Harvard University
Department of Economics

Economics 2010d: Final Examination and
General Examination in Macroeconomic Theory

Spring Term 2006

PLEASE USE A SEPARATE BLUE BOOK FOR EACH PART 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.

For those taking the **GENERAL EXAM** in macroeconomic theory:

1. You have **FOUR** hours.

2. Answer **ALL QUESTIONS** in Parts I, II, III, IV, and V.

3. Time allotted for each part:

I.	40 minutes
II.	40 minutes
III.	53 minutes
IV.	53 minutes
V.	53 minutes

For those taking the **FINAL EXAMINATION** in Economics 2010d
(**not the General Examination**):

1. You have **THREE** hours.

2. Answer **ALL QUESTIONS** in Parts III, IV and V.

3. **DO NOT ANSWER** the questions in Parts I and II.

Macro general **Spring 2006**
Laibson

True/false/uncertain: (40 minutes)

Explain briefly. Explanation determines grade.

1. Consider a regression in which the dependent variable is growth in household consumption and the independent variable is growth in household income. If consumers are rational and there are no liquidity constraints, then the coefficient on income growth should be zero.

2. Let I(t) represent an Ito Process. Then the variance of I(t) is increasing in t.

3. If a Bellman Operator has a unique fixed point, then the Bellman Operator is a contraction mapping.

4. Economic theory predicts that in retirement $\Delta\ln(c)$ should equal (EIS)*(r-ρ), where EIS is the elasticity of intertemporal substitution, r is the real interest rate, and ρ is the discount rate.

5. The continuous-time Bellman Equation may be an ordinary differential equation or a partial differential equation. In either case, it has many feasible solutions.

6. The price of capital will jump after a change in the rate of taxation on corporate earnings.

7. If an investment tax credit unexpectedly starts, the price of capital will jump up.

Barro question (40 minutes)

Consider the standard neoclassical growth model, where the representative household maximizes $\int_0^\infty u(c)\cdot e^{nt}\cdot e^{-\rho t}dt$, with $u(c)=c^{1-\theta}/(1-\theta)$. The population growth rate is n>0, the rate of time preference is ρ>0, and θ>0 is the magnitude of the elasticity of marginal utility. The production function takes the usual form, $\hat{y}=f(\hat{k})$, where $\hat{y}$ is output per unit of effective labor and $\hat{k}$ is capital per unit of effective labor. Effective labor grows at the rate n+x, where x is the rate of exogenous technical progress. The economy starts with capital per effective worker of $\hat{k}(0)$. Capital depreciates at the rate δ>0. Suppose that there are two kinds of assets: claims on capital and risk-free, short-term bonds.

a. How does the (risk-free) real interest rate on bonds relate to the expected rate of return on capital?

b. What is the real interest rate during the transition to the steady state and in the steady state?

c. What is the growth rate of real GDP during the transition to the steady state and in the steady state?

d. What is the transversality condition? Explain the meaning of this condition.

e. Suppose that the production function includes a multiplicative random shock, so that the rate of return on capital is uncertain. Does the transversality condition in **d.** still relate to the risk-free real interest rate? Explain.

General Exam
Spring 2006

Professor Alesina
Instructions. Please answer all questions.

1. Consider the Blanchard-Kiyotaki model as discussed in class, that is the simplified version of the original model as presented in the Blanchard-Fischer book. The utility function of the consumer is:

$$u_i = \left(\frac{c_i}{g}\right)^g \left(\frac{\frac{M_i}{P}}{1-g}\right)^{1-g} - \frac{d}{\beta} y_i^\beta$$

where $1 > g > 0$, $d > 0$, $\beta \geq 1$, and $c_i = \left(\sum_{j=1}^{n} c_{ji}^{\frac{\theta-1}{\theta}}\right)^{\frac{\theta}{\theta-1}} n^{\frac{1}{1-\theta}}$.

   (a) Provide a brief economic interpretation of this function. What is the interpretation of β? What is the interpretation of θ?

   (b) Write down the budget constraint for this consumer and his/her maximization problem.

   (c) Without actually deriving it, describe clearly the step-by-step procedure used to solve this model, and derive the equilibrium output.

