Sensitivity Analysis for Balancing Weights

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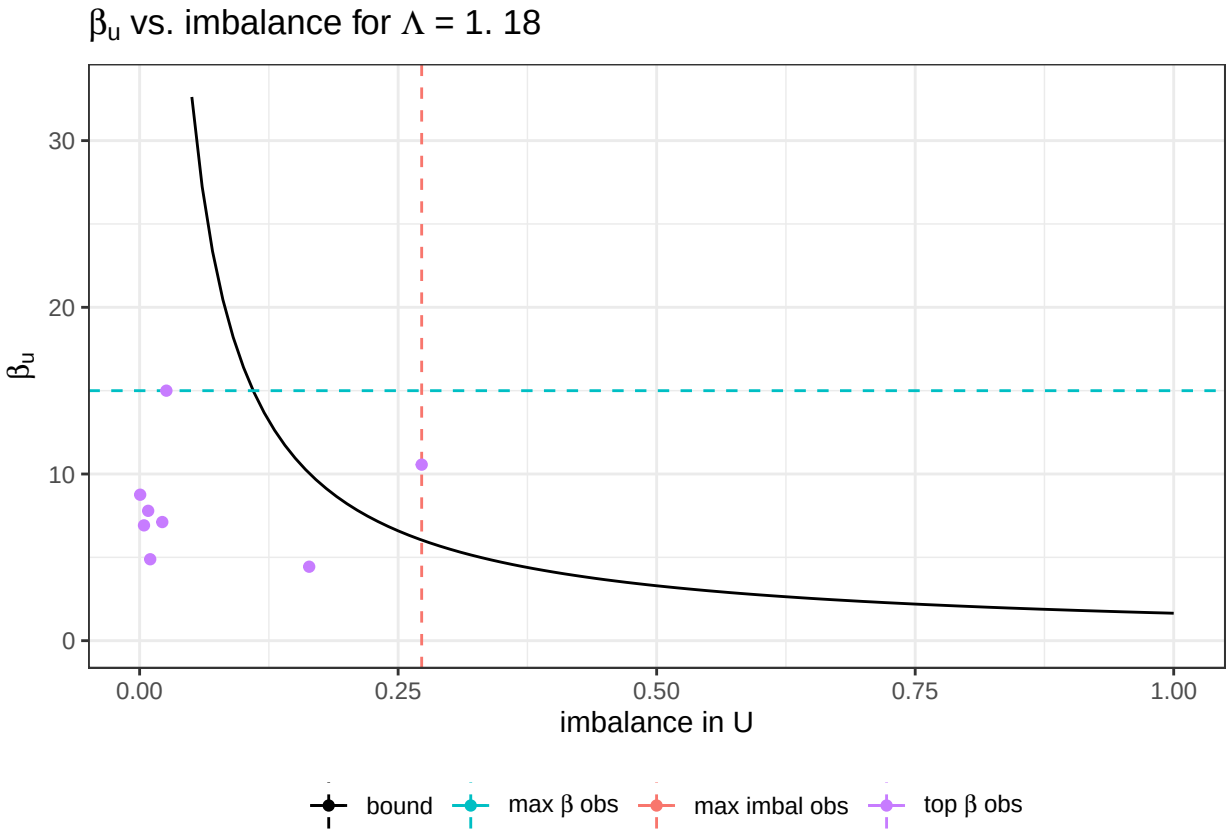
Amplification

