

Week 10 - Oscillations

I. Technical exercises discussion

A. Pigeons (spreadsheet)

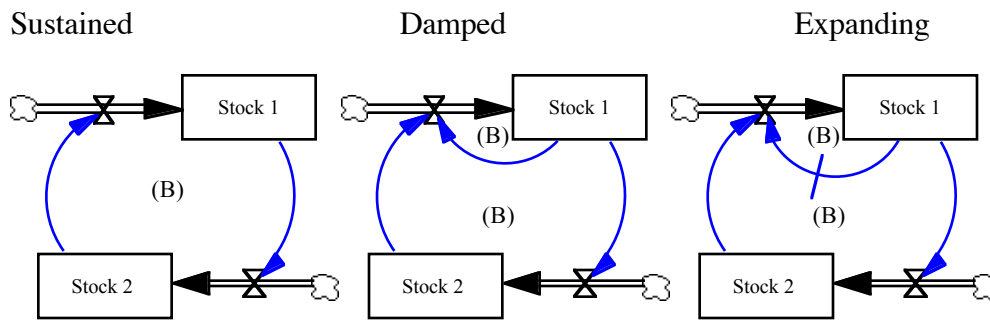
1. Review the net rate formulation
2. Overlay the hunting line; discuss the stable and unstable equilibria
3. Raise the hunt fraction and graph the stable equilibrium versus the hunt fraction, noting the bifurcation at $b = 0.1$
4. Graph the dynamics of the system for $b = 0.105$
5. Discuss extinction
6. Note that policies to change the hunt fraction involve licensing, much like the implementation policy in Kaibab.

B. Other questions

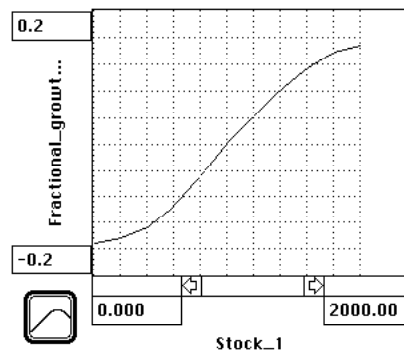
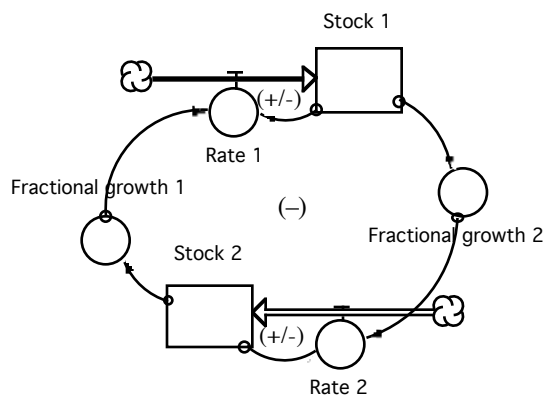
II. Oscillations

- A. Mass on a spring undamped
- B. With damping resistance loop
- C. With reinforcing loop
- D. With loops with delays

III. Summary of simple oscillating structures



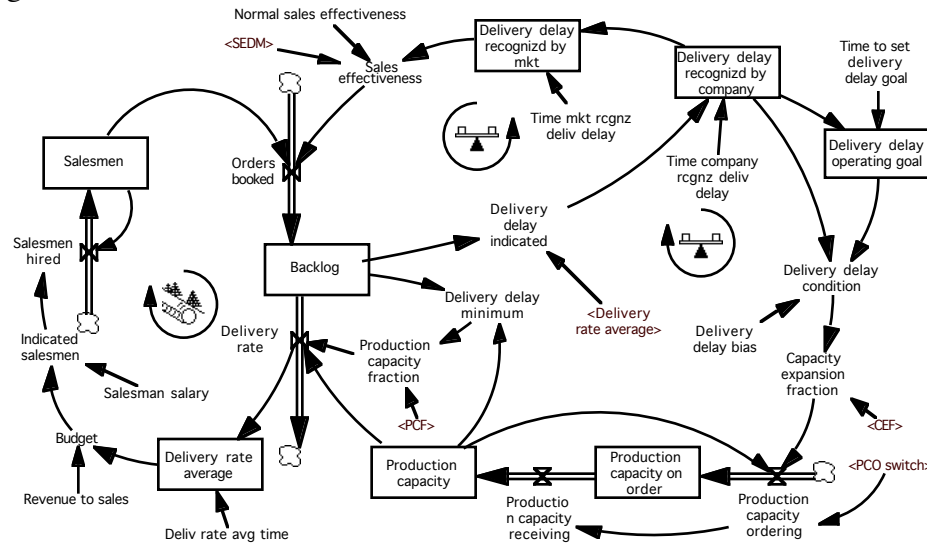
A nonlinear oscillator composed of two implicit goal-seeking structures:



Principles of oscillating systems (Graham 1977)

- Minor negative loops in an oscillatory structure increase damping, increase stability
- Major negative loops in an oscillatory structure usually decrease damping, increase instability
- Minor positive loops in an oscillatory structure decrease damping, increase instability
- Major positive loops in an oscillatory structure usually increase damping, increase stability

I. Market growth



- A.
- B. Source of oscillations
- C. Fixed versus sliding goals
- D. Apply to student understandings, if time