Parametric Bootstrap Bias Correction - Conditional Poisson Distribution

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1 Description

An alternative method to correct the bias of MLE is bootstrap. Here we apply a parametric bootstrap approach, that is, bootstrap samples are generated from the parametric model (conditional Poisson) where true parameters are replaced by their maximum likelihood estimates of original dataset in order to generate bootstrap samples. While a bias-corrected version of MLE can be derived from a single bootstrap process, we carry out a Monte Carlo simulation in order to achieve a better understanding of distribution of bootstrap bias-corrected MLE. In this way we will have also the opportunity to compare different bias-corrected versions of MLE (e.g., TBCMLE, HBCMLE and PBBCMLE - parametric-bootstrap bias-corrected MLE). We proceed as before, where for each set of values of set of parameters $\boldsymbol{\theta} = (\lambda, \boldsymbol{p})$, $S = 10,000$ datasets of sample size N are generated. In step k of simulation process, we generate $B = 2000$ bootstrap samples from parametric model where $\hat{\boldsymbol{\theta}}^{(i)} = (\hat{\lambda}^{(i)}, \hat{\boldsymbol{p}}^{(i)})$ are considered as model parameters. The bootstrap replicates for MLE of B datasets are derived and the bias-corrected MLE of MOI parameter and lineage frequencies are calculated. Finally, the mean and variance of $10,000$ simulation results are derived.
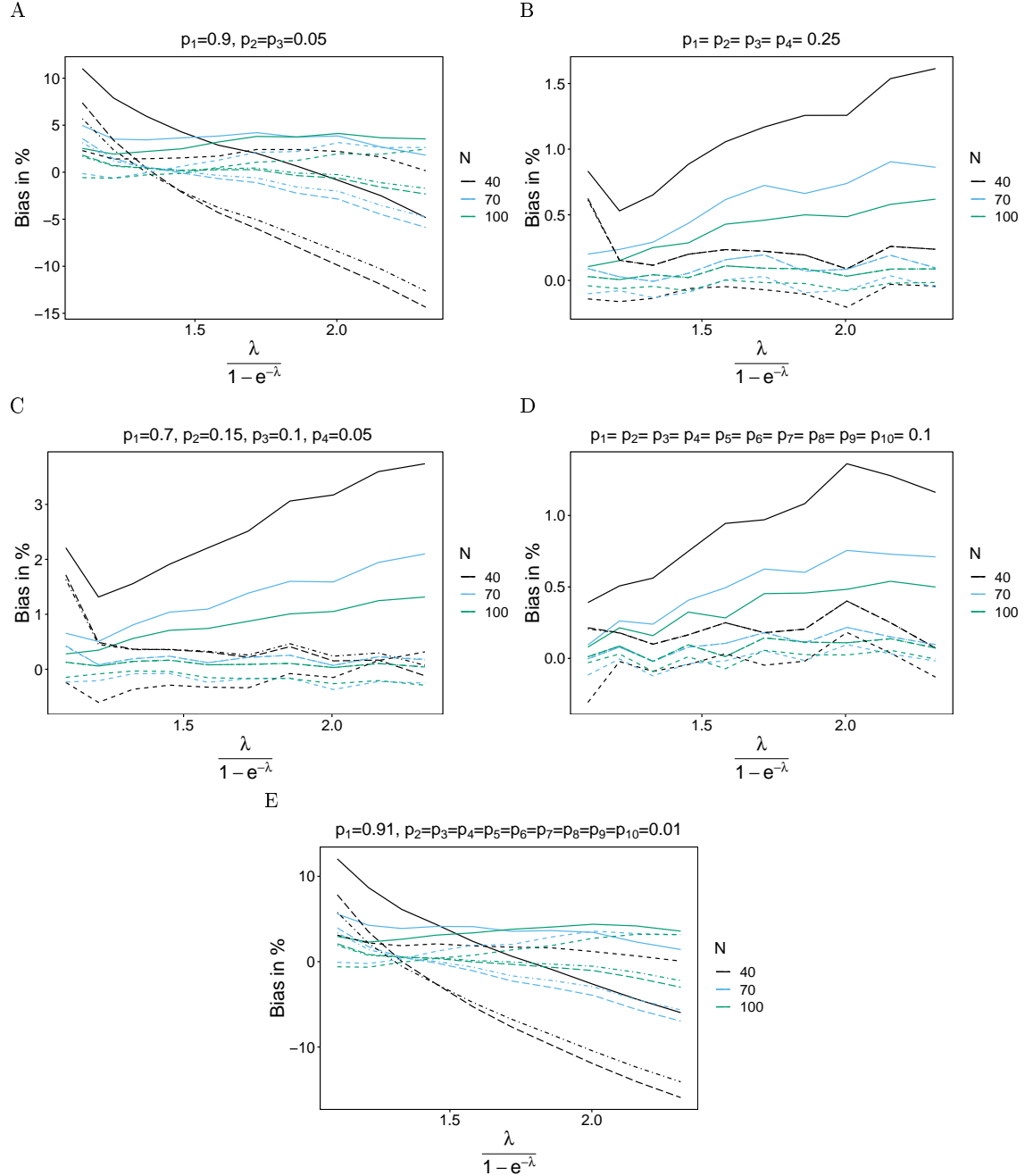
2 Bias of $\hat{\lambda}$

