Midterm – Formulas
STAT 992

MC simulation

- $\hat{F}(t) = \frac{1}{R}\sum_{r=1}^{R} I(t_r \le t)$
- $R^{-1}\sum_{r=1}^{R} g(t_r)$ estimates $E(g(T))$
- $w = \frac{R^{-1}\sum_{r=1}^{R}\widehat{Var}(T_r)}{(R-1)^{-1}\sum_{r=1}^{R}(t_r - \bar{t})^2}$
- $\hat{\pi} \pm Z_{1-\gamma/2}\sqrt{\frac{\hat{\pi}(1-\hat{\pi})}{R}}$
- $\tilde{\pi} \pm \frac{Z_{1-\gamma/2}R^{1/2}}{R + Z_{1-\gamma/2}^2}\sqrt{\hat{\pi}(1-\hat{\pi}) + \frac{Z_{1-\gamma/2}^2}{4R}}$ where $\tilde{\pi} = \frac{\sum_{r=1}^{R} x_r + Z_{1-\gamma/2}^2/2}{R + Z_{1-\gamma/2}^2}$
- $\alpha \pm Z_{1-\gamma/2}\sqrt{\frac{\alpha(1-\alpha)}{R}}$
- $\frac{\frac{1}{R}\sum_{r=1}^{R}\widehat{Var}(T_r^{(1)})}{\frac{1}{R}\sum_{r=1}^{R}\widehat{Var}(T_r^{(2)})}$

Bootstrap

- $2t - t^*_{((R+1)(1-\alpha))}$ and $2t - t^*_{((R+1)\alpha)}$
- $h^{-1}\{2h(t) - h(t^*_{((R+1)(1-\alpha))})\} < \theta < h^{-1}\{2h(t) - h(t^*_{((R+1)\alpha)})\}$
- $b = \left(\frac{1}{R}\sum_{r=1}^{R} t_r^*\right) - t$
- $t - b = 2t - \left(\frac{1}{R}\sum_{r=1}^{R} t_r^*\right)$
- $v_{boot} = \frac{1}{R-1}\sum_{r=1}^{R}(t_r^* - \bar{t}^*)^2$
- $v_{jack} = \frac{(n-1)^2}{n^2}\sum_{i=1}^{n}\left(t - t_{-i}\right)^2$
- $v_{jack,1} = \frac{n-1}{n}\sum_{i=1}^{n}\left(t_{-i} - \bar{t}_{jack}\right)^2$ where $\bar{t}_{jack} = \frac{1}{n}\sum_{i=1}^{n} t_{-i}$
- $v_{jack,2} = \frac{n-1}{n}\sum_{i=1}^{n}\left(t - t_{-i}\right)^2$
- $Z^* = \frac{T^* - t}{V^{*1/2}} = \frac{t(\hat{F}^*) - t(\hat{F})}{v(\hat{F}^*)^{1/2}}$
- $t - z^*_{((R+1)(1-\alpha))}v^{1/2} < \theta < t - z^*_{((R+1)\alpha)}v^{1/2}$
- $v^*_{boot,r} = \frac{1}{M-1}\sum_{m=1}^{M}\left(t_{rm}^{**} - \bar{t}_r^{**}\right)^2$ where $\bar{t}_r^{**} = \frac{1}{M}\sum_{m=1}^{M} t_{rm}^{**}$

- $$z^* = \frac{h(t^*) - h(t)}{|\dot{h}(t^*)|\sqrt{v^*}}$$
- $$h^{-1}\left\{h(t) - z^*_{((R+1)(1-\alpha))}|\dot{h}(t)|\sqrt{v}\right\} < \theta < h^{-1}\left\{h(t) - z^*_{((R+1)\alpha)}|\dot{h}(t)|\sqrt{v}\right\}$$
- $t^*_{((R+1)\alpha)} < \theta < t^*_{((R+1)(1-\alpha))}$ where $\tilde{\alpha}_{low} = \Phi\left(w + \frac{w + z_\alpha}{1 - a(w + z_\alpha)}\right)$, $\tilde{\alpha}_{up} = \Phi\left(w + \frac{w + z_{1-\alpha}}{1 - a(w + z_{1-\alpha})}\right)$,

  $w = \Phi^{-1}\left(\frac{\#\{t^*_r \le t\}}{R+1}\right)$, and $a_{jack} = \frac{1}{6}\frac{\sum_{j=1}^{n} l^3_{jack,j}}{\left[\sum_{j=1}^{n} l^2_{jack,j}\right]^{3/2}}$
- $$t - b - z_{1-\alpha}v^{1/2}_{boot} < \theta < t - b - z_\alpha v^{1/2}_{boot}$$
- $$h(\mu) = \int \frac{c}{\sqrt{Var(T)}}d\mu$$
- $$\binom{2n-1}{n-1}$$
- $$E^*(T^*) \Leftrightarrow E(T|\hat{F})$$
- $$y^*_{ij} = \hat{\mu} + \hat{\sigma}_i e^*_{ij}$$
- $p_{boot} = \frac{1 + \#\{t^*_r \ge t\}}{R+1}$, $p_{boot} = 2\left\{\min\left[\frac{1 + \#\{t^*_r \ge t\}}{R+1}, \frac{1 + \#\{t^*_r \le t\}}{R+1}\right]\right\}$
- $z_0 = \frac{t - \theta_0}{\sqrt{v_0}}$, $z^*_0 = \frac{t^* - \theta_0}{\sqrt{v^*_0}}$
- $$p_{perm} = \frac{1 + \#\{t^*_r \ge t\}}{R+1}$$
- $$r_j = \frac{y_j - \hat{\mu}_j}{(1 - h_j)^{1/2}}$$
- $$\frac{y_j - \hat{\mu}_j}{\hat{\sigma}(1 - h_j)^{1/2}}$$
- $$Y^*_j = \hat{\mu}_j + \varepsilon^*_j = \hat{\beta}_0 + \hat{\beta}_1 x_j + \varepsilon^*_j$$