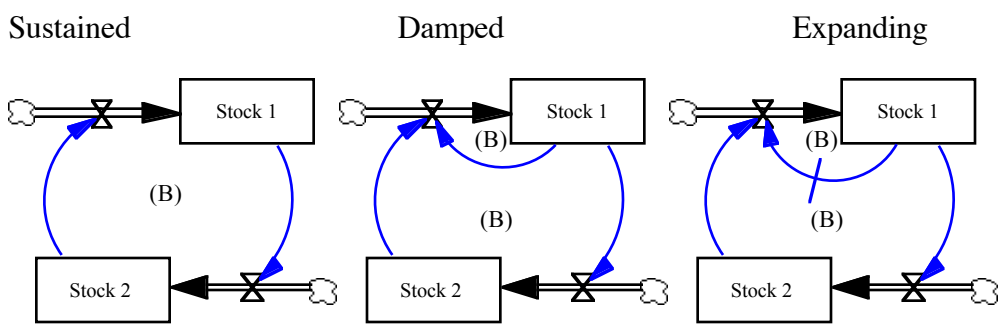
Week 10 - Oscillations

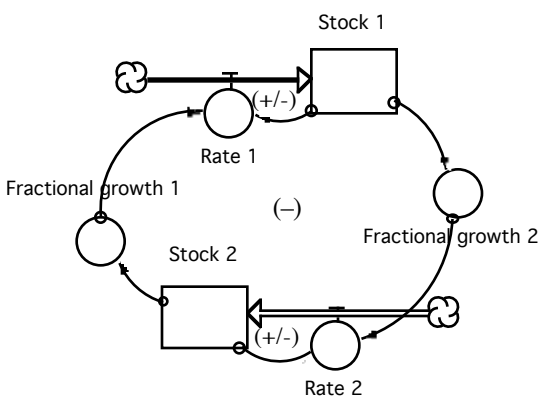
I. Technical exercises discussion
   A. Pigeons (spreadsheet)
      1. Review the net rate formulation
      2. Overlay the hunting line; discuss the stable and unstable equilibria
      3. Raise the hunt fraction and graph the stable equilibrium versus the hunt fraction, noting the bifurcation at b = 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

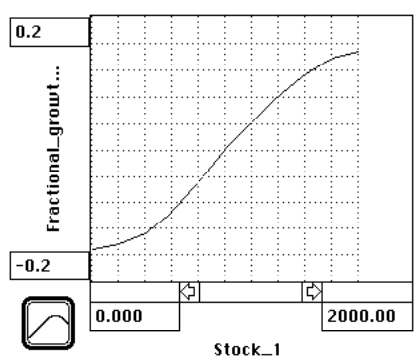
II. Oscillations
   A. Mass on a spring undamped
   B. With damping resistance loop
   C. With reinforcing loop
   D. With loops with delays

III. Summary of simple oscillating structures



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

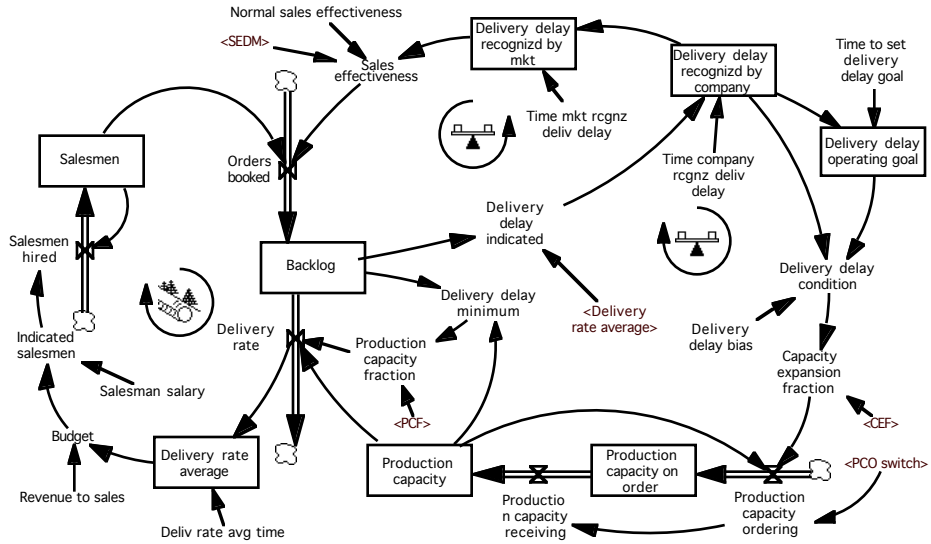




Principles of oscillating systems (Graham 1977)

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