



HARVARD UNIVERSITY
DEPARTMENT OF ECONOMICS

General Examination in Macroeconomic Theory

FALL 2011

You have **FOUR** hours. Answer all questions

Part A (Prof. Laibson): 48 minutes
Part B (Prof. Barro): 48 minutes
Part C (Prof. Farhi): 72 minutes
Part D (Prof. Friedman): 72 minutes

PLEASE USE A SEPARATE BLUE BOOK FOR EACH QUESTION AND WRITE THE QUESTION NUMBER ON THE FRONT OF THE BLUE BOOK.

PLEASE PUT YOUR EXAM NUMBER ON EACH BOOK.
PLEASE DO NOT WRITE YOUR NAME ON YOUR BLUE BOOKS.

Fall General Exam 2012

August 26, 2011

Bertola and Caballero (1990): Consider a firm that faces a decision problem. The firm tries to keep an Ito process, $X(t)$, near zero. Specifically, the firm tries to maximize the net present value of instantaneous payoffs

$$-\frac{b}{2}X^2$$

where the discount rate is ρ . Assume $X(t)$ is described by

$$dX = \alpha dt + \sigma dz + (\text{discrete adjustments undertaken by the firm}).$$

A discrete upward adjustment of I units costs the firm $C_u + c_u I$, with $C_u \geq 0$ and $c_u \geq 0$. A discrete downward adjustment of $|I|$ units costs the firm $C_d + c_d |I|$, with $C_d \geq 0$ and $c_d \geq 0$. Solving this problem, is equivalent to finding four endogenous boundaries for $X(t)$: U, u, d, D . When $X(t)$ reaches U , the firm discretely raises $X(t)$, jumping to $X(t) = u$. When $X(t)$ reaches D , the firm discretely lowers $X(t)$, jumping to $X(t) = d$.

- Intuitively explain why $u \leq d$. Under what conditions will this inequality hold strictly? When will $u = d$. Explain your reasoning with intuition.
- Intuitively explain why $U \leq u$ and $d \leq D$. Under what conditions will these inequalities hold strictly? When will $u = U$? When will $d = D$? Explain your reasoning with intuition.
- Derive the continuous-time Bellman Equation in the continuation region (i.e., for $U \leq X(t) \leq D$).
- Show that

$$V(X) = -\frac{b}{2} \left(\frac{X^2}{\rho} + \frac{\sigma^2 + 2\alpha X}{\rho^2} + \frac{2\alpha^2}{\rho^3} \right)$$

is the expected present value of the firm's payoff stream assuming that adjustment costs are infinite.

- Explain why the general solution of the Bellman Equation is given by

$$V(X) = -\frac{b}{2} \left(\frac{X^2}{\rho} + \frac{\sigma^2 + 2\alpha X}{\rho^2} + \frac{2\alpha^2}{\rho^3} \right) + A_1 e^{\alpha_1 X} + A_2 e^{\alpha_2 X}$$

with roots

$$\alpha_1 = \frac{-\alpha + \sqrt{\alpha^2 + 2\sigma^2\rho}}{\sigma^2}$$

$$\alpha_2 = \frac{-\alpha - \sqrt{\alpha^2 + 2\sigma^2\rho}}{\sigma^2}.$$

Sign roots α_1 and α_2 .

- How many equations do you need to solve for the unknown variables that characterize the solution? Write down the equation system that you would use to solve for the unknown variables. Intuitively explain all of the equations. (Do not solve the system. You'll get full credit just by writing the system down.)

Barro questions (8 minutes each, total of 48 minutes)

True-False-Uncertain.

Are the following statements true, false, or uncertain? Explain **briefly** (but your explanation determines your grade).

1. In the neoclassical growth model, poorer economies tend to grow faster than richer economies.
2. The observed high equity premium (difference between the average rates of return on equity and a risk-free asset) cannot be explained within the neoclassical growth model.
3. A constant tax rate on consumption has no effect on the equilibrium path of the neoclassical growth model even when the model allows for a labor-leisure choice.
4. In models of endogenous growth, a subsidy to expenditures on research & development can be Pareto improving.
5. Ricardian equivalence implies that a change in government purchases has no effect on real GDP.
6. In the strategic debt model (where political parties differ in their preferred sizes of government), a higher probability of reelection for the incumbent party lowers the current budget deficit.

Answer all the following questions. Some are True/False/Uncertain and are explicitly denoted as such. The others are direct questions. Explain and detail your answers VERY carefully. The QUALITY of your explanation determines your grade.

