

Lets' assume that the following system represents the dynamics of two (endogenous) variables,  $X$  and  $Y$ :

$$X_{t+1} = 1 - \gamma X_t^2 + Y_t \quad (1)$$

$$Y_{t+1} = \beta X_t. \quad (2)$$

where all the others are fixed parameters. You have to analyze the system and:

- (a) Try to detect the (possible) steady states;
- (b) Try to understand under which condition(s) the steady states are stable;
- (c) Show the bifurcation diagrams for different parameters, and try to tell which kind of bifurcation(s) you have encountered;
- (d) Compute the main statistics of the endogenous variables (for example median, mean, standard deviation, kurtosis, ..etc...);

Please, write a report with calculations, tables, graphs and the (commented) python code(s). I do suggest you to use latex. You are expected to deliver a .pdf file of the report plus the python file(s). Please, send everything by email to Francesco Campigli and me.