Macro Theory B

Final exam (spring 2014)

Ofer Setty
The Eitan Berglas School of Economics
Tel Aviv University

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Details:

- Course number: 1011-4108-01
- Year/semester: 2013-2014/2
- The exam includes 3 questions
- The weight for each question is specified
- Duration: 2.5 hours
- Number of pages: 3
- No other material is allowed

1 Economy with tax evasion (40 points)[1]

Consider a stationary economy populated by a continuum of measure one of infinitely lived, ex-ante equal households with preferences over sequences of consumption and leisure given by

$$U(c_{it}, , h_{it}) = \left[u\left(c_{it}\right) + \psi_{it} v\left(1 - h_{it}\right)\right],$$

where $\beta \in (0,1)$ is the subjective discount factor, c_{it} is consumption and $h_{it} \in (0,1)$ is the time devoted to work out of a time endowment of 1. Assume that $u(\cdot)$ and $v(\cdot)$ are twice continuously differentiable concave increasing functions.

Agents face individual shocks to their preference for leisure ψ_{it}, which follows some stochastic process, potentially with some persistence e.g., AR(1)). Agents can save but cannot borrow. Production takes place through the aggregate technology $C_t + K_{t+1} - (1-\delta)K_t = AK_t^{\alpha} H_t^{1-\alpha}$ where C_t, K_t, and H_t are, respectively, aggregate consumption, aggregate capital, and aggregate hours at time t. Labor and asset markets are competitive and clear, every period, with prices w_t and r_t, respectively. The government taxes capital income at a fixed flat rate τ. Tax revenues are returned to households as tax-exempt lump-sum transfers b. Households can evade taxes by deciding every period t the fraction of capital income ϕ_{it} to declare in their tax return, i.e., the fraction of capital income on which they pay taxes. Let x_{it} be the total undeclared taxes at time t.

The government, knowing that households may have evaded taxes at time $t-1$, at time t can monitor and perfectly verify the past period individual tax returns. Let π be the probability that, at time t, the time $t-1$ tax returned of a household is monitored. The household finds out whether her $t-1$ period tax return is monitored at the beginning of period t, i.e., before consumption decisions are taken. In the event the household is caught, at time t the tax agency collects a total of $z(x_{i,t1})$ (which includes both the tax evaded and a fine), where $x_{i,t1}$ is the tax amount due from the past period, with $z(0) = 0$ and $z'(x_{i,t-1}) > 1$.

1. What is the household's state? How is the state affected by whether the preference process has persistence or not?

2. Write down the problem of the household in recursive form, making explicit the individual and the aggregate state variables.

3. Define a stationary recursive competitive equilibrium for this economy. Suppose that, in order to verify households tax returns, the government faces an administrative monitoring expenditure $m(\pi)$, with $m(0) = 0$, $m'(\pi) > 0$, $m''(\pi) > 0$.

4. Write down the problem of a benevolent government that chooses the fraction π of households to monitor in order to maximize social welfare in the economy. Explain the trade-offs that the government faces in setting π.

[1]This question is based on an exam question by Gianluca Violante (NYU).

2 Search and matching (30 points)

In this question we will study the effect of severance payments on the search and matching equilibrium. Our point of departure is the textbook **steady state** Search and Matching model discussed in class. The government wants to provide workers with a severance payment. This is a payment that is paid for one period to workers who have separated from their job. This one-time payment is equal to $(w - b)$ where w is the steady state wage and b is a non-pecuniary value of leisure. The payment is provided in the period following the separation. The firm which hires the worker is responsible for this payment.

1. Write down the value functions for the revised model
2. Solve, i.e., provide one equation that depends only on the market tightness θ and the model's parameters
3. Compare this solution to the one without severance payment. Is what ways is the equilibrium different than the textbook solution and why? In particular, what happens to v, u, w?

3 Quadratic Utility (30 points)

Consider the consumption-saving problem of an infinitely lived household with quadratic utility:

$$u(c_t) = b_1 c_t - \frac{1}{2} b_2 c_t^2$$

who can save/borrow through a risk-free bond bearing an interest rate $r = 1/\beta - 1$. The household faces stochastic income shocks $\{y_t\}_{t=0}^{\infty}$. The agent is not subject to a borrowing constraint (except for a no-ponzi scheme constraint).

1. Define *certainty equivalence.*
2. Express c_t as a function of current assets and current and expected future income and show that certainty equivalence holds for this linear-quadratic consumer.
3. Which properties of the model are responsible for this result?