

Final
ECONOMICS 7110
MIDDLE TENNESSEE STATE UNIVERSITY
DUE: FRIDAY MAY 8

In accepting this test, I accept the following responsibilities:

- I will not receive nor give any aid on this test.
- I understand that all questions are equal points.
- I understand that some questions may be a little vague, either accidentally or by design. If so, I will state any assumptions I think I need to answer the question.
- I will turn this test in on (or before) Friday May 8, 2009 at 5:00 p.m.
- I understand that failure of one of these requirements can result in failure of this test.

Name (print): _____, Signed: _____.

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1. Consider a modified version of the skill acquisition model of Dejong and Ingram (2001) where the consumer solves:

$$\max_{\{c_t, n_{1,t}, n_{2,t}, h_{t+1}, k_{t+1}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t [\ln(c_t) + \psi \ln(1 - n_{1,t} - n_{2,t})]$$

subject to:

$$\begin{aligned} c_t + k_{t+1} - (1 - \delta)k_t &\leq \theta_t k_t^\alpha (h_t n_{1,t})^{1-\alpha} \\ h_{t+1} &\leq (n_{2,t})^\rho + (1 - \delta_h)h_t \end{aligned}$$

where

$$\ln \theta_{t+1} = \phi \ln \theta_t + \sigma \varepsilon_{t+1}$$

where $\varepsilon_{t+1} \sim N(0, 1)$. The idea is that our consumer produces two goods; goods to consume/invest and human capital. The time spent making goods is $n_{1,t}$. The time spent in human capital accumulation is $n_{2,t}$. Human capital is produced using a production function, $(n_{2,t})^\rho$, and past accumulated human capital, $(1 - \delta_h)h_t$. Also, the model is calibrated by $[\beta, \alpha, \psi, \delta, \delta_h, \phi, \rho] = [0.98, 0.40, 2.33, 0.025, 0.025, 0.95, 0.90]$. The coefficient σ will be calibrated by yourself below.

- (a) What is the Bellman's equation for this model? Define the states and controls.
- (b) Show how the equilibrium optimality equations are developed.
- (c) Using economic reasoning interpret the Eulers.
- (d) Write a `matlab` code that solves for the steady states. Present the steady states.
- (e) Write out the linearized optimality equations.
- (f) Write a `matlab` code that solves the model. Present these solutions rules.
- (g) Starting from the steady state, simulate the economy for 8,000 periods, dropping the first 1,000 to eliminate the effects of the initial conditions. Change the coefficient σ so that the standard deviations of output matches the U.S.economy's of 1.72%.
- (h) For the simulated economy, compute and present the standard deviations of output, consumption, capital investment, human capital investment, labor hours, and skill acquisition hours.
- (i) For the simulated economy, compute the correlations with respect to output of: consumption, capital investment, human capital investment, labor hours, and skill acquisition hours.
- (j) Relative to the baseline economy that was presented in class, does the model with human capital add to our understanding of the volatility in labor hours? Volatility in capital investment?