Problem 1 (Wooldridge, problem 4.1, p. 159)
Consider an equation to explain salaries of CEOs in terms of annual firm sales, return on equity (roe, in percentage form), and return on the firms stock (ros, in percentage form):

\[
\log(salary) = \beta_0 + \beta_1 \log(sales) + \beta_2 \text{roe} + \beta_3 \text{ros} + u,
\]

(i) In terms of the model parameters, state the null hypothesis that, after controlling for sales and roe, ros has no effect on CEO salary. State the alternative that better stock market performance increases a CEOs salary.

(ii) Using the data in CEOSAL1.RAW, the following equation was obtained by OLS:

\[
\hat{\log(salary)} = 4.32 + .280 \log(sales) + .0174 \text{roe} + .00024 \text{ros} \\
R^2 = .283
\]

By what percentage is salary predicted to increase if ros increases by 50 points? Does ros have a practically large effect on salary?

(iii) Test the null hypothesis that ros has no effect on salary against the alternative that ros has a positive effect. Carry out the test at the 10% significant level.

(iv) Would you include ros in a final model explaining CEO compensation in terms of firm performance? Explain.

Problem 2 (Wooldridge, problem 4.4, p. 160)
The following table was created using the data in CEOSAL2.RAW:

The variable mktval is market value of the firm, profmarg is profit as a percentage of sales, ceoten is years as CEO with the current company, and comten is total years with the company.

(i) Comment on the effect of profmarg on CEO salary.

(ii) Does market value have a significant effect? Explain.

(iii) Interpret the coefficients on ceoten and comten. Are these explanatory variables statistically significant?

(iv) What do you make of the fact that longer tenure with the company, holding the other factors fixed, is associated with a lower salary?
Table 1: Dependent variable: log(salary)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(sales)</td>
<td>.224</td>
<td>.158</td>
<td>.188</td>
</tr>
<tr>
<td></td>
<td>(.027)</td>
<td>(.040)</td>
<td>(.040)</td>
</tr>
<tr>
<td>log(mktval)</td>
<td>-</td>
<td>.112</td>
<td>.100</td>
</tr>
<tr>
<td></td>
<td>(.050)</td>
<td>(.049)</td>
<td></td>
</tr>
<tr>
<td>profmarg</td>
<td>-</td>
<td>-.0023</td>
<td>-.0022</td>
</tr>
<tr>
<td></td>
<td>(.0022)</td>
<td>(.0021)</td>
<td></td>
</tr>
<tr>
<td>ceoten</td>
<td>-</td>
<td>-</td>
<td>.0171</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.0055)</td>
</tr>
<tr>
<td>comten</td>
<td>-</td>
<td>-</td>
<td>-.0092</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.0033)</td>
</tr>
<tr>
<td>intercept</td>
<td>4.94</td>
<td>4.62</td>
<td>4.57</td>
</tr>
<tr>
<td></td>
<td>(0.20)</td>
<td>(0.25)</td>
<td>(0.25)</td>
</tr>
<tr>
<td>Observation R-squared</td>
<td>177</td>
<td>177</td>
<td>177</td>
</tr>
<tr>
<td></td>
<td>(.281)</td>
<td>(.304)</td>
<td>(.353)</td>
</tr>
</tbody>
</table>

Problem 3 (Wooldridge, problem 4.7, p. 162)

Consider the estimated equation from Example 4.3, which can be used to study the effects of skipping class on college GPA:

\[
\hat{colGPA} = 1.39 + .412 \cdot hsGPA + .015 \cdot ACT - .083 \cdot \text{skipped}
\]

\[
\begin{align*}
 n &= 141, R^2 = .234 \\
 (i) & \text{Using the standard normal approximation, find the 95\% confidence interval for } \beta_{hsGPA}. \\
 (ii) & \text{Can you reject the hypothesis } H_0 : \beta_{hsGPA} = .4 \text{ against the two-sided alternative at the 5\% level?} \\
 (iii) & \text{Can you reject the hypothesis } H_0 : \beta_{hsGPA} = 1 \text{ against the two-sided alternative at the 5\% level?}
\end{align*}

Problem 4 (Wooldridge, problem 4.9, p. 162)

Are rent rates influenced by the student population in a college town? Let rent be the average monthly rent paid on rental units in a college town in the United States. Let pop denote the total city population, avginc the average city income, and pctstu the student population as a percentage of the total population. One model to test for a relationship is

\[
\log\text{(rent)} = \beta_0 + \beta_1 \log\text{(pop)} + \beta_2 \log\text{(avginc)} + \beta_3 \text{pctstu} + u
\]

\[
\begin{align*}
 n &= \text{(i) State the null hypothesis that size of the student body relative to the population has no ceteris paribus effect on monthly rents. State the alternative that there an effect.} \\
 (ii) & \text{signs do you expect for } \beta_1 \text{ and } \beta_2?
\end{align*}
\]
(iii) The equation estimated using 1990 data from RENTAL.RAW for 64 college towns is

\[
\hat{\log(\text{rent})} = 0.043 + 0.66 \text{hsGPA} + 0.507 \text{ACT} + 0.0056 \text{skipped} \\
n = 64, R^2 = .458
\]

What is wrong with the statement: “A 10% increase in population is associated with about a 6.6% increase in rent”?

(iv) Test the hypothesis stated in part (i) at the 1% level.