

Comparison of simulations with expected values

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Here we compare the normalised expected branch lengths $\mathbb{E}[B_i(n)]/\mathbb{E}[B(n)]$ to estimated values from simulations under various coalescents. In the graphs below, the circles represent exact values of $\mathbb{E}[B_i(n)]/\mathbb{E}[B(n)]$, and the + the estimated values from simulating the corresponding coalescent process.

The recursions for the exact values are described in Birkner et al (2013): Statistical properties of the site-frequency spectrum associated with Λ -coalescents. *Genetics* 195: 1037–1053,

<https://doi.org/10.1534/genetics.113.156612>

and in

Blath et al (2016): The site-frequency spectrum associated with Ξ -coalescents. *Theoretical Population Biology* 10: 36–50.

<https://doi.org/10.1016/j.tpb.2016.04.002>

The C++ code for the simulations can be found at
<https://github.com/eldonb/coalescents/>

The scripts therein are part of a manuscript currently undergoing peer-review. Citation details will appear in due course.

Figure 1: Comparison of the normalised expected values $\mathbb{E}[B_i(n)]/\mathbb{E}[B(n)]$ computed exactly (circles) under the Λ -Beta($2-\alpha, \alpha$)-coalescent for sample size $n = 10$ and $\alpha = 1.1$ with estimates (+) obtained from 10^6 trials.

