1d-example.cpp

The first run_tdmc call performs deterministic drift dynamics with a totally unnecessary birth-death function $\chi = \beta(y - x)$, $\beta = -1.25$ in the release. Examples like this show how the walker numbers can vary when the path each walker takes is fully specified in advance.

The second run_tdmc call performs purely diffusive dynamics with the same birth-death function, which now improves sampling in one tail of the distribution while worsening sampling in the other tail. Which is which depends on the sign of β. This example provides a quantitative check on the walker numbers: with diffusion constant $D = 1$, for any β the expected walker number after one time unit is given by

$$\int dx \frac{1}{\sqrt{4\pi}} e^{-(x^2/4)+\beta x} = e^{\beta^2} \tag{1}$$

Fig. 1 shows an example of the results. Calculating the error bars makes a simple exercise. Also consider trying a time-dependent drift-diffusion equation, imagining you're a microrheologist simulating particles in driven matter, or trying a geometric drift-diffusion, imagining you're in finance pricing idealized options.

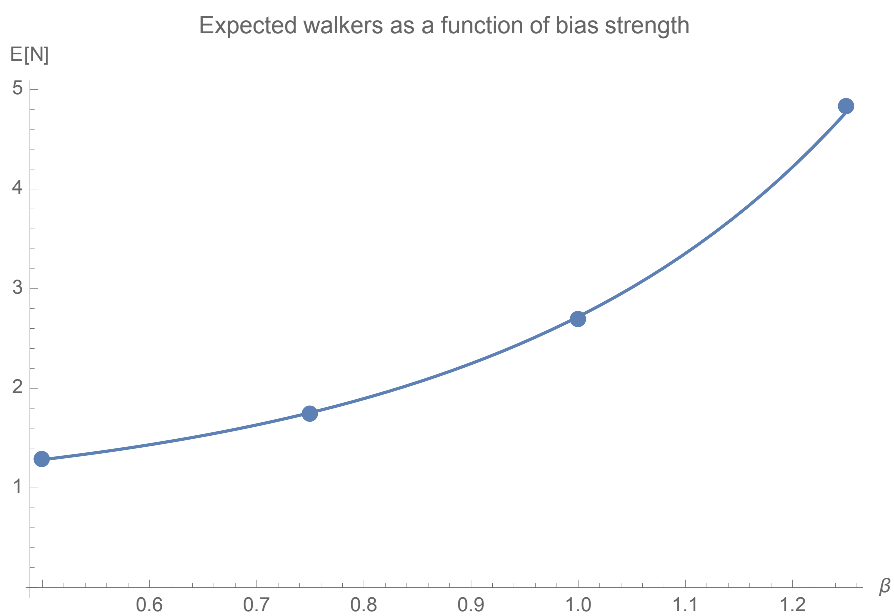

Figure 1: Expectation of the final number of walkers per run for a variety of bias strengths $\beta \in \{0.5, 0.75, 1, 1.25\}$. Data points are averages of walker number per replicate over 10,000 replicates at the β of interest; the solid line corresponds to the analytical reference $E[N] = e^{\beta^2}$.