Amplification of bias = imbalance in $U \times \beta_u$



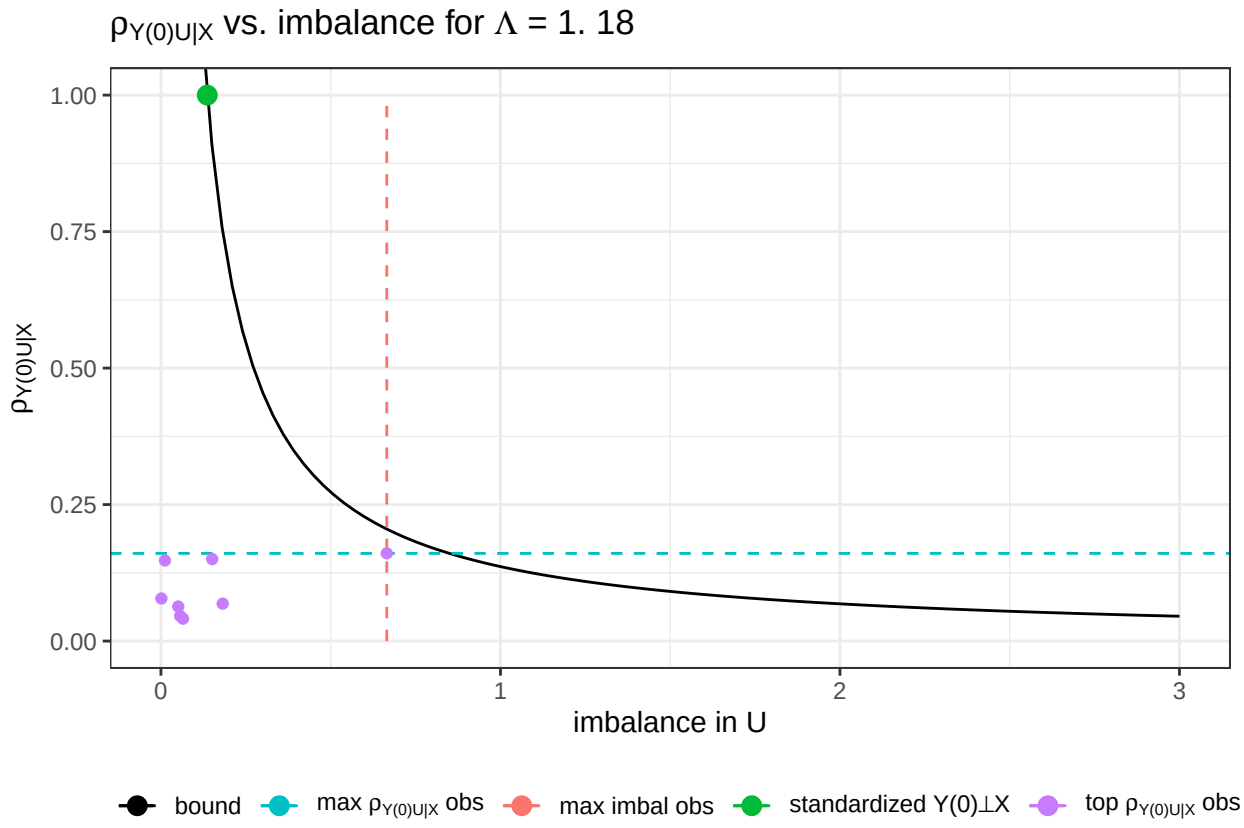
- **bound:**
  - if estimated ATT is positive, bound $= \left(\sup_{h \in \mathcal{H}(\Lambda)} \hat{\mu}_0^{(h)}\right) - \hat{\mu}_0$
  - if estimated ATT is negative, bound $= \left(\inf_{h \in \mathcal{H}(\Lambda)} \hat{\mu}_0^{(h)}\right) - \hat{\mu}_0$
- We consider $U \in [0, 1]$, so we transform each observed covariate as follows:
  - Make min = 0: subtract min value of covariate

  - Make max = 1: divide by max of shifted covariate

- **max β obs:** max absolute value of coefficients of transformed covariates from OLS of Y on transformed covariates for control units.
- **max imbal obs:** max absolute value of difference in means of transformed covariates before weighting between treatment and control.
- **top β obs:** coefficient and imbalance for specified number of observed covariates sorted by descending coefficient value

covar	coeff	imbal
pulse	14.999	0.026
age_mo	10.562	0.273
together	8.757	0.001
potassium	7.790	0.008
alcohol	7.117	0.022
bmi	6.919	0.004
packyr	4.886	0.010
widowed	4.438	0.164
female	3.902	0.008
r_sodipota	3.388	0.020
income	3.353	0.029
sodium	3.018	0.039
black	2.940	0.014
edu	2.732	0.042
hhsize	1.864	0.107
divorced	1.701	0.008
separated	1.640	0.020
married	1.228	0.022
white	0.802	0.178
hisp	0.589	0.161
insurance	0.078	0.160

Amplification of bias = imbalance in $U \times \rho_{Y(0),U|X} \times \text{sd}(Y(0)^{\perp X})$



- **bound:**
  - if estimated ATT is positive, bound $= \frac{\left(\sup_{h \in \mathcal{H}(\Lambda)} \hat{\mu}_0^{(h)}\right) - \hat{\mu}_0}{\text{sd}(Y(0)^{\perp X})}$
  - if estimated ATT is negative, bound $= \frac{\left(\inf_{h \in \mathcal{H}(\Lambda)} \hat{\mu}_0^{(h)}\right) - \hat{\mu}_0}{\text{sd}(Y(0)^{\perp X})}$
- We consider $U \perp X$ with $\text{sd}(U) = 1$, so we transform each observed covariate as follows:
  - Residualize: residualized covarites = residuals from OLS of a covariate on the other covariates
  - Standardize: divide the residualized covariate by the standard deviation of the residualize covariate
- **max** $\rho_{Y(0)U|X}$ **obs:** max absolute value of the partial correlations of $Y(0)$ and a covariate given the other covariates for control units.
- **max imbal obs:** max absolute value of difference in means of transformed covariates before weighting between treatment and control.
- **standardized** $Y(0)^{\perp X}$: point for strongest possible confounder with partial correlation = 1.
- **top** $\rho_{Y(0)U|X}$ **obs:** partial correlation and imbalance for specified number of observed covariates sorted by descending partial correlation

covar	pcorr	imbal
age_mo	0.161	0.665
pulse	0.150	0.151
female	0.148	0.012
widowed	0.078	0.001
bmi	0.069	0.182
alcohol	0.063	0.051
income	0.046	0.057
packyr	0.041	0.065
edu	0.040	0.006
married	0.034	0.022
divorced	0.033	0.030
potassium	0.032	0.018
hhsize	0.030	0.026
separated	0.027	0.026
black	0.026	0.071
sodium	0.018	0.010
together	0.016	0.004
r_sodipota	0.014	0.039
white	0.007	0.057
hisp	0.005	0.011
insurance	0.002	0.108