

**Economics 614: Macroeconomics II**

Spring 2006

Cornell University

**Problem Set #11**

Due: Monday, April 21, 2006

# 1 Inventive Activity and Capital Accumulation

$$\begin{aligned} Y &= Y_C + Y_I + Y_R = AK \\ Y_R &= (1/4)Y \\ Y_C &= (4/5)(3/4)Y \\ Y_I &= (1/5)(3/4)Y \\ \dot{K} &= Y_I - (1/10)K \\ \dot{A} &= Y_R - (1/9)A \end{aligned}$$

Fully describe the dynamical system including:

- (a) the phase diagram
- (b) the associated linear system
- (c) the economic implications
- (d) stability of the system
- (e) robustness of the assumptions.

Change the production function to  $Y = AK^{3/4}L^{1/4}$ . Let  $L = 1$ . Redo the analyses above.

Change the production function to  $Y = A^{1/2}K^{1/4}L^{3/4}$ . Let  $L = 1$ . Redo the analyses above. (In parts 1 and 2, the production function exhibits increasing returns in the reproducible factors [ $1+1 > 1$ ,  $1 + 3/4 > 1$ ], while in part 3, the production function exhibits decreasing returns to the reproducible factors [ $1/2 + 1/4 < 1$ ].)

## 2 Externalities.

Assume that the production function for firm  $i$  is

$$Y_i = F(K_i, K, L_i) = 20(K_i)^{1/4}(K)^{1/8}(L_i)^{3/4}$$

where  $K_i$  is capital employed in firm  $i$ , and  $K$  is the aggregate capital stock. Firm  $i$  is so small that its affect on  $K$  is negligible, but firm  $i$  believes that all firms act like themselves. Assume that  $F$  is homogeneous of degree one in  $K_i$  and  $L_i$ . Set up the RCK model for this situation. Solve it. Analyze it.