sample size $n=10$, $\alpha = 1.1$

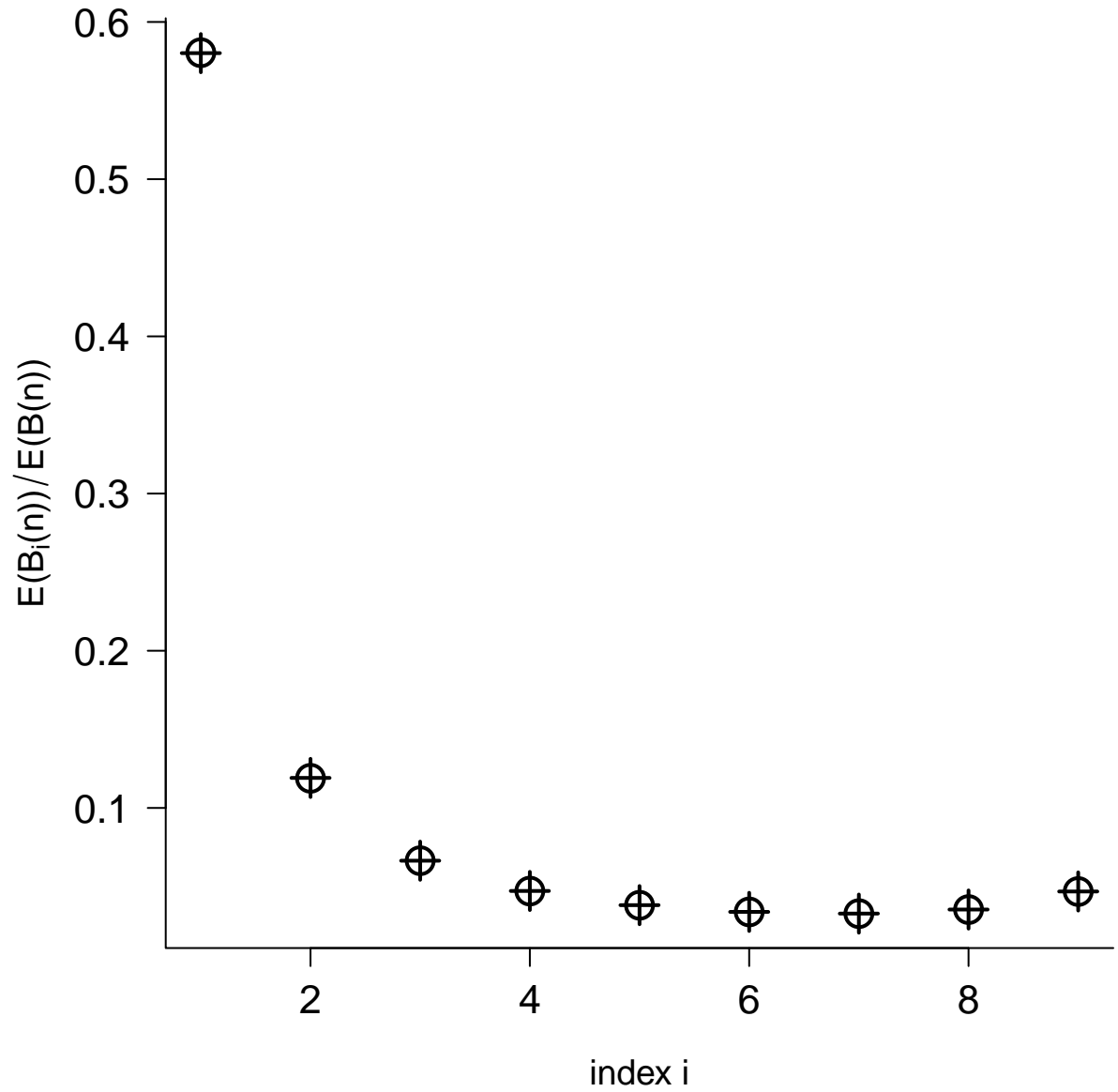


Figure 2: Comparison of the normalised expected values $\mathbb{E}[B_i(n)]/\mathbb{E}[B(n)]$ computed exactly (circles) under the Λ -Beta($2 - \alpha, \alpha$)-coalescent for sample size $n = 10$ and $\alpha = 1.25$ with estimates (+) obtained from 10^6 trials.

