HARVARD UNIVERSITY
DEPARTMENT OF ECONOMICS

General Examination in Macroeconomic Theory

SPRING 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.

This part of the exam has two questions designed to take 48 minutes in total: 23+25. Good luck!

Problem 1 (Growth model: 23 minutes) Recall the growth model that we discussed in class. We expressed the Bellman equation as

$$v(k) = \sup_{0 \leq y \leq k^{\alpha}} \ln(k^{\alpha} - y) + \beta v(y).$$

Note that $0 \leq \alpha < 1$.

a. Interpret this equation economically and re-express it as a sequence problem.

b. Solve the Bellman Equation using guess and check. Start by guessing that the form of the solution is

$$v(k) = \psi + \phi \ln(k).$$

Solve for the coefficients ψ and ϕ.

Problem 2 (True, False, Ambiguous: 25 minutes. Your grade depends on the quality of your explanation.)

1. Let $x(t)$ be Brownian motion. The expected distance, $E_0|x(t)-x(0)|$, rises linearly with t.

2. A Bellman Operator either has a unique fixed point or no fixed points.

3. Consider a consumer who has constant relative risk aversion, γ. Assume that wealth dynamics are given by

$$W_t = R(W_{t-1} - c_{t-1}).$$

   An increase in γ raises the predicted slope of the consumption path.

4. If there is no fixed cost of adjusting the capital stock, then a firm's capital stock should instantly respond to all shocks that affect the profitability of capital.

5. Investment should rise when the tax rate on corporate profits falls.

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. Long-term data conflict with the neoclassical growth model's prediction that the steady-state real interest rate exceeds the steady-state growth rate of real GDP.

2. Tax-rate smoothing implies that the expected marginal tax rate on capital income should be the same in every period.

3. In the strategic debt model, the left-leaning government, which has a relatively high preference for government expenditure, tends to run inefficiently high budget deficits.

4. In the neoclassical growth model (Ramsey-Cass-Koopmans model), the time paths of capital per worker, k, and consumption per person, c, are uniquely determined (for a given initial capital per worker, k[0]).

5. Panel data for a large group of countries accord with the convergence implications of the neoclassical growth model.

6. In the neoclassical growth model, the spending multiplier for a permanent change in government purchases is larger than that for an equal-size, but temporary, change.

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. Discuss the comovements and relative volatilities of output, consumption expenditure (both for durable and for non-durable goods), investment, total hours, labor productivity, total factor productivity, real wages, and interest rates in the data.

2. 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.

3. 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?

4. The (log-linearized) New Keynesian model can be summarized by three equations. A Philips curve, a dynamic IS equation, and a policy rule (say a Taylor rule). Write down these equations, and explain their economic content.

5. Why is inflation or deflation costly in the New-Keynesian model?

6. 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 $\rho' > \rho$? Consider now the New-Keynesian model. What happens to inflation and interest rates when the coefficient ρ is increased to ρ' in the short run and in the long run? What happens to output in the short run and in the long run?

7. Consider the New-Keynesian model with a government who finances government expenditures with lump-sum taxes. In addition, the government can issue debt. Imagine that there is some government debt outstanding, with different maturities. What happens if the governmnent buys some long term government bonds and finances these purchases by issuing short-term government bonds? Now introduce money in the utility function (separably from consumption and leisure). Imagine that the economy is at the zero bound with zero nominal interest rates. Consider a policy of "quantitative easing" whereby the government purchases some long term government bonds and finances these purchases by printing money. What are the effects on the economy?

8. Consider the following experiment. Starting from a situation of budget balance, the government reduces taxes in the first period, issues debt to compensate for the loss of revenues, and

then raises taxes in all future periods to stabilize debt to GDP at a permanently higher level. Imagine first a closed economy. Explain how interest rates and investment are affected in the overlapping generations model and in the infinite horizon representative consumer model. Imagine now a small open economy, what happens to the current account in the overlapping generations model and in the infinite horizon representative consumer model?

9. Consider a small open endowment economy with two periods, populated by agents who live and consume for two periods. Explain the effects of temporary and permanent output shocks on the current account. Now introduce a government. Explain the effects of temporary and permanent government expenditure shocks.

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, the real exchange rate?

Questions for spring 2011 macro theory generals

Question 1

The recent financial crisis and subsequent economic downturn have been extraordinary in many ways, not least the set of policy responses that they have provoked. Central banks in particular have reacted in unprecedented ways. Most of the major economies' central banks have not only doubled or trebled the size of their balance sheets (in the United States the Federal Reserve System's balance sheet has expanded from $925 billion at yearend 2007 to $2.7 *trillion* today) but also purchased categories of assets, including various forms of private-sector credits, that central banks have traditionally avoided owning (for example, in the United States mostly securities backed by residential mortgages). It is no surprise that vigorous debate on the merit of these actions has ensued in many countries.

Part (a) Under what circumstances might a central bank choose – or even think itself forced – to adopt this kind of "unconventional monetary policy"?

Part (b) What conditions determine whether, and if so to what degree, purchases of private-sector credits by the central bank will cause output and employment to increase? In answering this part of the question, be as specific as you can about whatever behavioral assumptions underlie your answer.

Part (c) If the conditions you lay out in part (b) are satisfied, so that central bank purchases of private-sector credits do cause output and employment to increase, would this form of policy action then be warranted whenever policymakers choose to stimulate economic activity, even in normal times – that is, even if the circumstances you specified in part (a) do not apply? Why or why not? Here again, be specific about whatever assumptions underlie your answer.

Question 2

In an economy where aggregate supply behavior is consistent with the natural rate property so that there is no long-run trade-off between the *mean* rate of inflation and the *mean* rate of output relative to potential, but price setting is subject to short-run stickiness, what determines whether the monetary policy authority faces a trade-off between the *variability* of inflation and the *variability* of output over time? If there is a trade-off between the variability of inflation and the variability of output (again, relative to potential), what determines its shape?

What would be the consequences for inflation if monetary policy sought to achieve the minimum possible variability of output? What would be the consequences for output if monetary policy sought to achieve the minimum possible variability of inflation?

Be as explicit as you can in making clear the assumptions on which your answers rely.