TOPIC: PERFORMING HYPOTHESIS TESTS: VARIANCE

Hypothesis Tests for Variance

◆ Like proportions and means, we can use the same steps to perform a hypothesis test for variance: σ^2.

EXAMPLE

A cereal packaging line requires the fill-weight variance to be no greater than 0.25 g^2. A sample of 30 boxes is collected and yields a simple variance 0.31 g^2. Test if the population variance is greater than 0.25 g^2 using $\alpha = 0.10$. Assume the fill-weights are normally distributed.

New — Hypothesis Tests for Variance

1) Hyp

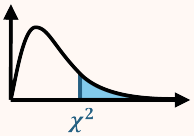
H_0: $\sigma^2 =$ _____ H_a: σ^2 **[< | > | ≠]** _____

2) Test Stat

$\chi^2 = \dfrac{(n-1)s^2}{\sigma^2}$ $n =$ _____ $s^2 =$ _____

$\chi^2 =$

3) *P*-Value

Area "beyond" χ^2 

$df = n - 1 =$ _____

P-Value = _____

4) Conclusion

Because P-value **[< | >]** α, we **[REJECT | FAIL TO REJECT]** H_0.
There is **[ENOUGH | NOT ENOUGH]** evidence to suggest…

Criteria

Random Sample? ☐ Data is Normally Distributed? ☐

PRACTICE

A machine produces ball bearings that are designed to have a diameter standard deviation of 0.04 mm, but an engineer suspects the variability has increased. A sample of 60 bearings shows a standard deviation of 0.052 mm. Perform a hypothesis test with $\alpha = 0.01$ to test the claim. Should the line manager have the machine serviced?

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EXAMPLE

Data from previous years suggests that the final exam scores for a statistics course have a standard deviation of about 6.3 percentage points ($\sigma^2 = 36.69$). After changing some instructional practices, the professor wondered if the variance in final exam scores changed for this semester, so they collected a random sample of 40 students, finding $s = 5.9$. Perform a hypothesis test to see if the final exam score variance has changed using $\alpha = 0.10$, and assume the exam scores are normally distributed.