University of California, Davis   Date: June 26, 2007

Department of Economics   Time: 3 hours

Monetary Economics   Reading Time: 20 minutes

<u>PRELIMINARY EXAMINATION FOR THE Ph.D. DEGREE</u>

Directions: Answer all questions.

1. Consider the Carlstrom-Fuerst model of agency costs. Assume there are two
   types of agents, entrepreneurs and lenders, both risk neutral. Entrepreneurs
   enter the period with net worth of n and have access to a stochastic technology
   that contemporaneously transforms i units of consumption goods into ωi units
   of capital, with i distributed *i.i.d.*, $i > 0$, $E(i) = 1$, with distribution Φ and
   density ϕ. The shock, ω, is privately observed by entrepreneurs but can only
   be observed by lenders by incurring a monitoring cost of μi capital units. The
   lending contract stipulates an interest rate r^k. Thus, an entrepreneur borrows
   $(i - n)$ and repays $(1 + r^k)(i - n)$. The entrepreneur defaults if the projects
   returns are insufficient to pay back the loan; in this case, the lender incurs
   the monitoring costs and confiscates all the returns on the project. Given this
   environment, answer the following

   (a) Define the lower bound of the technology shock $\bar{\omega}$ that determines solvency;
       i.e., for values $\omega < \bar{\omega}$ entrepreneurs default on the loan.

   (b) Show that the optimal debt contract can be defined in terms of $(i, \bar{\omega})$.

   (c) Calculate expected lender's and entrpreneurial's income as a function of
       $(i, \bar{\omega})$.

   (d) Design the optimal contract as the pair $(i, \bar{\omega})$ that maximizes entrepre-
       neur's expected returns subject to the lender being indifferent between
       lending or retaining the funds. Derive and interpret the necessary condi-
       tions associated with this contract.

   (e) Describe the roles that net worth and monitoring costs play in the equi-
       librium characteristics of this model.

2. An economy is populated by a representative household that makes labor, con-
   sumption and asset choices in order to maximize:

$$E_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left[\ln c_t + \ln \left(\frac{M_t}{P_t} \right) + A(1 - h_t) \right] \right\}$$

   where c_t denotes consumption, M_t is money chosen in period t, and h_t denotes
   labor. In addition to labor income, the household is supplied with one unit

of capital which it rents to firms at the nominal price of R_t. (There is no investment in the economy, $k_t = 1$ for all t.) The income from labor and capital is combined with the income from one period nominal bonds purchased in the previous period and beginning of period money holdings in order to finance consumption, new bond purchases and the acquisition of new money. (Note that the household does not acquire new capital - hence the aggregate capital stock is fixed at one.) Also, the household receives a lump sum monetary transfer from the government, denoted T_t.

Firms in the economy hire capital and labor in order to maximize profits. These inputs are used to produce output, y_t, using a constant returns to scale technology:

$$y_t = z_t k_t^{1-\alpha} h_t^\alpha$$

where z_t denotes a stochastic technology shock. The law of motion for z_t is given by

$$z_t = z_{t-1}\varepsilon_t \tag{1}$$

where ε_t is an i.i.d. shock with $E(\varepsilon_t) > 1$. Note that this implies that the economy is, on average, growing over time. The government controls the money supply and adjusts the monetary growth rate according to the current innovation to the technology shock. That is, the money supply is given by:

$$M_t = (\gamma\varepsilon_t) M_{t-1} \tag{2}$$

If $\gamma > 1$, then the central bank "accomodates" a technology shock; if $\gamma < 1$, this can be interpreted as the central bank "leaning against the wind".

Given this environment, do the following:

(a) Write down the household's maximization problem as a dynamic programming problem and derive the associated necessary conditions.

(b) Derive the necessary conditions associated with the firm's maximization problem.

(c) Define a recursive monetary equilibrium. (Again, note that output in this economy is growing over time.)

(d) Characterize the equilibrium behavior of consumption, labor, inflation, and nominal interest rates in this economy.

(e) How does the value of γ affect the equilibrium behavior of nominal interest rates? Explain.

3. Imagine you are an advisor to a new Federal Reserve Bank President. His background is investment banking; he has no formal training as an economist. Write a memorandum outlining:

(a) The main features of dynamic new Keynesian models.

(b) Their most important normative lessons for monetary policy.

4. Discuss the following:

   (a) Explain intuitively why optimal monetary policy under committment is history dependent.

   (b) Explain the difference between t_0-optimal committment and committment from the timeless perspective. In your opinion, which is a more plausible concept of committment? Why?