ECON 103: Midterm Solutions

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Outline

Outline

Question 1

$$\mathbf{Y} = \beta_1 + \beta_2\mathbf{X} + \mathbf{e}$$

Suppose that, from a sample of 62 observations, the least squares estimates are given by: $\mathrm{b1} = 2.0$ and $\mathrm{b2} = 6.0$, and var$(\mathrm{b1}) = 2.0$, var$(\mathrm{b2}) = 4.0$, cov$(\mathrm{b1},\ \mathrm{b2}) = -2.0$, and cov$(\mathrm{b2},\ \mathrm{b1}) = -2.0$
Using a 5% significance level, and an alternative hypothesis that the equality does not hold, test each of the following null hypotheses:

a) $H_0 : \beta_2 = 0$

b) $H_0 : \beta_1 + 2\beta_2 = 5$

Given:

- $\mathrm{t}_{(\mathbf{0.975,60})} = 2.00$
- $\mathrm{t}_{(\mathbf{0.950,60})} = 1.69$

Question 1

Model: $\mathbf{Y} = \beta_1 + \beta_2\mathbf{X} + \mathbf{e}$
Given: $\mathrm{b}_1 = 2.0$, $\mathrm{b}_2 = 6.0$, var$(\mathrm{b}_1) = 2.0$, var$(\mathrm{b}_2) = 4.0$, cov$(\mathrm{b}_1,\ \mathrm{b}_2) = -2.0$, cov$(\mathrm{b}_2,\ \mathrm{b}_1) = -2.0$, $\mathrm{t}_{(\mathbf{0.975},\mathbf{60})} = 2.00$ and $\mathrm{t}_{(\mathbf{0.950},\mathbf{60})} = 1.69$
Q: Using $\alpha = .05$, test:

a) $H_0 : \beta_2 = 0$

b) $H_0 : \beta_1 + 2\beta_2 = 5$

Prerequisites

1. One side or two sided?
2. Variance of combination of parameters:

$$\mathrm{Var}(ab_1 + bb_2) = a^2\,\mathrm{Var}(b_1) + b^2\,\mathrm{Var}(b_2) + 2ab\,\mathrm{Cov}(b_1, b_2)$$

Question 1

Model: $\mathbf{Y} = \beta_1 + \beta_2\mathbf{X} + \mathbf{e}$
Given: $\mathrm{b}_1 = 2.0$, $\mathrm{b}_2 = 6.0$, $\mathsf{var}(\mathrm{b}_1) = 2.0$, $\mathsf{var}(\mathrm{b}_2) = 4.0$, $\mathsf{cov}(\mathrm{b}_1,\ \mathrm{b}_2) = -2.0$, $\mathsf{cov}(\mathrm{b}_2,\ \mathrm{b}_1) = -2.0$, $\mathrm{t}_{(\mathbf{0.975,60})} = 2.00$ and $\mathrm{t}_{(\mathbf{0.950,60})} = 1.69$
Solution for (a): This is a two sided test: $H_0 : \beta_2 = 0$ vs $H_a : \beta_2 \neq 0$, so we use $t_{0.975,60} = 2$.

Question 1

Model: $\mathbf{Y} = \beta_1 + \beta_2\mathbf{X} + \mathbf{e}$
Given: $\mathrm{b}_1 = 2.0$, $\mathrm{b}_2 = 6.0$, $\text{var}(\mathrm{b}_1) = 2.0$, $\text{var}(\mathrm{b}_2) = 4.0$, $\text{cov}(\mathrm{b}_1,\ \mathrm{b}_2) = -2.0$, $\text{cov}(\mathrm{b}_2,\ \mathrm{b}_1) = -2.0$, $\mathrm{t}_{(\mathbf{0.975,60})} = 2.00$ and $\mathrm{t}_{(\mathbf{0.950,60})} = 1.69$
Solution for (a): This is a two sided test: $H_0 : \beta_2 = 0$ vs $H_a : \beta_2 \neq 0$, so we use $t_{0.975,60} = 2$.
The T statistic is:

$$t = \frac{\mathrm{b}_2 - 0}{\sqrt{\text{var}(\mathrm{b}_2)}} = \frac{6 - 0}{\sqrt{4}} = 3$$

