

Exercise walk-through

Setting Up a Test for the Slope of a Regression Model ■ 9.4

eXercise

You must be able to

- state the hypotheses $H_0 : \beta = 0$ and H_a
- write the test statistic $t = \frac{b}{SE(b)}$
- state the degrees of freedom $n - 2$

Method — Hypotheses

- **Null** $H_0 : \beta = 0$ (no linear relationship).
- **Alternative** $H_a : \beta \neq 0$ (or one-sided).

Method — Test statistic

$$t = \frac{b}{SE(b)}, \quad \text{df} = n - 2,$$

where b is the sample slope and $SE(b)$ its standard error.

Method — Example

$$b = 3.0, SE(b) = 0.6: t = \frac{3.0}{0.6} = 5.0.$$

Practice 2.1 ■ 1 mark

State the null hypothesis for a slope test.

Solution 2.1

Method: Test statistic

Worked steps

$$H_0 : \beta = 0 \quad \text{B1}.$$

Practice 2.2 ■ 1 mark

Write the test-statistic formula for a slope.

Solution 2.2

Method: Test statistic

Worked steps

$$t = \frac{b}{SE(b)} \quad \text{B1}.$$

Practice 2.3 ■ 2 marks

For $b = 3.0$ and $SE(b) = 0.6$, find the test statistic t .

Solution 2.3

Method: Test statistic

Worked steps

$$t = \frac{3.0}{0.6} = 5.0 \quad \text{M1} \quad \text{A1}.$$

Exam-style 3.1 ■ 1 mark

The null hypothesis in a slope test is usually

A $\beta = 1$

B $\beta = 0$

C $b = 0$

D $\beta \neq 0$

Solution 3.1

Method: Test statistic

A $\beta = 1$

B $\beta = 0$



C $b = 0$

D $\beta \neq 0$

Worked steps

B.

Exam-style 3.2 ■ 1 mark

The test statistic for a slope is

A $\frac{b}{SE(b)}$

B $b \cdot SE(b)$

C $\frac{SE(b)}{b}$

D $b - SE(b)$

Solution 3.2

Method: Test statistic

A $\frac{b}{SE(b)}$



B $b \cdot SE(b)$

C $\frac{SE(b)}{b}$

D $b - SE(b)$

Worked steps

A.

Exam-style 3.3 ■ 1 mark

A regression has $b = 2.4$, $SE(b) = 0.8$, $n = 22$.

- (a) Write H_0 .
- (b) Compute t .
- (c) State the degrees of freedom.

Solution 3.3

Worked steps

(a) $H_0 : \beta = 0$ **B1**. (b) $t = \frac{2.4}{0.8} = 3.0$ **M1** **A1**. (c) $n - 2 = 20$ **B1**.