

$$\ln \left( \frac{p_{ik}}{\tilde{p}_{ik}} - 1 \right) = \ln \left( \sum_i \alpha_i^\tau \mathbb{1}_i \times \sum_{s(k)} \alpha_{s(k)}^\tau \mathbb{1}_{s(k)} - 1 + \frac{\sum_i \alpha_i^t \mathbb{1}_i + \sum_{s(k)} \alpha_{s(k)}^t \mathbb{1}_{s(k)}}{\tilde{p}_{ik}} \right) + \epsilon_{ik}$$