Question 1

Model: $\mathbf{Y} = \beta_1 + \beta_2 \mathbf{X} + \mathbf{e}$
Given: $\mathrm{b}_1 = 2.0$, $\mathrm{b}_2 = 6.0$, $\text{var}(\mathrm{b}_1) = 2.0$, $\text{var}(\mathrm{b}_2) = 4.0$, $\text{cov}(\mathrm{b}_1,\ \mathrm{b}_2) = -2.0$,
$\text{cov}(\mathrm{b}_2,\ \mathrm{b}_1) = -2.0$, $\mathrm{t}_{(\mathbf{0.975,60})} = 2.00$ and $\mathrm{t}_{(\mathbf{0.950,60})} = 1.69$
Solution for (a): This is a two sided test: $H_0 : \beta_2 = 0$ vs $H_a : \beta_2 \neq 0$, so we use $t_{0.975,60} = 2$.
The T statistic is:

$$t = \frac{\mathrm{b}_2 - 0}{\sqrt{\text{var}(\mathrm{b}_2)}} = \frac{6 - 0}{\sqrt{4}} = 3$$

Is $|t| > t_{1-\alpha/2,60}$?

Question 1

Model: $\mathbf{Y} = \beta_1 + \beta_2 \mathbf{X} + \mathbf{e}$
Given: $\mathrm{b}_1 = 2.0$, $\mathrm{b}_2 = 6.0$, $\mathrm{var}(\mathrm{b}_1) = 2.0$, $\mathrm{var}(\mathrm{b}_2) = 4.0$, $\mathrm{cov}(\mathrm{b}_1,\ \mathrm{b}_2) = -2.0$,
$\mathrm{cov}(\mathrm{b}_2,\ \mathrm{b}_1) = -2.0$, $\mathrm{t}_{(\mathbf{0.975,60})} = 2.00$ and $\mathrm{t}_{(\mathbf{0.950,60})} = 1.69$
Solution for (a): This is a two sided test: $H_0 : \beta_2 = 0$ vs $H_a : \beta_2 \neq 0$, so we use $t_{0.975,60} = 2$.
The T statistic is:

$$t = \frac{\mathrm{b}_2 - 0}{\sqrt{\mathrm{var}(\mathrm{b}_2)}} = \frac{6 - 0}{\sqrt{4}} = 3$$

Is $|t| > t_{1-\alpha/2,60}$? $|3| > 2$, so we reject H_0.

Question 1

Model: $\mathbf{Y} = \beta_1 + \beta_2\mathbf{X} + \mathbf{e}$
Given: $\mathrm{b}_1 = 2.0$, $\mathrm{b}_2 = 6.0$, $\mathrm{var}(\mathrm{b}_1) = 2.0$, $\mathrm{var}(\mathrm{b}_2) = 4.0$, $\mathrm{cov}(\mathrm{b}_1,\ \mathrm{b}_2) = -2.0$,
$\mathrm{cov}(\mathrm{b}_2,\ \mathrm{b}_1) = -2.0$, $\mathrm{t}_{(\mathbf{0.975,60})} = 2.00$ and $\mathrm{t}_{(\mathbf{0.950,60})} = 1.69$
Solution for (b):
This is a two sided test: $H_0 : \beta_1 + 2\beta_2 = 5$ vs $H_a : \beta_1 + 2\beta_2 \neq 5$, so we still use $t_{0.975,60} = 2$.

Question 1

Model: $\mathbf{Y} = \beta_1 + \beta_2 \mathbf{X} + \mathbf{e}$
Given: $\mathrm{b}_1 = 2.0$, $\mathrm{b}_2 = 6.0$, var$(\mathrm{b}_1) = 2.0$, var$(\mathrm{b}_2) = 4.0$, cov$(\mathrm{b}_1,\ \mathrm{b}_2) = -2.0$,
cov$(\mathrm{b}_2,\ \mathrm{b}_1) = -2.0$, $\mathrm{t}_{(\mathbf{0.975},\mathbf{60})} = 2.00$ and $\mathrm{t}_{(\mathbf{0.950},\mathbf{60})} = 1.69$
Solution for (b):
This is a two sided test: $H_0 : \beta_1 + 2\beta_2 = 5$ vs $H_a : \beta_1 + 2\beta_2 \neq 5$, so we still use $t_{0.975,60} = 2$.
Compute the T statistic:

$$t = \frac{b_1 + 2b_2 - 0}{\sqrt{\mathrm{Var}(b_1 + 2b_2)}} = \frac{2 + 2 \cdot 6 - 5}{\sqrt{10}} = \frac{9}{\sqrt{10}}$$

$$\sqrt{\mathrm{Var}(b_1 + 2b_2)} = \sqrt{\mathrm{Var}(b_1) + 4\,\mathrm{Var}(b_2) + 4\,\mathrm{Cov}(b_1, b_2)} = \sqrt{10}$$

We have

$$\left| \frac{9}{\sqrt{10}} \right| = 2.846 > 2$$

so we reject H_0.

