Example 5.4.1

$\bar{x}_1 = 92$, $\bar{x}_2 = 105$, $\sigma_{\bar{x}_1} = 20$, $\sigma_{\bar{x}_2} = 20$, $n_1 = 15$, $n_2 = 15$

$\bar{x}_1 - \bar{x}_2 \sim N(0, \frac{2(20)^2}{15}) \equiv N(0, 53.333)$.

$P(\bar{x}_1 - \bar{x}_2 > 13) = P(z > \frac{13}{7.30297}) = P(z > 1.78)$

$= P(z < -1.78) = 0.0375$

Example 5.4.2

$\mu_1 = 45$, $\mu_2 = 30$, $\sigma_{\bar{x}_1} = 15$, $\sigma_{\bar{x}_2} = 20$, $n_1 = 35$, $n_2 = 40$

$\bar{x}_1 - \bar{x}_2 \cong N(45\text{-}30, \frac{(15)^2}{35} + \frac{(20)^2}{40}) \equiv N(15, 16.4286)$.

$P(\bar{x}_1 - \bar{x}_2 > 20) = P(z > \frac{20-15}{4.05322}) = P(z > 1.23359)$

$= P(z < -1.23) = 0.1093$

5.4.1 :

$\bar{x}_1 = 183$, $\bar{x}_2 = 189$, $\sigma_{\bar{x}_1} = 37.2$, $\sigma_{\bar{x}_2} = 34.7$, $n_1 = n_2 = 50$

$\bar{x}_1 - \bar{x}_2 \cong N(189 - 183, \frac{(37.2)^2+(34.7)^2}{50}) \equiv N(6, 51.7586)$.

$P(\bar{x}_1 - \bar{x}_2 > 8) = P(z > \frac{8-6}{7.19435}) = P(z > 0.277996)$

$= P(z < -0.28) = 0.389739$

5.4.2 :

$\bar{x}_1 = 797$, $\bar{x}_2 = 660$, $\sigma_{\bar{x}_1} = 482$, $\sigma_{\bar{x}_2} = 414$, $n_1 = 40$, $n_2 = 35$

$\bar{x}_1 - \bar{x}_2 \cong N(797\text{-}660, \frac{(482)^2}{40} + \frac{(414)^2}{35}) \equiv N(137, 10705.1)$.

$P(\bar{x}_1 - \bar{x}_2 > 100) = P(z > \frac{100-137}{103.466}) = P(z > -0.357605)$

$= P(z > -0.36) = P(z < -0.36) = 0.6406$

5.4.3 :

$\mu_1 = \mu_2$, $\sigma_1^2 = 100$, $\sigma_2^2 = 80$, $n_1 = 25$, $n_2 = 16$.

$\bar{x}_1 - \bar{x}_2 \sim N(0 , 4 + 5) \equiv N(0 , 9)$

$P(\bar{x}_1 - \bar{x}_2 > 8) = P(z > \frac{8}{3}) = P(z > 2.67) = P(z < -2.67) = 0.0037926$

5.4.4 :

$\mu_1 = \mu_2$, $\sigma_1^2 = 240$, $\sigma_2^2 = 350$, $n_1 = 40$, $n_2 = 35$.

$\bar{x}_1 - \bar{x}_2 \sim N(0 , 6 + 10) \equiv N(0 , 16)$

$P(\bar{x}_1 - \bar{x}_2 > 12) = P(z > \frac{12}{4}) = P(z > 3) = P(z < -3) = 0.0013499$

Example 5.5.1

$p = \frac{X}{N}$, $\hat{p} = \frac{x}{n}$.

$\hat{p} \cong N(p , \frac{pq}{n})$, $\hat{p} \cong N(0.31 , \frac{(0.31)(0.69)}{150})$, $\hat{p} \cong N(0.31 , 0.001426)$

$P(\hat{p} > 0.4) = P(z > \frac{0.09}{0.0377624}) = P(z > 2.38332)$

$P(z > 2.38) = P(z < -2.38) = 0.0086563$

Example 5.5.2

$\hat{p} \cong N(p , \frac{pq}{n})$, $\hat{p} \cong N(0.51 , \frac{(0.51)(0.49)}{200})$, $\hat{p} \cong N(0.51 , 0.0012495)$

$P(\hat{p} < 0.45) = P(z < \frac{-0.06}{0.0353483}) = P(z < -1.6974)$

$P(z < -1.7) = 0.0445655$

5.5.1

P = 0.3 , n = 50 ,

$P(\hat{p} > 0.4) = P(z > \frac{(0.4-0.3)\sqrt{50}}{\sqrt{(0.3)(0.7)}}) = P(z>1.54) = P(z < -1.54) = 0.0617802$

Or, using c.f. = $P(z>1.39) = P(z < -1.39) = 0.0822644$

5.5.2

P = 0.13 , n = 70 ,

$P(\hat{p} < 0.1) = P(z > \frac{(0.1-0.13)\sqrt{70}}{\sqrt{(0.13)(0.87)}}) = P(z < -0.75) = 0.226627$

$$\hat{P}_1 - \hat{P}_2 \sim N(P_1 - P_2, \sqrt{\frac{P_1Q_1}{n_1} + \frac{P_2Q_2}{n_2}})$$

Example 5.6.1

$P_1 = 0.28, \quad P_2 = 0.21 \ , \quad n_1 = n_2 = 100$

$P(\hat{P}_1 - \hat{P}_2 > 0.1) = P(z > \frac{0.1-(0.28-0.21)}{\sqrt{\frac{0.28*0.72}{100}+\frac{0.21*0.79}{100}}}) = P\left(z > \frac{.03}{.003675}\right) = P(z >$

$0.49 = P(z < -0.49) = 0.3121$