sample size $n=10$, $\alpha = 1.25$

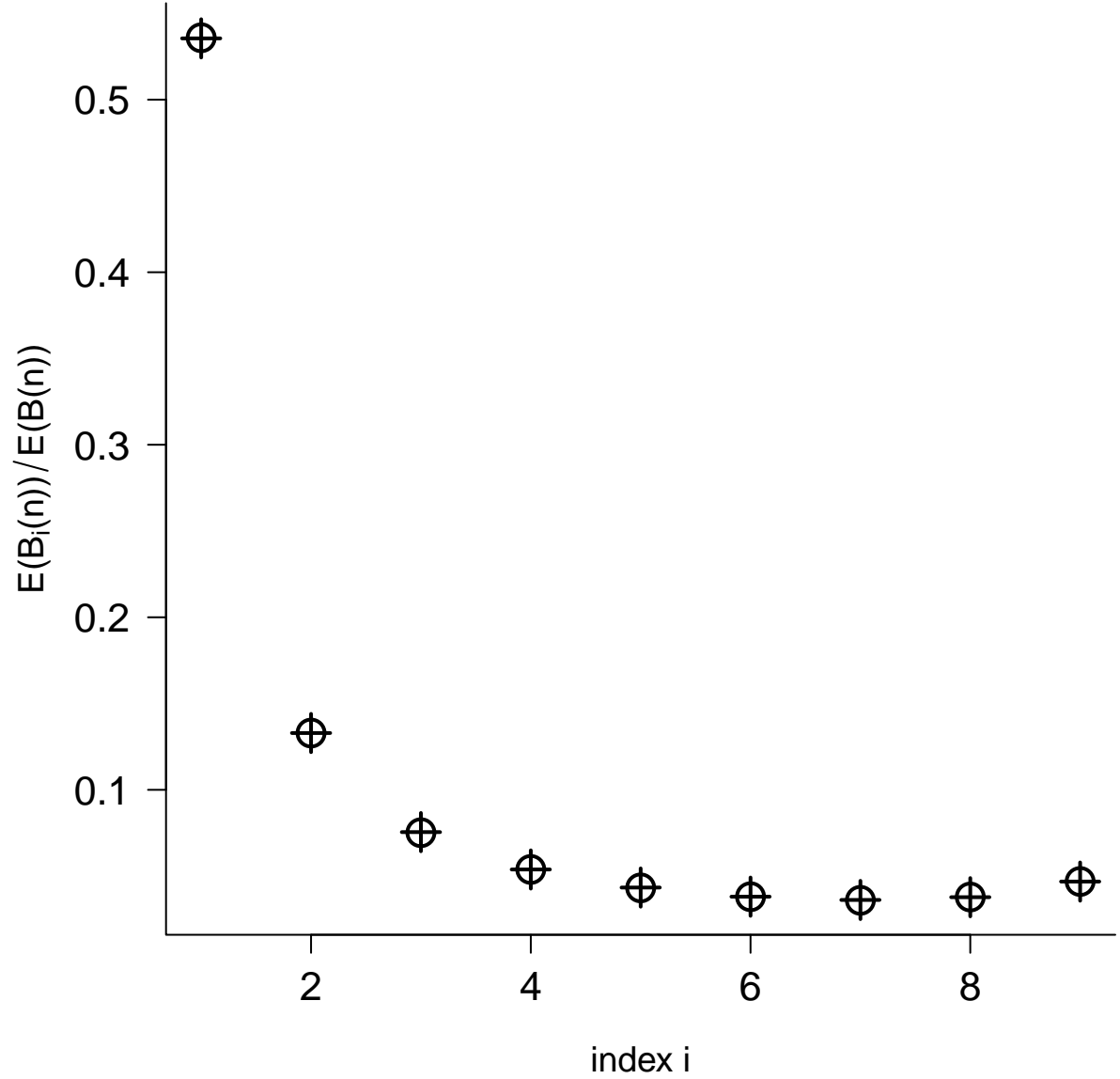


Figure 3: Comparison of the normalised expected values $\mathbb{E}[B_i(n)]/\mathbb{E}[B(n)]$ computed exactly (circles) under the Kingman(β)-coalescent for sample size $n = 10$ and $\beta = 1.0$ with estimates (+) obtained from 10^6 trials.

sample size $n=10$, $\beta = 1.0$

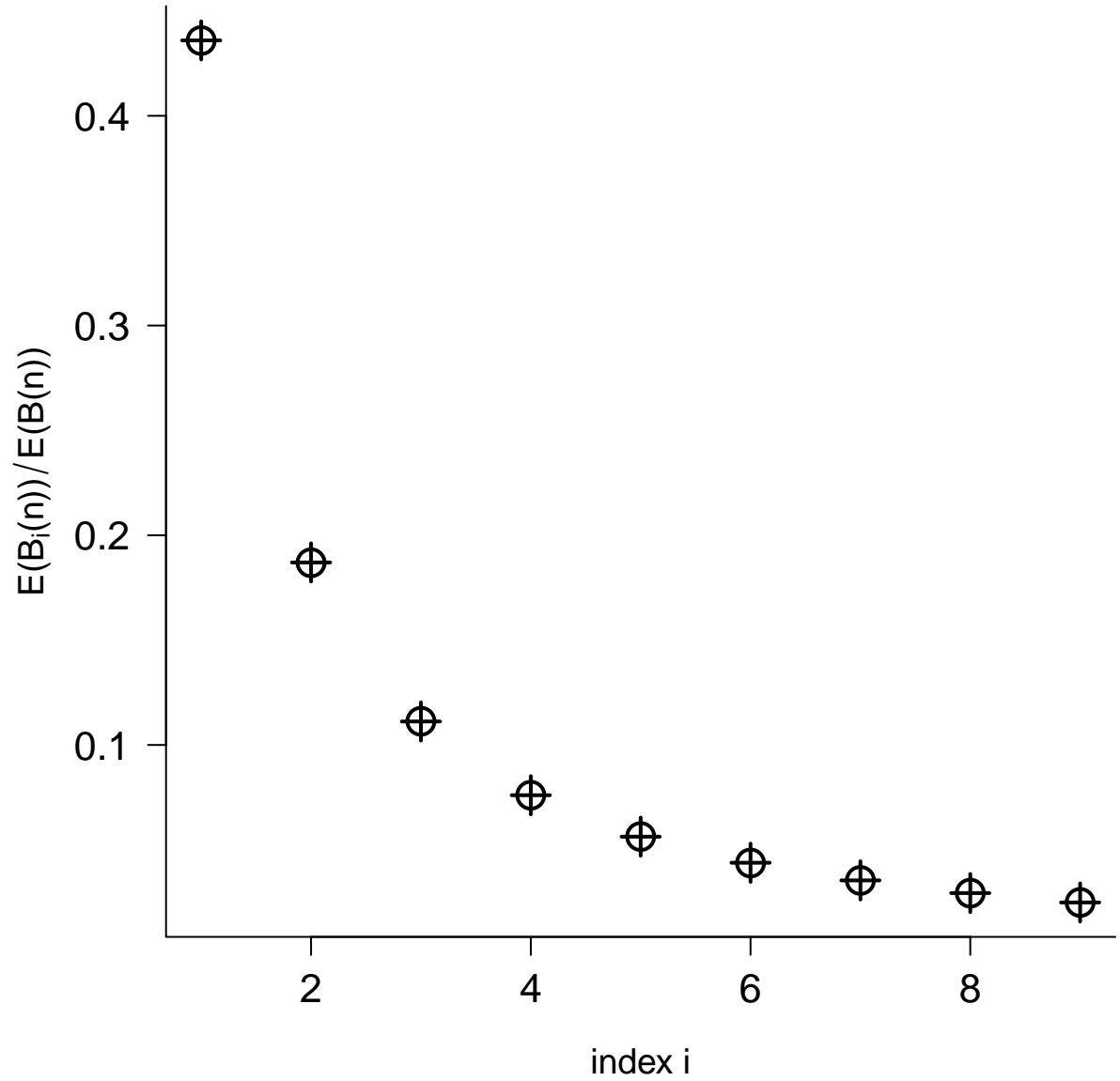


Figure 4: Comparison of the normalised expected values $\mathbb{E}[B_i(n)]/\mathbb{E}[B(n)]$ computed exactly (circles) under the Kingman(β)-coalescent for sample size $n = 200$ and $\beta = 100.0$ with estimates (+) obtained from 10^6 trials. Shown are values with indexes $i \in \{1, 2, 3, 5, 15, \dots, 185, 199\}$.