Question 2

A study looked at the relationship between household food expenditures (FEXP) and weekly income (INC). The study suggested that a simple linear regression model given by:

$$FEXP = 83.416 + 10.209 * INC$$

Given:

1. $se(\mathrm{b1}) = 43.41$, $se(\mathrm{b2}) = 2.09$, $\mathrm{N} = 40$
2. $t_{0.975,38} = 2.024$, $t_{0.95,38} = 1.686$
3. food expenditures (in \$), weekly income (in \$100)

Question

A) Construct a 95% confidence interval for b 2 .

B) Test the null hypothesis that $\beta 2$ is zero with an alternative hypothesis that it is greater than zero.

C) Make the assumption that SR6 holds and that $\text{cov}(\mathrm{b}_1, \mathrm{b}_2) = -85.903$ and then compute $se(\mathrm{b}_1 - 10\mathrm{b}_2)$.

Prerequisites

Question 2

Model: $FEXP = 83.416 + 10.209 * INC$
Given: $se(\mathrm{~b1}) = 43.41$, $se(\mathrm{~b2}) = 2.09$, $\mathrm{N} = 40$, $t_{0.975,38} = 2.024$, $t_{0.95,38} = 1.686$
Q: 95% CI for β_2, $H_0 : \beta_2 = 0$, $H_a : \beta_2 > 0$, find $se(\mathrm{b}_1 - 10\mathrm{b}_2)$.

Prerequisites

1. One tailed or two tailed?
2. CI formula: $\hat{\beta}_2 \pm t_{\alpha/2,n-2} \cdot se(\beta_2)$
3. Variance formula for parameters:
   $\mathrm{Var}(ab_1 + bb_2) = a^2\,\mathrm{Var}(b_1) + b^2\,\mathrm{Var}(b_2) + 2ab\,\mathrm{Cov}(b_1, b_2)$

Question 2

Model: $FEXP = 83.416 + 10.209 * INC$
Given: $se(\mathrm{b}_1) = 43.41$, $se(\mathrm{b}_2) = 2.09$, $\mathrm{N} = 40$, $t_{0.975,38} = 2.024$, $t_{0.95,38} = 1.686$
Q: 95% CI for β_2, $H_0 : \beta_2 = 0$, $H_a : \beta_2 > 0$, find $se(\mathrm{b}_1 - 10\mathrm{b}_2)$.

Solution for (a)

To construct a 95% two-sided CI for β_2, we use $t_{1-.05/2,38} = t_{.975,38} = 2.024$

$$b_2 \pm t_{0.975}(38) \text{ s.e. } (b_2) = 10.209 \pm 4.23 \approx [5.98, 14.44]$$

Question 2

Model: $FEXP = 83.416 + 10.209 * INC$
Given: $se(\mathrm{b}_1) = 43.41$, $se(\mathrm{b}_2) = 2.09$, $\mathrm{N} = 40$, $t_{0.975,38} = 2.024$, $t_{0.95,38} = 1.686$
Q: 95% CI for β_2, $H_0 : \beta_2 = 0$, $H_a : \beta_2 > 0$, find $se(\mathrm{b}_1 - 10\mathrm{b}_2)$.

Solution for (b)

$$H_0 : \beta_2 = 0 \text{ vs } H_a : \beta_2 > 0$$

This is a **one sided test**, so we use $t_{1-\alpha,38} = t_{0.95,38} = 1.686$ Compute the t statistic:

$$t = \frac{b_2 - 0}{\text{s.e. } (b_2)} = \frac{10.209}{2.09} \approx 4.89$$

$|t| = |4.89| > 1.686 = t_{1-\alpha,38} \implies$ reject H_0

Question 2

Model: $FEXP = 83.416 + 10.209 * INC$
Given: $se(\mathrm{b}_1) = 43.41$, $se(\mathrm{b}_2) = 2.09$, $\mathrm{N} = 40$, $t_{0.975,38} = 2.024$, $t_{0.95,38} = 1.686$
Q: 95% CI for β_2, $H_0 : \beta_2 = 0$, $H_a : \beta_2 > 0$, find $se(\mathrm{b}_1 - 10\mathrm{b}_2)$.

