$$\langle R_{(w_d,z)} \rangle = \frac{\phi_{(z,w_{d,i})}\,\theta_{(d,z)}}{\sum_k^T \phi_{(k,w_{d,i})}\,\theta_{(d,k)}}$$

$$\theta_{(d,z)} = \frac{\sum_i \langle R_{(w_{d,i},z)} \rangle}{N_d}$$

$$\phi_{(z,w)} = \frac{\sum_d \sum_i^{N_d} \langle R^{(d)}_{(w_{d,i},z)} \rangle}{\sum_w^V \sum_d^D \sum_i^{N_d} \langle R^{(d)}_{(w_{d,i},z)} \rangle}$$

$$\langle R^{(d)}_{(w,k)} \rangle = \frac{P(k,w)\,\theta_{(d,k)}}{\sum_k^T P(k,w)\,\theta_{(d,k)}}$$

$$\theta_{(d,k)} = \frac{\sum_w^V n_{(d,w)} \langle R^{(d)}_{(w,k)} \rangle}{N_d}$$

$$\phi_{(k,w)} = \frac{\sum_d^D n_{(d,w)} \langle R^{(d)}_{(w,k)} \rangle}{\sum_w^V \sum_d^D n_{(d,w)} \langle R^{(d)}_{(w,k)} \rangle}$$