Hypothesis Testing

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Let H_0 : null hypothesis

H_1 : alternative hypothesis

	Reject H_0	Accept H_0
H_0 is true	Type I error	Correct
H_0 is false	Correct	Type II error

(1) One-tailed test: $H_0: \mu = \mu_0$, $H_1: \mu \neq \mu_0$

(2) Two-tailed test: $H_0: \mu = \mu_0$, $H_1: \mu > \mu_0$

A *level of significance* (denoted by α), a certain probability of occurrence, will be chosen for the hypothesis testing. The z-score corresponds to the level of significance is called the *critical value*.

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Example (Tests about the mean).

A concrete manufacturer claims that his product has a mean strength of 15 MPa, with a standard deviation of 1.2 MPa. A random sample of 36 concretes is tested and found to have a mean strength of 14.5 MPa. Test the manufacturer's claim of the performance of his products at the 0.05 level of significance.

(Ans. $H_0: \ \mu = 15$, $H_1: \ \mu < 15$. $z = \dfrac{\bar{x} - \mu}{\sigma / \sqrt{m}}$. H_0 is rejected)

A machine is used to produce a certain dimension of parts is 20 cm. A random sample of 40 of the parts produced a mean of 20.1 cm and a standard deviation of 0.2 cm. Do the results, test at the 5% level of significance, indicate that the machine is out of adjustment?

(Ans. $H_0: \ \mu = 20$, $H_1: \ \mu \neq 20$. $z = \dfrac{\bar{x} - \mu}{\sigma / \sqrt{m}}$. H_0 is rejected. The machine is need of adjustment.)

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Example (Tests about the proportions).

A student claims that 90% of people in his School watch television. In a random survey of 400 people, 60 said that they did not watch television. Investigate whether the claim is justified.

(Ans. $H_0:\ p = 0.9$, $H_1:\ p < 0.9$. $z = \dfrac{\bar{x} - p}{\sqrt{p(1-p)} / \sqrt{m}}$. H_0 is rejected. The claim is not justified.)