Solution for (c)

$$\text{Var}\,(b_1 - 10b_2) = \text{Var}\,(b_1) + 100\,\text{Var}\,(b_2) - 20\,\text{Cov}\,(b_1, b_2)$$

To compute the standard error, we use the formula:

$$\text{se}\,(b_1 - 10b_2) = \sqrt{\text{Var}\,(b_1 - 10b_2)} = \sqrt{43.41^2 + 100 \cdot 2.09^2 - 20 \cdot (-85.903)} \approx 63.56$$

Question 3

For wage denoting daily wage and edu denoting years of education, consider the model:

$$WAGE = \beta_1 + \beta_2 * (EDU)^3 + \mathrm{e}$$

We estimate the model by linear regression and obtain:

- $\mathrm{b}_1 = 1.00, \quad \mathrm{se}(\mathrm{b}_1) = 1.00,\ \mathrm{b}_2 = 0.05, \quad \mathrm{se}(\mathrm{b}_2) = 0.01$
- *WAGE* is in units of \$1,000

Q:

A) Expected wage for a person with $EDU = 10$

B) Marginal effect of one additional year of education at $EDU = 10$

C) Standard error of the marginal effect in (B)

Prerequisites

1. Formula for marginal effect: $\dfrac{\partial WAGE}{\partial EDU} = 3\beta_2(EDU)^2$
2. Variance of marginal effect: $\mathrm{Var}\left(\dfrac{\partial WAGE}{\partial EDU}\right) = \mathrm{Var}\left(3\beta_2(EDU)^2\right) = 9\beta_2^2(EDU)^4$

Question 3

Model: $WAGE = \beta_1 + \beta_2 * (EDU)^3 + \mathrm{e}$
Given: $\mathrm{b}_1 = 1.00$, $\mathrm{se}(\mathrm{b}_1) = 1.00$, $\mathrm{b}_2 = 0.05$, $\mathrm{se}(\mathrm{b}_2) = 0.01$, units are \$1,000.

Solution for (A)

Expected wage at $EDU = 10$

$$\mathbb{E}[WAGE \mid EDU = 10] = \mathrm{b}_1 + \mathrm{b}_2 \cdot 10^3 = 1 + 0.05 \cdot 1000 = 51$$

The expected wage is \$51,000.

Question 3

Model: $WAGE = \beta_1 + \beta_2 * (EDU)^3 + \mathrm{e}$
Given: $\mathrm{b}_1 = 1.00$, $\mathrm{se}(\mathrm{b}_1) = 1.00$, $\mathrm{b}_2 = 0.05$, $\mathrm{se}(\mathrm{b}_2) = 0.01$, units are \$1,000.

Solution for (B)

Marginal effect at $EDU = 10$

$$\text{M.E.}(EDU) = \frac{\partial WAGE}{\partial EDU} = 3\beta_2(EDU)^2$$

Question 3

Model: $WAGE = \beta_1 + \beta_2 * (EDU)^3 + \mathrm{e}$
Given: $\mathrm{b}_1 = 1.00$, $\mathrm{se}(\mathrm{b}_1) = 1.00$, $\mathrm{b}_2 = 0.05$, $\mathrm{se}(\mathrm{b}_2) = 0.01$, units are \$1,000.

Solution for (B)

Marginal effect at $EDU = 10$

$$\text{M.E.}(EDU) = \frac{\partial WAGE}{\partial EDU} = 3\beta_2(EDU)^2$$

Plug-in estimate at $EDU = 10$:

$$\widehat{\text{M.E.}} = 3 \cdot \mathrm{b}_2 \cdot 10^2 = 3 \cdot 0.05 \cdot 100 = 15$$

$\implies$ The marginal effect is \$15,000 per additional year (at $EDU = 10$).

Question 3

Model: $WAGE = \beta_1 + \beta_2 * (EDU)^3 + \mathrm{e}$
Given: $\mathrm{b}_1 = 1.00$, $\mathrm{se}(\mathrm{b}_1) = 1.00$, $\mathrm{b}_2 = 0.05$, $\mathrm{se}(\mathrm{b}_2) = 0.01$, units are \$1,000.

