Economics 314 Spring 2009
Project #3 Assignment Due: 10am, Wednesday, February 18

Partner assignments

Gavin Bell	Cori Savaiano
Juan Brito Rodriguez	Erik Swanson
Andrew Dubay	Trey Sands
Laura Florescu	Derek Rutter
Michael Gottesman	Alex Ragus
Lai Jiang	Ethan Knudson
Robert Kahn	Nina Showell

Each team should submit a single paper. You should not type your paper unless you get lots of utility from doing so; it can be very time-consuming to produce the equations and graphs electronically. I strongly encourage you to work as a team in solving the problems. At a very minimum, both partners must understand everything that's on the paper when you turn it in. You are free to interact with other teams and to seek advice from me as you work on the problems, especially on the mathematical solutions. The idea of problem sets is to learn from them, not to test whether you can do them perfectly without help.

Problems

1. Romer's Problem 1.6.
    - In part (*b*), be sure that you think about both the level and the slope of the growth path of *Y*.
2. Romer's Problem 1.8.
3. Romer's Problem 2.2.
    - Addendum: (*c*) Explain the intuition of the elasticity of intertemporal substitution. In other words, what are the implications for consumption behavior if $1/\theta$ is large or small?
4. Romer's Problem 2.4.
    - Hint: Start with the Lagrangean

$$\mathcal{L} = \int_{t=0}^{\infty} e^{-\rho t} \ln C(t) \frac{L(t)}{H} dt + \lambda \left[\Omega - \int_{t=0}^{\infty} e^{-R(t)} C(t) \frac{L(t)}{H} dt \right],$$

where

$$\Omega \equiv \frac{K(0)}{H} + \int_{t=0}^{\infty} e^{-R(t)} A(t) w(t) \frac{L(t)}{H} dt$$

is the right-hand side of Romer's equation (2.6). Derive the first-order condition, then use the budget constraint (with Ω substituted in) to solve out λ. You may need to evaluate a simple integral involving the exponential function.

- You may assume that $\rho > n$.
- Recall that $L(t) = L(0)e^{nt}$.

5. **Adding depreciation to the model.** Derive the equations of motion of c and k (*i.e.,* new versions of (2.24) and (2.25)) when the depreciation rate is positive.
   - Adding depreciation to the model makes two elemental changes.
     - The dynamics of the capital stock will change because we must now account for the flow of depreciation as well as the flow of investment/saving.
     - The rate of return to owners of capital is now smaller: equation (2.3) is replaced by an equation that accounts for depreciation.