

Metropolis-Hasting for two-sided logit

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1 Notation

Characteristics (observed data):

- WW $_{(njobs \times nw)}$ is a matrix of job characteristics, whose j th row WW_j $_{(nw \times 1)}$ is job j 's characteristics
- XX $_{(nworkers \times nx)}$ is a matrix of worker characteristics, whose i th row XX_i $_{(nx \times 1)}$ is the characteristics of worker i

Preferences (parameters to be estimated):

- α $_{(nw \times 1)}$: a vector of workers' preference for jobs' characteristics
- β $_{(nx \times njobs)}$: a matrix of employers' preference for workers' characteristics. Each employer has his own set of preference. β_j — β 's j th column—is the preference of employer j .

Matching structure:

- Worker i 's opportunity set is O_i , which includes unemployment and other jobs that are offered to worker i .

2 Updating the opportunity set

We update the opportunity set by sampling $J^*(i)$ as a new job to be considered for worker i . The M-H acceptance ratio is $rr1 \times rr2$, with $rr1$ coming from $P(A|O, \alpha)$ and $rr2$ coming from $P(O|\beta)$. To calculate $rr1, rr2$ for worker i :

$$den_i = \sum_{j: j \in O_i} \exp(\alpha' WW_j) \quad \text{line 81, den} <- \text{opp} \%* \% \text{ avec} \quad (1)$$

$$denstar_i = \begin{cases} den_i - \exp(\alpha' WW_{J^*(i)}) & \text{if } J^*(i) \text{ is already offered} \\ den_i + \exp(\alpha' WW_{J^*(i)}) & \text{if } J^*(i) \text{ is not yet offered} \end{cases} \quad (2)$$

$$\text{line 125, denstar} <- \text{den} + \text{avec}[\text{new}] * \text{plusminus} \quad (3)$$

$$\begin{aligned}
rr1 &= \frac{den_i}{denstar_i} & \text{line 126, } rr1 &<- den/denstar \\
rr2 &= \begin{cases} -\exp(\beta'_{J^*(i)} X X_1) & \text{if } J^*(i) \text{ is already offered} \\ \exp(\beta'_{J^*(i)} X X_1) & \text{if } J^*(i) \text{ is not yet offered} \end{cases} & \text{line 129, } rr2 &<- \exp(\text{plusminus} * xb)
\end{aligned} \tag{4}$$

$$\tag{5}$$

In sum, the MH acceptance ratio for the proposed new job $J^*(i)$ for worker i is:

$$rr1 \times rr2 = \frac{den_i}{denstar_i} \times rr2 \tag{6}$$

$$= \frac{\sum_{j:j \in O_i} \exp(\alpha' W W_j)}{\sum_{j:j \in O_i} \exp(\alpha' W W_j) \pm \exp(\alpha' W W_{J^*(i)})} \times \pm \exp(\beta'_{J^*(i)} X X_1) \tag{7}$$