sample size $n=200$, $\beta = 100.0$

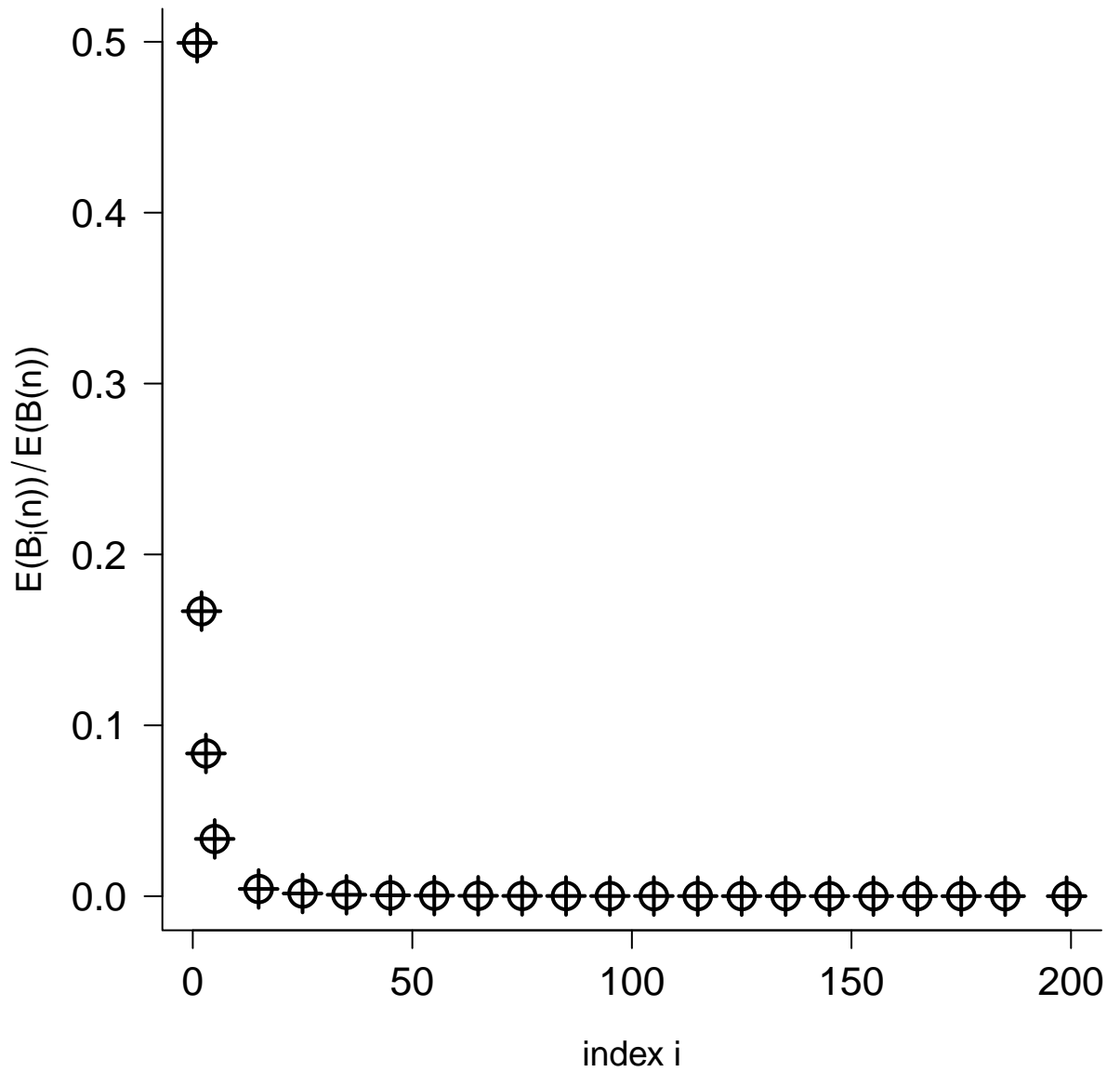


Figure 5: Comparison of the normalised expected values $\mathbb{E}[B_i(n)]/\mathbb{E}[B(n)]$ computed exactly (circles) under the Ξ -Beta($2-\alpha, \alpha$)-coalescent for sample size $n = 50$ and $\alpha = 1.1$ with estimates (+) obtained from 10^6 trials.

