

## EC8602: Problem Set 2

(Due December 6)

Write up your work clearly. Include beautiful figures. Also include your computer program, clearly commented. The basic idea is to simulate Brownian motion based on a discrete process with frequent small steps. Where possible, make connections between your answers to the different questions. You can work in the logarithmic formulation in which you get a Normal Distribution rather than Log Normal and an Exponential Distribution rather than Pareto.

1. Write a computer program to verify the derivation of Brownian motion in Feller. Think of a nice way to illustrate the results graphically. Be very clear about the link between the parameters of the discrete process and the parameters of the resulting Brownian motion.
2. Write a computer program that simulates the process in Erzo's paper where there is an entry point  $S$  and an exit point  $b$ . What can you learn about the formula for the fraction that survive to age  $a$  as a function of age?
3. Continuing with the problem above, what do you get for the distribution of size (profitability) conditional on survival to age  $a$ , as  $a$  evolves?
4. Allowing for continuous entry, simulate the invariant joint distribution of age and size among survivors.
5. Based on your answer above, what do you find for the size distribution? Is there an easier way to simulate it?