



 $Deff \ Deff \ Deff \ D_{eft}^2$

Deff

Deff

Deff < 1

Deff

Deff = 1

Deff>1

Deff < 1

Deff > 1





$var(\hat{\theta}_w)$	${\hat heta}_w$
$var(\hat{ heta}_{SRSWOR})$	$\hat{ heta}_{SRSWOR}$
$var(\hat{ heta}_{SRSWR})$	$\hat{ heta}_{SRSWR}$
Deff Deff	
	$Deff_p(\hat{ heta}) = rac{var(\hat{ heta}_w)}{var(\hat{ heta}_{SRSWOR})}$
Deft Deft	
	$Deft = \sqrt{rac{var(\hat{ heta}_w)}{var(\hat{ heta}_{SRSWR})}}$
n	
Ν	
$n_{ m eff}$	
	$n_{ m eff} = rac{n}{Deff}$
w_i	





n_h
N_h
w_h
Н
$n^*ar{b}$
K
n_k
ρ
$LC_V^2 \ relvar(w)$
${\hat ho}_{y,P}$
â
$\hat{\sigma}_y$
$cv_w cv_P$
f
S_y^2
$p_i P_i$
π_i

$Deff \quad D_{eff}$

 θ

 $\hat{\theta}_{SRSWOR}$

 $\hat{ heta}_w \hspace{0.5cm} p \hspace{0.5cm} Deff_p(\hat{ heta}) = rac{var(\hat{ heta}_w)}{var(\hat{ heta}_{SRSWOR})}$

Deff





 $Deft = \sqrt{rac{var(\hat{ heta}_w)}{var(\hat{ heta}_{SRSWR})}}$

Deff

 $Deft^2$ Deff

Deff

Deft

 \sqrt{Deff}

 $Deff_p = rac{var_p(ar{y}_p)}{(1-f)S_y^2/n} \ n \qquad f = n/N$

 $egin{array}{c} (1-f) & \ S_y^2 \ var_p(ar y_p) \end{array}$

DeftDeff $Deft pprox \sqrt{Deff}$

Deft

Deff

Deff

Deff

Deft Deft





$$n_{ ext{eff}} = rac{n}{Deff}$$

$$_{Deff} \qquad rac{n_{eff}}{n} = rac{1}{Deff}$$





$$\begin{split} Deff &= \frac{n \sum_{i=1}^{n} w_i^2}{(\sum_{i=1}^{n} w_i)^2} = \frac{\overline{w^2}}{\overline{w^2}} & w_i & i \\ \hline Deff &= 1 + (n^* - 1)\rho & n^* & \rho \\ \hline Deff &= \frac{n \sum_{h=1}^{H} (n_h w_h^2)}{(\sum_{h=1}^{H} n_h w_h)^2} (1 + (n^* - 1)\rho) & h & h \\ \hline Deff &= (1 - \hat{\rho}_{y,P}^2)(1 + L) + (\frac{\hat{\alpha}}{\hat{\sigma}_y})^2 L & \hat{\rho}_{y,P} \\ \hline \hat{\alpha} & \dot{\sigma}_y & L & \hat{\rho}_{y,P} \\ \hline Deff &= (1 - \hat{\rho}_{y,P}^2)(1 + cv_w^2) + \frac{\hat{\rho}_{y,P}^2}{cv_P^2} cv_w^2 & cv_w & cv_P \\ \hline \end{split}$$





Unequal selection probabilities Sources of unequal selection probabilities





$$n_h = n rac{W_h S_{Uh}}{\sum_h W_h S_{Uh}}$$
 n_h $W_h = rac{N_h}{N}$

 S_{Uh}









 p_h h













 n_h

 w_h

h

H

 $\sum_{h=1}^{H} n_h = n$

 w_h

h

 $n\sum_{k=1}^{H}(n_{h}w_{k}^{2})$

 $orall h:n_h=1$

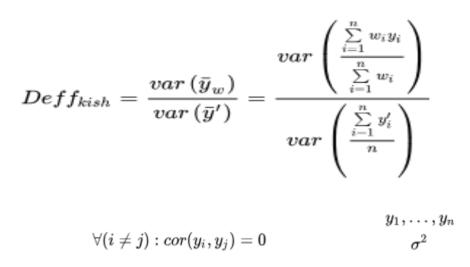
$$Deff = \frac{n \sum_{i=1}^{n} w_i^2}{(\sum_{i=1}^{n} w_i)^2} = \frac{\frac{1}{n} \sum_{i=1}^{n} w_i^2}{\left(\frac{1}{n} \sum_{i=1}^{n} w_i\right)^2} = \frac{\overline{w^2}}{\overline{w}^2}$$