A

B

C

D

E

Figure 1: **Bias**-The figure shows the bias in % of different versions of bias-corrected MLE along with MLE of mean MOI parameter $\psi = \frac{\lambda}{1-e^{-\lambda}}$ for different lineage frequency distributions. Different colors correspond to different sample sizes N. The solid, long-dashed, dot-dashed and dashed lines correspond to MLE, TBCMLE (theoretical bias-corrected MLE), HBCMLE (heuristic bias-corrected MLE) and PBBCMLE (parametric bootstrap bias-corrected MLE), respectively.
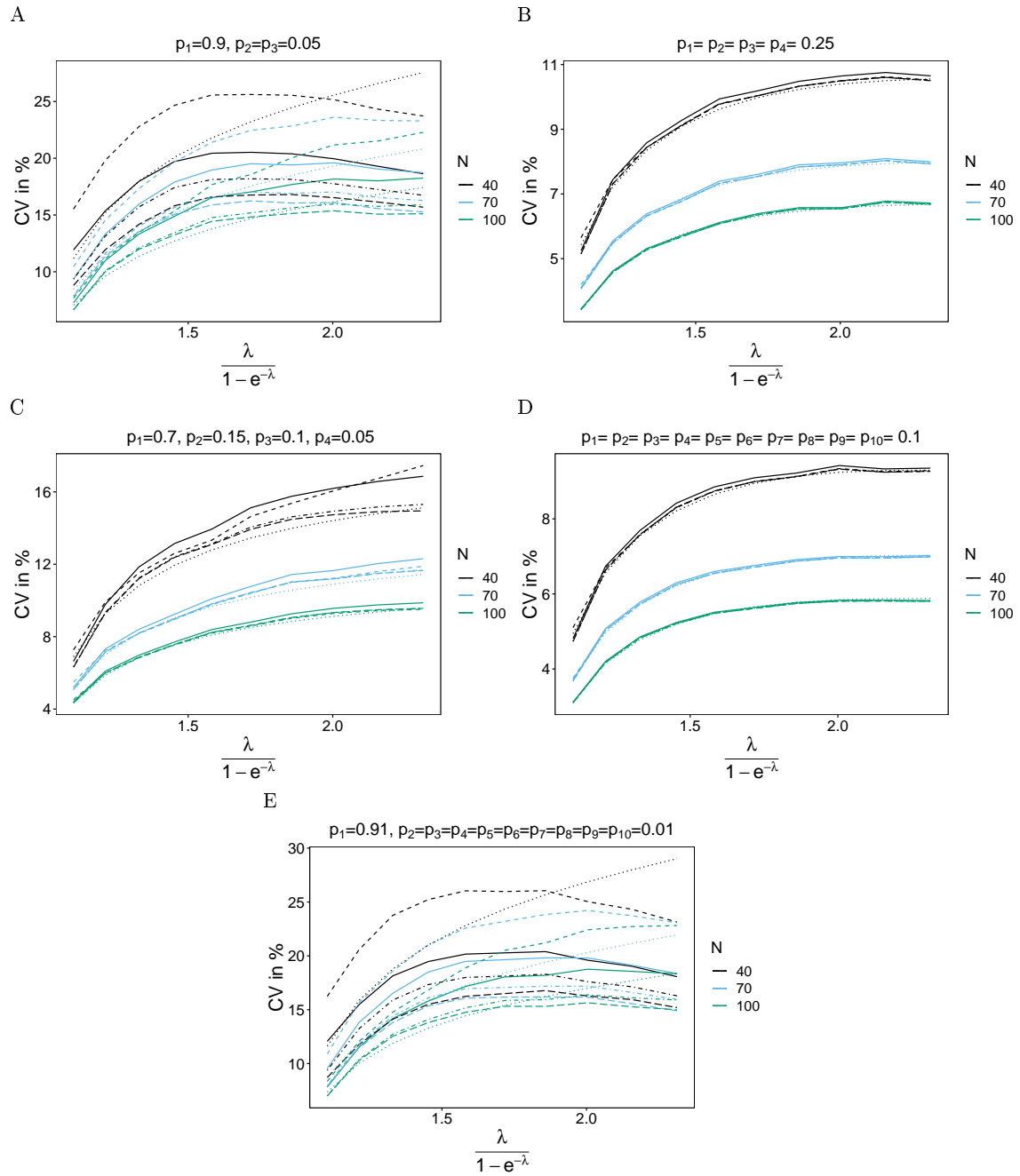
3   CV of $\hat{\lambda}$

A

B

C

D

E

Figure 2: Same as Figure 1 but for coefficient of variation.