Assignment 11

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Papoulis chap 8 Exercise 8.29

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Problem

Q) A coin is tossed 64 times, and heads shows 22 times.

- a) Test the hypothesis that the coin is fair with significance level 0.05.
- b) We toss a coin 16 times, and heads shows k times. If k is such that $k_1 \leq k \leq k_2$, we accept the hypothesis that the coin is fair with significance level α =0.05.

Find k_1 and k_2 and the resulting β error.

Solution

a)In this problem , $n = 64,\ k = 22,\ p_o = q_o = 0.5$

$$q = \frac{k - np_o}{\sqrt{np_oq_o}} = 2.5 \tag{1}$$

$$z_{\frac{\alpha}{2}} = z_{1-\frac{\alpha}{2}} \approx -2 \tag{2}$$

since 2.5 is outside the interval (-2,2), we reject the fair coin hypothesis.

b)

$$\beta(p) = P\{|q| < z_{1-\frac{\alpha}{2}}\} = G\left(\frac{z_{1-\frac{\alpha}{2}} - n_q}{\sqrt{pq/p_o q_o}}\right) - G\left(\frac{z_{\frac{\alpha}{2}} - n_q}{\sqrt{pq/p_o q_o}}\right) \tag{3}$$

from eqn(3) with $n = 16$, $p_o = q_o = 0.5$

$$\frac{k_1 - np_o}{\sqrt{np_o q_o}} = z_{\frac{\alpha}{2}} \tag{4}$$

$$\frac{k_2 - np_o}{\sqrt{np_o q_o}} = -z_{\frac{\alpha}{2}} \tag{5}$$

This yeilds $k_1 = 8$ - (2×2), $k_2 = 8 + (2 \times 2)$
i.e., $k_1 = 4$ and $k_2 = 12$.

CODES

Beamer

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