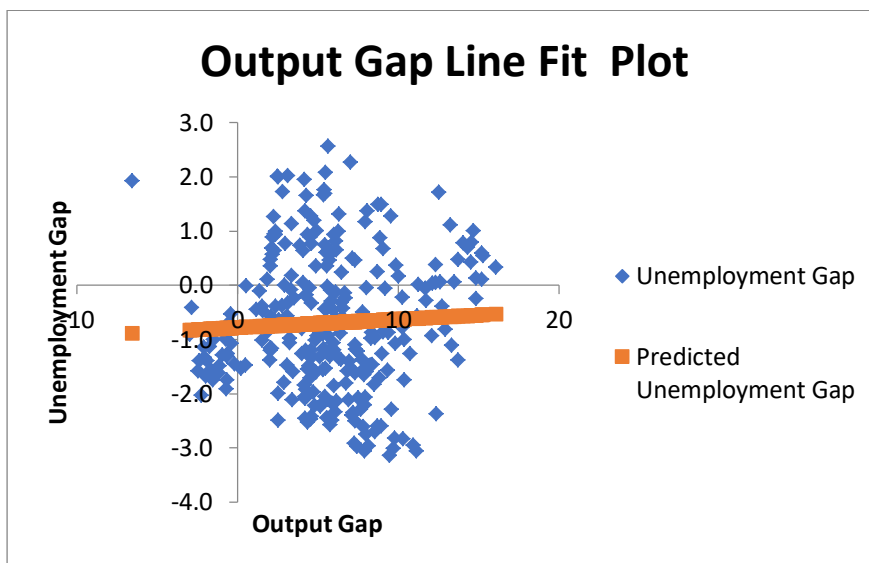
2. A)



b)



c)



$$Y = mx + b$$

Y = Unemployment gap

X = output

b = constant

$$Y = -0.78X + 0.015$$

<i>Coefficients</i>	
Intercept	-0.78316
Output	
Gap	0.015233

d) The regression analysis supports Okun's law. Okun states that unemployment and output are inversely related. Unemployment is high when output is low and low when output is high.

3. Deriving the optimal rate rule

3 The loss function is

$$L = (y_t - y^p)^2 + \beta(\pi_t - \pi^T)^2 \quad \dots (1)$$

The IS curve is $y_t - y^p = -\frac{1}{\sigma}(r_t - r^*) \dots (2)$

The Phillips curve is $\pi_t = \pi_{t-1} + \gamma(y_t - y^p) \dots (3)$

Substituting the Phillips curve into the loss curve, we get

$$L = (y_t - y^p)^2 + \beta(\pi_{t-1} + \gamma(y_t - y^p) - \pi^T)^2 \quad \dots (4)$$

We differentiate the loss function with respect to y_t i.e

$$\frac{\partial L}{\partial y_t} = 2(y_t - y^p) + 2\beta\gamma(\pi_{t-1} + \gamma(y_t - y^p) - \pi^T) = 0 \quad (5)$$

From equation 5

$$(y_t - y^p) = -\beta\gamma(\pi_t - \pi^T)$$

The projection of the central bank at time t is

$$(y_{t+1} - y^p) = -\beta\gamma(\pi_{t+1} - \pi^T)$$

The inflation prediction of the central bank is

$$\pi_{t+1} = \pi_t + \gamma(y_{t+1} - y^p)$$

The output gap is $y_{t+1} - y^p = -\frac{1}{\sigma}(r_t - r^*)$

substituting Phillips curve to optimal path we get

$$y_{t+1} - y^p = -\beta\gamma(\pi_{t+1} - \pi^T)$$

Solving for interest rate at time t

$$r_t = r^* + \frac{1}{\frac{1}{\sigma}\gamma(1 + \frac{1}{\beta})}(\pi_t - \pi^T)$$

4. $0.10\% = 1/100$

The bonds are worthy \$65 million

The initial interest rate is 0.25%

$$25/100 * 65,000,000$$

$$= \$16,250,000$$

$$1/100 \text{ interest rate} = 1/100 * \$65,000,000$$

$$= \$650,000$$

The bank will pay $\$(16,250,000 - 650,000)$

= \$15.6 million