1. TRUE/FALSE/UNCERTAIN. In the neoclassical growth model with endogenous labor, a temporary increase in government expenditures leads to a temporary increase in output, labor and capital.
2. Explain how the impulse responses for consumption and labor in the RBC model change when the persistence of the productivity shock increases. How is the amount of amplification of productivity fluctuations on output affected?
3. TRUE/FALSE/UNCERTAIN. In order to match the data, the RBC model requires a large elasticity of labor supply. This is consistent with the microeconomic evidence on the elasticity of labor supply.
4. Explain what the the employment-lottery model is. Can this model generate an aggregate elasticity of labor supply which is larger than the individual elasticity of labor supply?
5. Explain what happens when the RBC model is extended to incorporate endogenous capital utilization.
6. TRUE/FALSE/UNCERTAIN (for each of the following three statements). In the New-Keynesian model, real interest rates are counter-cyclical when monetary policy shocks are driving fluctuations. In the RBC model, real interest rates are pro-cyclical when productivity shocks are driving fluctuations. In both cases, real wages are pro-cyclical. All these properties are consistent with the data.
7. Consider the RBC model with money in the utility function. Imagine a Taylor rule of the form $i_t = \rho + \phi_\pi \pi_t$. What does local determinacy mean? What conditions on the parameters (ρ, ϕ_π) of the Taylor rule guarantee local determinacy? Consider alternatively a money supply rule $M_t = \bar{M}$ (where M_t is nominal money supply and \bar{M} is a constant) yield local determinacy? How would your answer change for the New Keynesian model?
8. Consider the RBC model with money in the utility function (and assume as in class that money enters the utility function separably from consumption and leisure). Consider a Taylor rule of the form $i_t = \rho + \phi_\pi \pi_t$. Assume that $\phi_\pi > 1$ so that the Taylor rule yields local determinacy. Suppose that the economy is initially in steady state. What happens to real money balances, the path of the money supply, inflation and interest rates when the coefficient ρ is increased to $\rho' > \rho$?
9. Consider the New-Keynesian model and let \bar{r}_t be the natural interest rate. Imagine first that $\bar{r}_t \geq 0$ for all $t \geq 0$. Explain why optimal monetary policy can be described as a Taylor rule of the form $i_t = \bar{r}_t + \phi_\pi \pi_t$ with $\phi_\pi > 1$? Imagine that the natural interest rate \bar{r}_t is negative for $t \in [0, T]$ and positive for $t \in [T, \infty)$. There is a zero lower bound on nominal interest rates because agents can substitute away from bonds and into cash. Consider a Taylor rule that delivers the flexible price outcome with zero inflation when the zero bound is ignored: $i_t = \bar{r}_t + \phi_\pi \pi_t$ with $\phi_\pi > 1$. Can monetary authorities do better than simply use the truncated Taylor rule $i_t = \max\{\bar{r}_t + \phi_\pi \pi_t, 0\}$? If so how?
10. What is the Feldstein-Horiokka puzzle? Is it a good test of international financial integration?

11. Explain the Balassa-Samuelson effect. Is there evidence for this effect in the data?
12. Illustrate the effect of a unilateral transfer from one country to another country using the Dornbusch-Fischer-Samuelson model augmented with nontraded goods. What happens to the terms of trade and to the real exchange rate?

By most accounts, the catalyst for the recent “great recession” in the United States was the sharp decline in house prices that began in mid 2006, continued for nearly the next four years, and since then has slowed but not ended. Presumably, falling house prices exerted a contractionary effect on economic activity via the familiar wealth effect on consumer demand. (In the United States, owner-occupied housing is the largest single component of wealth for most households.) But many people have argued that the steep decline in house prices depressed nonfinancial activity in ways beyond just the wealth effect on consumer demand and, further, that the consequences also included an impaired capacity of monetary policy to stimulate economic activity, both during the initial recessionary period when short-term nominal interest rates were still positive and then after the Federal Reserve System had lowered its key policy interest rate (the federal funds rate) to approximately zero.

By what mechanism(s), other than the usual negative wealth effect on consumer demand by forward-looking households, would falling house prices be expected to depress nonfinancial economic activity, and thereby make the downturn more severe, for a given level of the federal funds rate maintained by the central bank? Be specific about the assumptions on which your answer relies.

By what mechanism(s) would falling house prices also reduce the ability of monetary policy to stimulate nonfinancial economic activity once the central bank decided to try to resist the economic downturn? Here too, be specific about the assumptions on which your answer relies. Also distinguish between effects that would apply only when the short-term nominal interest rate is positive and those that would also apply when the short-term nominal rate is at the zero lower bound.