Solution for (C)

Since $\widehat{\text{M.E.}} = 3(EDU)^2\,\mathrm{b}_2$, we find the standard error as:

$$\text{se}(\widehat{\text{M.E.}}) = 3(EDU)^2 \cdot \text{se}(\mathrm{b}_2) = 3(10)^2(0.01) = 3$$

Question 3

Model: $WAGE = \beta_1 + \beta_2 * (EDU)^3 + \mathrm{e}$
Given: $\mathrm{b}_1 = 1.00$, $\mathrm{se}(\mathrm{b}_1) = 1.00$, $\mathrm{b}_2 = 0.05$, $\mathrm{se}(\mathrm{b}_2) = 0.01$, units are \$1,000.

Solution for (C)

Since $\widehat{\text{M.E.}} = 3(EDU)^2\,\mathrm{b}_2$, we find the standard error as:

$$\text{se}(\widehat{\text{M.E.}}) = 3(EDU)^2 \cdot \text{se}(\mathrm{b}_2) = 3(10)^2(0.01) = 3$$

$\Longrightarrow$ The standard error of the marginal effect is \$3,000 per year.

Outline

Question 4

What does R^2, the goodness-of-fit, measure?

A) The probability of the true value falling within $+/-$ it's standard error.

B) The *p*-value on the coefficient we are using to test our hypothesis of interest

C) The confidence interval of the error terms as determined by the coefficients

D) The proportion of the variation in y explained by x within the regression model

E) The sum of squares total (SST), as defined in class.

Solution: D

R^2, the goodness-of-fit, is defined as:

$$R^2 = 1 - \frac{\text{SSR}}{\text{SST}}$$

Equivalently, R^2 measures the proportion of variation in y explained by the regression model:

$$R^2 = \frac{\text{Explained Variation}}{\text{Total Variation}} = \frac{\sum_{i=1}^{n}(\hat{y}_i - \bar{y})^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2}$$

Question 5

How do you reduce the probability of committing a Type I error?

A) Reduce α

B) Increase α

C) Use a two-tailed test

D) Increase the rejection region

E) None of the above will reduce a Type I error.

Solution: A

The significance level, denoted by α, is the probability of rejecting the null hypothesis when it is actually true:

$$\alpha = P(\text{Type I Error}) = P(\text{Reject } H_0 \mid H_0 \text{ is true})$$

Question 6

In the regression of y on x, the error term (residuals) exhibit heteroskedasticity if:

A) the residuals have constant variance

B) $\mathrm{Var}(\mathrm{y} \mid \mathrm{x})$ is constant.

C) $\mathrm{Var}(\mathrm{y} \mid \mathrm{x})$ varies with the estimate of either β_1 or β_2

D) $\mathrm{Var}(\mathrm{y} \mid \mathrm{x})$ varies with x

E) y is a function of x

Solution: D

Heteroskedasticity occurs when the variance of the error term is not constant across observations:

$$\mathrm{Var}(\varepsilon \mid X) = \sigma^2 h(x), \qquad h(x) \neq 1$$

Question 7

In which case would testing the null hypothesis involve a two-tailed statistical test?

A) H_1 : Incentive pay for teachers does not increase student achievement.

B) H_1 : Higher sales tax rates does not reduce state tax revenues.

C) H_1 : Extending the duration of unemployment benefits does not increase the length of joblessness.

D) H_1 : Smoking does not reduce life expectancy.

E) None of the above involve a two-tailed statistical test.

Solution: E

A) "does not increase" $\implies$ one-tailed test

B) "does not reduce" $\implies$ one-tailed test

C) "does not increase" $\implies$ one-tailed test

D) "does not reduce" $\implies$ one-tailed test

Question 8

Let Y denote annual income in thousands of dollars, and $FEMALE = 1$ if an individual is female and $FEMALE = 0$ otherwise. We estimate the model:

$$\mathbf{Y} = \beta_1 + \beta_2 \text{ FEMALE } + \mathbf{e}$$

and determine that $\mathrm{b}_1 = 44.75$ and $\mathrm{b}_2 = 11.25$. Note that b 1 and b 2 are measured in $\$1,000\ \mathrm{s}$. What is your estimate of expected income among females?

A) $\$44,750$

B) $\$56,000$

C) $\$11,250$

D) Not enough information to answer this question.

Solution: B

First note that in this model $\mathrm{E[Y \mid FEMALE]} = \beta_1 + \beta_2$ Our estimate for $\beta_1 + \beta_2$ is $\mathrm{b}_1 + \mathrm{b}_2 = 44.75 + 11.25 = 56$. Because income is measured in thousands, the correct answer is $\mathbf{\$56,000}$.

