

4. Now let's look at the association between $x = \text{GDP}$ and $y = \text{CO}_2$. $\bar{x} = 16$, $\bar{y} = 6.81$, $\sigma_x = 10.60$, $\sigma_y = 4.67$ and $r = 0.786$.

(a) Find the regression equation for predicted CO2 given a GDP value.

$$b = r \frac{\sigma_y}{\sigma_x} = (0.786) \left(\frac{4.67}{10.60} \right) = 0.34$$

$$a = \bar{y} - b\bar{x} = 6.81 - (0.34)(16) = 1.37$$

$$\hat{y} = 1.37 + 0.34x$$

(b) Predict CO2 at the (i) minimum x value of 0.8 and the (ii) maximum $x = 34.3$.

$$\hat{y} = 1.37 + 0.34(0.8) = 1.642 \text{ predicted CO}_2 \text{ @ GDP \$800}$$

$$\hat{y} = 1.37 + 0.34(34.3) = 13.03 \quad \text{GDP \$34,300}$$

(c) For the US, $x = 34.3$ and $y = 19.7$. Find the predicted CO2 value and the residual. Interpret this large positive

$$\hat{y} = 13.03 \text{ from part (b)}$$

$$\text{Residuals} = y - \hat{y} = 19.7 - 13.03 = 6.67$$

We have 6.67 more CO2 than predicted from GDP level.

(d) Switzerland is nearly as economically advanced as the US, having $x = 28.1$ and $y = 5.7$. Find the predicted CO2 value and the residual. Interpret.

$$\hat{y} = 1.37 + 0.34(28.1) = 10.924$$

$$\text{Residual} = y - \hat{y} = 5.7 - 10.924 = -5.224$$

Switzerland has 5.224 less CO2 than predicted from its GDP level.