Covariance and confidence intervals

The asymptotic covariance matrix of $\hat{\pi}$ can be approximated by the inverse of the observed Fisher information matrix, I:

$$I(\boldsymbol{\pi}'|\mathbf{x},\mathbf{y}) = -rac{\partial^2 \mathcal{V}(\boldsymbol{\pi}')}{\partial \boldsymbol{\pi}' \partial \boldsymbol{\pi}'^T}$$

$$\mathsf{Cov}(\hat{\pi}_p,\hat{\pi}_q) = \left[I^{-1}(\hat{\pi}')\right]_{pq}$$

with variance and correlation given by

$$\mathsf{Var}(\hat{\pi}_j) = \sigma_j^2 = \left\{ \mathsf{Cov}(\hat{m{\pi}})
ight\}_{jj}$$

$$\mathsf{Corr}(\hat{\pi}_p,\hat{\pi}_q) = \frac{\mathsf{Cov}(\hat{\pi}_p,\hat{\pi}_q)}{\sqrt{\sigma_p^2\sigma_q^2}}$$