n

$$n_{ ext{eff}} = rac{(\sum_{i=1}^n w_i)^2}{\sum_{i=1}^n w_i^2}$$

 \bigcirc





 $\begin{array}{ll} y = y' & & var\left(\bar{y}_{w}\right) & \overline{var\left(\bar{y}_{w}\right)} = \overline{var\left(\bar{y}\right)} \times Deff \\ & & y_{i} \end{array}$

 y_i

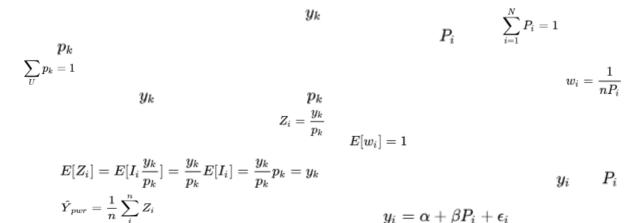
$$\begin{split} Deff &= 1 + L = 1 + C_V{}^2 = 1 + relvar(w) = 1 + \frac{V(w)}{\bar{w}^2} \\ V(w) &= \frac{\sum (w_i - \bar{w})^2}{n} & w & \bar{w} = \frac{\sum w_i}{n} \\ Deff &= 1 + V(w) \end{split}$$











 y_k

$$y_i = \alpha + \beta P_i + \epsilon_i$$







 $cov(y_i,y_j)=0$ $var(y_i) = \sigma_h^2 = \sigma^2$ $Deff = 1 + (n^* - 1)\rho.$ n_k $n = \sum n_k$ ρ $_k^i$

$$j \ cov(y_i,y_j) =
ho \sigma^2$$

 \times

$$Deff_{Kish} = rac{n\sum\limits_{h=1}^{H}(n_hw_h^2)}{\left(\sum\limits_{h=1}^{H}n_hw_h
ight)^2}\left(1+(n^*-1)
ho
ight) = deff_k imes deff_C$$

 \times

 \times

9

CC

 $ho_{y,P}$

 $Deff_C$

 n^{*}

 n^{*}

 \bar{b}

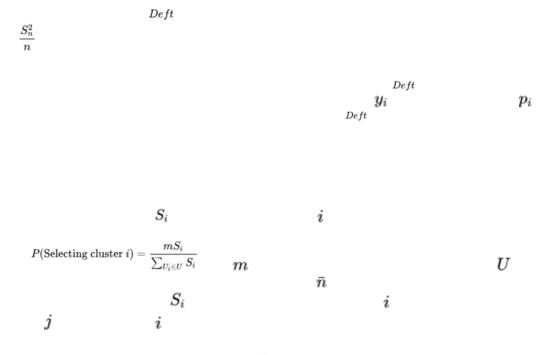








Deft



 S_i

 \bar{n}

 $rac{ar{n}}{S_i}$

i

18 of 21 |

 $\frac{\bar{n}}{S_i}$



 \bar{n}

ê

$$egin{aligned} \pi_j(i) &= rac{mS_i}{\sum_{U_i \in U} S_i} & i & S_i & m \ P(ext{Selecting cluster}\ i) &= rac{mS_i}{\sum_{U_i \in U} S_i} & S_i^* \ j & i & \pi_j(j) &= rac{mS_i}{\sum_{U_i \in U} S_i} rac{ar{n}}{S_i^*} & S_i^* \ S_i^* & S_i & \end{aligned}$$

$$Deff_{Kish}=deft^2=deftu_s^2(1+L)=ig(1+
ho(ar b-1)ig)\,rac{n\sum k_j^2}{\left(\sum k_j
ight)^2}$$

References

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