ECON408: Assignment 2

Jesse Perla, UBC

Question 1

Take the nonlinear growth model in the lecture.

In this question we will explore the depreciation parameter, δ. Using the original code, copying and pasted as required, we will use the `plot45` function here and `ts_plot` function as before.

The baseline parameters are the same `p = (A=2, s=0.3, α=0.3, δ=0.4, xmin=0, xmax=4)`.

With these, 1. With `k0=0.25` use the `plot45` contrasting the `δ=0.1` and `δ = 0.001` to the existing `δ=0.4`. Adapt the range and domain as required. 3. Plot the time series with `ts_plot` for those same cases - again adapting the range and domain as required. 4. Can you interpret the results? What is happening as $\delta \to 0$ and why?

Question 2

Take the nonlinear growth model in the lecture.

As before, start with our baseline parameters in that notebook: The baseline parameters are the same `p = (A=2, s=0.3, α=0.3, δ=0.4, xmin=0, xmax=4)`.

Now change the parameter to have `α=0.8` rather than the default of `0.3`.

1. Find the new k^* using the formula for the steady state for the case of `α=0.8` and `α=0.99`. Hint: it might diverge
2. Plot `ts_plot` and `plot45` for these cases, starting at `k_0=0.25` as before. Adapt the range and domain as required, but it may not be feasible to contain the steady state in that case
3. What is your interpretation? What is happening to the steady state and convergence?
4. Now do the same case with `α=0.8` but now have a higher depreciation rate, `δ=0.8`. Interpret and try to guess what would happen as $\alpha \to 1$, and how it depends on δ.

Question 3

Following the notes on AR(1) processes rather than plotting the distribution as normal instead lets see what the stationary distribution looks like with simulation.

1. From $X_0 = 1.0$ simulate up to $T = 1000$ using the process $X_t = aX_{t-1} + b + cW_t$ in the notes with the parameters there, $a = 0.9, b = 0.1, c = 0.5$.
2. On the same graph plot the histogram of those simulated values (i.e., $\{X_0, \dots X_T\}$) using `hist`, then plot the density of the stationary distribution calculated in closed from in those notes (i.e. create a normal distribution with $\mu^* = b/(1-a)$ and $v^* = c^2/(1-a^2)$)
3. Do these line up approximately? What happens if you discard the first 200 observations from that simulation (i.e. (i.e., $\{X_{199}, \dots X_T\}$))?