Estimador de sesgo

$$\delta = \frac{n - \bar{n}}{\bar{n}}$$

$$\delta = \frac{n}{\bar{n}} - 1$$

$$n = \bar{n}\,(\delta + 1)$$

Definiciones

Para 1 punto

$$R = \int W \bar{n}\, dV$$

$$D = \int W n\, dV$$

si $\langle \, , \rangle = \int dV$

$\ast$ Calcular Peebles - Hauser

$$\xi^2_{PH} = \frac{1}{n_{est}^2} \frac{DD}{RR} - 1$$

Para dos puntos

$$R_1 R_2 = \int \bar{n}_1 W_1\, dV_1 \int \bar{n}_2 W_2\, dV_2 \qquad \bar{n}_1 = \bar{n}_2 = \bar{n}$$

$$R_1 R_2 = \iint \bar{n}^2 \, W_1 W_2\, dV_1 dV_2 = \bar{n}^2 \langle\langle W_1 W_2 \rangle\rangle$$

$$D_1 D_2 = \int n_1 W_1\, dV_1 \int n_2 W_2\, dV_2 = \iint n_1 n_2 W_1 W_2\, dV_1 dV_2$$

usando $n_1 = \bar{n}_1 (\delta_1 + 1)$.

$$D_1 D_2 = \iint \bar{n}_1 \bar{n}_2 (\delta_1 + 1)(\delta_2 + 1) W_1 W_2\, dV_1 dV_2$$

$$= \bar{n}^2 \iint (\delta_1 + 1)(\delta_2 + 1) W_1 W_2\, dV_1\, dV_2$$

$$= \bar{n}^2 \iint (\delta_1 \delta_2 + \delta_1 + \delta_2 + 1) W_1 W_2\, dV_1 dV_2$$

$$DD = \bar{n}^2 \left[\iint \delta_1 \delta_2 W_1 W_2 + \iint \delta_1 W_1 W_2 + \iint \delta_2 W_1 W_2 + \iint W_1 W_2 \right] dV_1 dV_2$$

$$DD = \bar{n}^2 \left[\xi^2 \langle\langle W_1 W_2 \rangle\rangle + \Psi(x_1) \langle\langle W_1 W_2 \rangle\rangle + \Psi(x_2) \langle\langle W_1 W_2 \rangle\rangle + \langle\langle W_1 W_2 \rangle\rangle \right]$$

usando $\bar{n}^2 \langle\langle W_1 W_2 \rangle\rangle = RR$ y despejando

$$\frac{DD}{RR} = \xi^2 + \Psi(x_1) + \Psi(x_2) + 1$$

$$\frac{DD}{RR} = \xi^2 + \Psi(x_1) + \Psi(x_2) + 1$$

$$n_{est} = \frac{D}{R} = \frac{\int n w dV}{\int \bar{n} w dV} = \frac{\bar{n} \int (1 + \bar{\delta}) w dV}{\bar{n} \int w dV}$$

uso $\bar{\delta} = \frac{\langle w \delta \rangle}{\langle w \rangle}$

$$n_{est}^2 = \frac{\langle w \rangle + \bar{\delta} \langle w \rangle}{\langle w \rangle} = 1 + \bar{\delta}$$

$$\xi_{PH}^2 = \frac{DD}{RR} \frac{1}{n_{est}^2} - 1 = \frac{1}{(1+\bar{\delta})^2}$$

Estimador de Hamilton (usando cálculos de Peebles-Hauser)

$$\xi_H^2 = \frac{DD\ RR}{DR^2}$$

$$DD = \bar{n}^2 \langle\langle W_1 W_2 \rangle\rangle \left(1 + \Psi(x_1) + \Psi(x_2) + \xi^2\right)$$

$$RR = \bar{n}^2 \langle\langle W_1 W_2 \rangle\rangle$$

$$DR = \int n_1 W_1 dV_1 \int \bar{n}_1 W_2 dV_2 = \iint \bar{n}^2 (\delta_1 + 1)\, W_1 W_2 dV_1 dV_2$$

$$DR = \bar{n}^2 \left[\langle\langle \delta W_1 W_2 \rangle\rangle + \langle\langle W_1 W_2 \rangle\rangle\right]$$

$$DR = \bar{n}^2 \left[\Psi(x_1) \langle\langle W_1 W_2 \rangle\rangle + \langle\langle W_1 W_2 \rangle\rangle\right]$$

$$DR = \bar{n}^2 \langle\langle W_1 W_2 \rangle\rangle \left[\Psi(x_1) + 1\right]$$

$$\frac{DR}{RR} = \left[\Psi(x_1) + 1\right]$$

$$DR = (\Psi(x_1) + 1) RR$$

$$\xi_H^2 = \frac{DD\ RR}{DR^2} = \frac{RR^2 \left(1 + \Psi(x_1) + \Psi(x_2) + \xi^2\right)}{RR^2 \left(\Psi(x_1) + 1\right)^2}$$

$$\xi_H^2 = \frac{1 + \Psi(x_1) + \Psi(x_2) + \xi^2(x_1, x_2)}{(\Psi(x_1) + 1)^2}$$

Estimador Landy-Szalay

$$\xi_{LZ}^2 = 1 + \frac{1}{N_{est}^2}\frac{DD(r)}{RR(r)} - 2\frac{1}{N_{est}}\frac{DR(r)}{RR(r)}$$

$$= 1 + \frac{1}{(1+\bar{\delta})^2}\frac{RR(\varphi(x_1)+\varphi(x_2)+\xi^2+1)}{RR} - \frac{2}{1+\delta}\frac{(\varphi(x_1)+1)RR}{RR}$$

$$= \frac{1}{(1+\bar{\delta})^2}\left[\varphi(x_1)+\varphi(x_2)+\xi^2+1-2\varphi(x_1)(1+\bar{\delta}) - 2(1+\bar{\delta})+(1+\bar{\delta})^2\right]$$

$$= \frac{\left[\varphi(x_1)+\varphi(x_2)+\xi^2+\cancel{1}-2\varphi(x_1)-2\bar{\delta}\varphi(x_1)-\cancel{2}-\cancel{2\bar{\delta}}+\cancel{1}+\cancel{2\bar{\delta}}+\bar{\delta}^2\right]}{(1+\bar{\delta})^2}$$

$$\xi_{LZ}^2 = \frac{\delta^2 - \varphi(x_1)+\varphi(x_2) - 2\bar{\delta}\varphi(x_1)+\bar{\delta}^2}{(1+\bar{\delta})^2}$$