

Problem Set 2

Econ 504

September 2009

Consider the Solow model with production function:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha}$$

where A_t is a stationary random process with mean one. Assume that the labor force is constant, and there is no labor productivity growth.

- (i) Derive the nonstochastic steady state as a function of α , s , and δ .
- (ii) Derive a linear approximation for the capital/labor ratio of the form:

$$k_{t+1} = \theta_0 k_t + \theta_1 a_t$$

where θ_0 and θ_1 are constants and lower case variables denote percentage (or log) deviations from the nonstochastic steady state. Find explicit expressions for θ_0 and θ_1 in terms of α , s , and δ .

- (iii) Assume that the process for a_t is an AR(1), that is

$$a_t = \rho a_{t-1} + \varepsilon_t$$

where ρ is a constant and ε_t is white noise with standard deviation σ . Discuss assumptions on ρ and/or σ that you need to impose to ensure that the linear approximation is valid in a neighborhood of the nonstochastic steady state.

- (iv) Assume the following values for the parameters: $\alpha = 0.36$, $s = 0.12$, $\delta = 0.10$, $\rho = 0.75$, $\sigma = 0.01$. Write a computer program whose output is a graph of the impulse responses (for the first 48 periods) of k_t and y_t to a one percent shock to a .

- (v) For the same parameters as in (iv), compute the implied variance of k and y . (You may do this analytically or via simulations.)