Test of Hypothesis about Population Mean

1. **A trucking company claims that the average weight of a fully loaded moving van is 12,000 lb. The highway patrol decides to check this claim. A random sample of 30 moving vans shows that the average weight is 12,300 lb. with a standard deviation of 800 lb. Construct a hypothesis test to determine whether the average weight of a moving van is more than 12,000 lb. Use a 5% level of significance.**

H_o: $\mu = 12{,}000$
H_a: $\mu > 12{,}000$

Critical value: **to = 1.699**

Test Statistic: t = 2.054

***P* value = 0.0245**

Decision: Reject H_0

Conclusion: **At 5% level of significance, we have sufficient evidence to conclude that average weight of a moving van is greater than 12,000 lb.**

2. A cigarette company claims that their cigarettes contain an average of only 10 mg of tar. A random sample of 100 cigarettes shows the average tar content to be 11 mg with standard deviation 4.5 mg. Construct a hypothesis test to determine whether the average tar content of cigarettes is different from 10 mg. Use a 1% level of significance.

Ho: $\mu = 10$ mg

Ha: $\mu \neq 10$ mg

Critical value: **to = ± 2.263**

Test Statistic: t = 2.222

***P* value = 0.0285**

Decision: Fail to Reject H_0

Conclusion: **At 1% level of significance, we have insufficient evidence to conclude that average amount of tar is different from 10 mg.**

Test of Hypothesis about Population Proportion

1. Increasing numbers of businesses are offering child-care benefits for their workers. However, one union claims that more than 80% of firms still do not offer any child-care benefits. A random sample of 500 companies is selected, and only 80 of them offer child-care benefits. Test the union claim at $\alpha = 0.05$.

Hypothesized Parameter value: $p_o = .80$ **Number of Successes** $X = 500 - 80 = 420$

$H_o: P = .80$

$H_a: P > .80$

Point –estimator: $\hat{p} = \frac{x}{n} = \frac{420}{500} = .84$ **T.S.:** $Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}} = \frac{.84 - .80}{\sqrt{\frac{.8 \times .2}{500}}} = 2.24$

RR: Reject H_o if $Z > 1.645$

P-value = P (Z > 2.24) = 0.5 – 0.4875 = 0.0125 P-val < α → Decision: Reject Ho

Conclusion:

At α = 0.05 there is sufficient evidence to conclude that more than 80% of firms still do not offer any child-care benefits.

2. A coin is tossed 1000 times and 540 heads appear. At $\alpha = 0.03$, test the claim that this is a biased coin.

Hypothesized Parameter value: $p_o = .50$ **Number of Successes** $X = 540$

$H_o: P = .50$

$H_a: P \neq .50$

Point –estimator: $\hat{p} = \frac{x}{n} = \frac{540}{1000} = .54$ **T.S.:** $Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}} = \frac{.54 - .50}{\sqrt{\frac{.5 \times .5}{1000}}} = 2.53$

RR: Reject H_o if $Z > 2.17$ or $Z < -2.17$

P-value = 2 × P (Z > 2.53) = 0.0114 P-val < α → Decision: Reject Ho

Conclusion: At α = 0.03 there is sufficient evidence to conclude that coin is biased.