sample size $n=50$, $\alpha = 1.1$

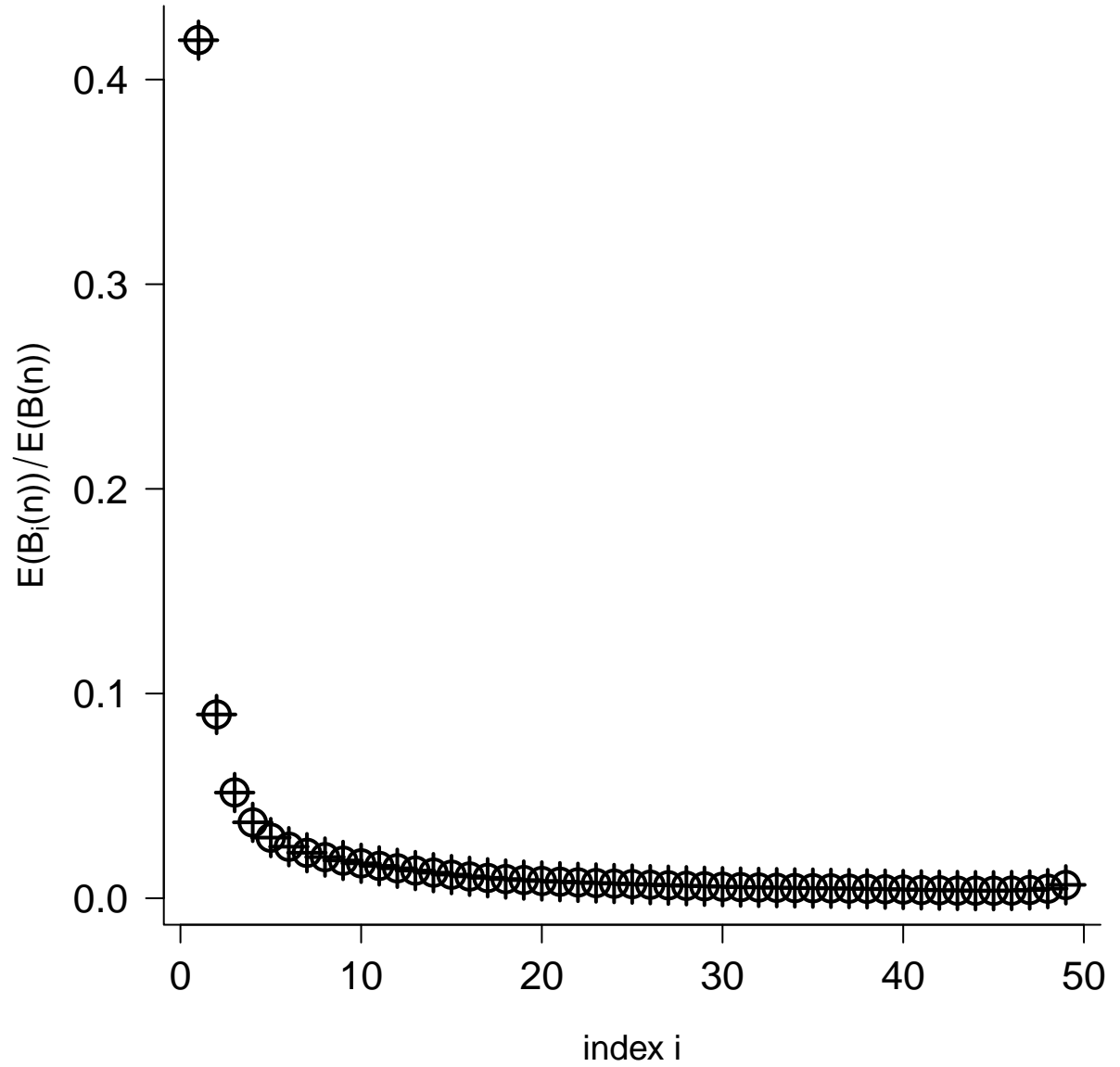


Figure 6: Comparison of the normalised expected values $\mathbb{E}[B_i(n)]/\mathbb{E}[B(n)]$ computed exactly (circles) under the Ξ -Beta($2 - \alpha, \alpha$)-coalescent for sample size $n = 100$ and $\alpha = 1.1$ with estimates (+) obtained from 10^6 trials.

sample size $n=100$, $\alpha = 1.1$