Question 9

You estimate a simple linear regression model using a sample of 78 observations and obtain the following results:

$$Y = 97.25 + 33.74 * X$$

where: $\mathrm{b1} = 97.25$, $\mathrm{b2} = 33.74$, se$(\mathrm{b1}) = 3.86$, se$(\mathrm{b2}) = 9.42$
You want to test the following hypothesis:

$$\mathrm{H}_0 : \beta_2 = 0, \quad \mathrm{H}_1 : \beta_2 \neq 0$$

Assume $\alpha = 5\%$. What is the probability of a Type II Error?

A) between 0.05 and 0.10

B) between 0.01 and 0.025

C) between 0.02 and 0.05

D) It impossible to determine without knowing the true value of $\beta 2$

E) None of the above are correct.

Solution: D

$$\text{Type II error: } P(\text{Fail to reject } H_0 \mid H_A \text{ true}) = \beta$$

Question 10

There were 64 countries in the 2024 Olympics that won at least one medal. Let *MEDALS* be the total number of medals won by a country and let *GDPB* be the GDP (in billions of 2024 dollars). A linear regression model explaining the number of medals won is given by:

$$\text{Medals} = \beta_1 + \beta_2 * \ln(\text{GDPB}) + \mathrm{e}$$

We want to test the hypothesis that a one-billion dollar increase in GDP leads to an increase in the expected numbers of medals won by 0.015 , against an alternative hypothesis that is does not.

What are the null and alternative hypotheses in terms of the model parameters?

A) $\mathrm{Ho} : \beta_2 = 0.015$ and $\mathrm{H}_1 : \beta_2 < 0.015$

B) Ho: $\beta_2 = 0.015$ and H1: $\beta_2 > 0.015$

C) Ho: $\beta_2 = 0.015$ and H1: $\beta_2 \neq 0.015$

D) Ho: $\beta_2 \neq 0.015$ and $\mathrm{H}_1 : \beta_2 = 0.015$

E) Ho: $\beta_2 \neq 0.015$ and $\mathrm{H}_1 : \beta_2 < 0.015$

Solution: C

Question 11

Suppose we are interested in the relationship between students' test scores and class size, and we have conducted an experiment in which we randomly assign students either to a large class or a small class, and we consider the model:

$$(\text{ test score }) = \beta_1 + \beta_2 * (\text{ LARGE CLASS }) + \mathrm{e}$$

where LARGE CLASS $= 1$ if the student is in a large class and LARGE CLASS $= 0$ if the student is in a small class.
Which of the following statements is false?

A) Because the classroom assignment is random, we can say that the assumption that $\mathrm{E}[\mathrm{e} \mid \text{LARGE CLASS}] = 0$ is credible.

B) β_1 measures the expected test score for students in a small class.

C) β_2 measures the expected test score in a large class.

D) β_2 measures the difference between expected scores in large and small classes.

E) All of the above are True.

Solution: C

Question 12

All other things equal, using a t -approximation gives a smaller confidence interval than using a standard normal (Z) approximation.

A) True

B) False

Solution: B

The t -distribution is more spread out than the standard normal distribution.

Question 13

In testing H_0: $\beta_2 = c$ (where $c = a$ constant) using a 0.05 probability of a Type I error, you determine that the $\mathrm{p}-$ value $= 0.38$. What should you conclude?

A) H_0 is true, $\beta_2 = \mathrm{c}$.

B) H_0 should be rejected and is unlikely to be true since the p -value < 0.50.

C) It is impossible to know for certain, but we can say that there is a 0.38 probability that $\beta_2 = \mathrm{c}$

D) There is sufficient evidence to reject H_0, so we accept the null hypothesis by default.

E) None of the above are true.

Solution: E

Outline

Some Common Issues

Common Mistakes

- A few students left some multiple choice questions blank–always guess at the end!
- We don't "fail to reject H_A". We only "Reject H_0" or "Fail to reject H_0".
- Plugging in 11 instead of 10 in the marginal effect.
- Math errors / going too quickly. Ex: $(10)^2 \cdot 2 = 20$
- Mixing up the one sided vs. two sided test–draw a picture to help!

Grading

- We gave partial credit on the free response questions, even though it takes much longer to grade, which raised the scores significantly!

Thank you!

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