   (d) Is there money neutrality in this model?

   (e) Can monetary policy influence the level of equilibrium output?

2. Consider the McDonald and Solow monopolistic union model.

   (a) Describe its basic assumptions.

   (b) In what sense does this model provide a justification for "real rigidities"? Please define what is the meaning of real rigidities in this context.

   (c) How would you criticize this model?

   (d) Why are real rigidities important for monetary non neutrality?

Questions for spring 2006 macro theory generals

Answer both questions:

1. A familiar theme in discussions of monetary policy is that expectations about future policy actions shape the behavior of households and firms in ways that constrain the central bank's ability to influence the economy. What determines whether or not the effect of such expectations should optimally lead policymakers to forego any attempt to reduce fluctuations in real economic activity and, instead, simply use monetary policy to keep inflation as steady as possible at some chosen rate – even when, in principle, both policymakers and the public would prefer that such fluctuations be reduced? Under conditions such that it is not optimal to forego stabilization of output and employment altogether, in what way does the effect of expectations about future policy lead the optimal monetary policy to differ from what it would be if neither households nor firms thought in advance about what the central bank was likely to do?

2. During the recent economic expansion in the United States, prices of residential real estate have risen sharply in many parts of the country – so much so that many observers have expressed concerns about a "housing bubble." Now that the Federal Reserve System has raised short-term interest rates by four percentage points, and longer-term interest rates have risen as well, house prices in many areas have stopped rising and in some areas they are on the decline. As a result, many people are now expressing concerns that if the "bubble" breaks, and house prices fall substantially, a recession could ensue.

   Presumably, falling house prices would exert a contractionary force 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.) Under what conditions would a further mechanism be at work, under which falling house prices would also result in monetary policy's being more contractionary, for a given level of interest rates, than would otherwise be the case? Under those conditions, how should monetary policymakers take this additional effect of falling house prices into account in deciding how to set interest rates?

Questions for the Macro General

Problem 1. International Lucas trees

There is a world with two countries that last for two periods. Each country is endowed with a tree that produces the same fruit. The fruits can be transported across countries at no cost. At time t=1 (first period) each tree produces one fruit. In period t=2, two states of nature are possible. In state s_1, with occurs with probability 1/2, country A's tree produces H fruits while country's B produces L. In state s_2, country B's tree produces H fruits while country's A produces L. Let $H + L = 2$. The utility function of all agents is logarithmic in consumption: $u(c) = \ln(c)$; and all agents discount at rate β.

(i) Compute the Pareto optimal allocations

(ii) Suppose that the only assets available in this world are shares of the trees. Every country initially own only their own trees. Suppose that at the end of period $t = 1$, after receiving the initial fruit, the countries can trade their shares of the trees. What would be the competitive equilibrium allocation? Is it Pareto optimal? What is the price of a tree at the end of period t=1?

(iii) Following part (ii), what would be the price in period t=1 of a riskless bond: a bond that pays one unit of the fruit in period t=2?

(iv) Following part (ii), what would be the price at time t=1 of an asset that returns one unit of consumption if a coin tossed in period 2 gives up heads, and zero otherwise?

Problem 2. Investment and the Trade balance

Suppose an infinite horizon small open economy with access to a complete asset markets and having a production function of the form

$$zf(k) = zk^{\alpha}$$

The depreciation rate is $\delta = 1$. There are two possible states of nature $z = H$ and $z = L$. The probability that next period productivity shock is the same as today is given by p. The representative consumer has log utility with no labor supply and $\beta = 1/R$, where β is the discount rate and R the gross interest rate abroad. There are no adjustment costs to investment. The country initial asset position is 0.

(i) In the context the small open economy planner's problem; state and solve the first order conditions for the optimal capital levels tomorrow as a function of the state today. (Argue that complete markets allows you to separate the consumption problem from the investment problem)

(ii) What are the optimal investment levels as a function of the previous state and today's?

(ii) What are the first order conditions for the consumption levels?

(iv) Suppose that $p = 1/2$. What is the relationship between the trade balance and output? (Hint: you do not need to solve for consumption to answer this question)

(v) Explain in words how this relationship might change when shocks become more persistent, $p > 1/2$.