

Exercise walk-through

9.5

Carrying Out a Test for the Slope of a Regression Model

AP Statistics

Test for a slope

The test asks directly whether the slope is zero:

- **null** $H_0 : \beta = 0$ (no linear relationship)
 - **alternative** $H_a : \beta >, <, \text{ or } \neq 0$
- $$t = \frac{b}{SE_b}, \quad df = n - 2$$

$\beta = 0$ means a flat line – x has no straight-line effect on y .

Study time

$b = 2.5$, $SE_b = 0.6$, $n = 20$:

$$t = \frac{2.5}{0.6} \approx 4.17$$

$df = 18$, $p \approx 0.0006$: reject – a real linear link.

Exercises 2.1-2.3

2.1 State the steps to carry out a slope test.

[2]

2.2 State what a small p-value indicates about the slope.

[1]

2.3 A slope test gives a p-value of 0.001 at $\alpha = 0.05$. State the decision.

[1]

Exercises 2.1-2.3

2.1 State the steps to carry out a slope test. [2]

2.1

- state hypotheses and check conditions; compute t ; find the p-value; compare to α and conclude
-

2.2 State what a small p-value indicates about the slope. [1]

2.2

- the slope is significantly different from 0 – a real linear relationship
-

2.3 A slope test gives a p-value of 0.001 at $\alpha = 0.05$. State the decision. [1]

2.3

- reject H_0 ($0.001 < 0.05$)

Exercises 3.1-3.2

3.1 A slope test with a small p-value suggests

[1]

☐

A no relationship

B a real linear relationship

C bias

D a curved pattern

3.2 A slope test rejects H_0 when the p-value is

[1]

☐

A above α

B below α

C exactly zero

D exactly one

Exercises 3.1-3.2

3.1 A slope test with a small p-value suggests

[1]

☐

A no relationship

B a real linear relationship

C bias

D a curved pattern

3.1 B

- a real linear relationship.

3.2 A slope test rejects H_0 when the p-value is

[1]

☐

A above α

B below α

C exactly zero

D exactly one

3.2 B

- below α .

Exercise 3.3 (a)

3.3 A slope test gives $t = 3.0$, $df = 20$, p-value 0.007 at $\alpha = 0.05$.

(a) State the decision.

[1]

Exercise 3.3 (a)

3.3 A slope test gives $t = 3.0$, $df = 20$, p-value 0.007 at $\alpha = 0.05$.

(a) State the decision.

[1]

(a)

- reject H_0

Exercise 3.3 (b)

3.3 A slope test gives $t = 3.0$, $df = 20$, p-value 0.007 at $\alpha = 0.05$.

(b) State whether there is a linear relationship.

[1]

Exercise 3.3 (b)

3.3 A slope test gives $t = 3.0$, $df = 20$, p-value 0.007 at $\alpha = 0.05$.

(b) State whether there is a linear relationship.

[1]

(b)

- yes

Exercise 3.3 (c)

3.3 A slope test gives $t = 3.0$, $df = 20$, p-value 0.007 at $\alpha = 0.05$.

(c) State the conclusion in context.

[1]

Exercise 3.3 (c)

3.3 A slope test gives $t = 3.0$, $df = 20$, p-value 0.007 at $\alpha = 0.05$.

(c) State the conclusion in context.

[1]

(c)

- there is convincing evidence of a linear relationship between the variables