Harvard University
Department of Economics

General Examination in Macroeconomic Theory

Spring 2008

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. 48 minutes
   II. 48 minutes
   III. 48 minutes
   IV. 48 minutes
   V. 48 minutes
Macro General Exam
May 2008

True, False, or Partially True (48 minutes): Please explain whether the following statements are True, False, or Partially True. You will be graded on the quality of your explanation.

a. If the variance of labor income increases, consumption should fall (holding everything else constant).

b. A rise in the interest rate will increase consumption in the long run.

c. If you iterate a Bellman operator on any initial bounded function, you will converge to a fixed point in the space of bounded functions.

d. All Bellman Operators that satisfy Discounting and Monotonicity have a unique fixed point.

e. Brownian motion is a continuous-time random walk. It is everywhere continuous and everywhere differentiable, though it does not have finite length over any finite span of time.

f. The price of capital will not jump unless there is a contemporaneous change in an exogenous variable (like the tax rate or the production function).

g. If a value function, $V(x)$, has a zero second derivative, then $E[dV] = 0$ if $x$ is Brownian motion or geometric Brownian motion.

h. Let $\hat{V}_{t,N}$ represent the perceived value function of a naive quasi-hyperbolic agent. The perception is taken with respect to the beliefs of the naive agent. Let $\hat{V}_{t,S}$ represent the perceived value function of a sophisticated quasi-hyperbolic agent. The perception is taken with respect to the beliefs of the sophisticated agent. It will then be the case that $\hat{V}_{t,N} < \hat{V}_{t,S}$.
General Exam, May 2008, Barro questions

I. Long-run Economic Growth (24 minutes)

1. What determines the long-run growth rate of per capita GDP in the neoclassical growth model (the Ramsey-Cass-Koopmans model)?

2. Consider a model with the production function $Y = AK$. Does this model satisfy the properties of the neoclassical growth model? What determines the long-run growth rate of per capita GDP in the AK model?

3. Consider the varieties model of endogenous growth (for example, the model presented in Chapter 6 of the Economic Growth book), in which new varieties can be discovered by investing in research (R&D). What determines the long-run growth rate of per capita GDP in this model? Is it a good idea, in terms of efficiency, to subsidize R&D expenditure in this model?

II. Strategic Public Debt (24 minutes)

Consider a strategic-debt model in which political party D puts more weight than party R on government expenditure, G, in its objective function. Suppose that the government can raise revenue only through a proportional tax on consumption.

1. Which party has an excessive tendency to run budget deficits when in power? How does the extent of the budget deficit depend on:
   a. the probability that power will shift next term to the other party, and
   b. the differential weight that the parties put on government expenditure in their objective functions?

2. Explain why outcomes are more efficient, in terms of deadweight-loss from taxation, if the political parties can commit, ex ante, not to engage in strategic budget deficits. How does the consumption tax rate behave over time in this case?
Part III

Consider each of the following claims. State (at the beginning of your answer) whether the claim is TRUE, FALSE, or PARTLY TRUE. Explain your answer.

1. In the IS-LM model, the tax multiplier is greater than one (in absolute value) if the income elasticity of money demand is zero, but the tax multiplier is zero if the interest elasticity of money demand is zero.

2. In the Lucas imperfect information model, if suppliers do not face any idiosyncratic shocks, then output moves proportionately with the money supply.

3. In the Fischer contracting model, an announced, gradual reduction in inflation causes an economic boom.

4. In the Caplan-Leahy menu-cost model, at any moment, a monetary shock affects either output or the price level but not both.

5. The Golosov-Lucas calibrated menu cost model suggests that most movements in the prices of individual goods are driven by monetary shocks, which is why money is approximately neutral.

6. According to Woodford’s “imperfect common knowledge” model of monetary nonneutrality, suppliers are slow to obtain information about monetary shocks; they all know that other suppliers are also slow to obtain this information; and, as a result, they all adjust their output in response to these shocks.
Questions for spring 2008 macro theory generals

ANSWER BOTH QUESTIONS

Question 1 (15 minutes)

Say whether each of these statements is true, false, or indeterminate. Briefly explain why.

(a) If a government runs a large enough fiscal deficit, compared to the size of its economy, either price inflation will result or the government’s debt will become worthless and no one will voluntarily buy it.

(b) In this situation the central bank can prevent inflation, at least for some time, by not buying the government’s debt and restraining its own monetary liabilities to expand at a pre-set rate.

(c) If the central bank pursues such a policy, then the less of the government’s debt it buys the less inflation there will be.

Question 2 (30 minutes)

Confronted with the twin prospects of faster price inflation and sluggish (or perhaps even declining) real economic activity, in recent months the U.S. and European central banks have followed different policy paths. In the United States, the Federal Reserve System has lowered short-term interest rates substantially. In Europe, the ECB has held short-term interest rates unchanged and, further, publicly expressed a determination not to lower them.

To what extent is it plausible to infer from these contrasting policy actions that Europe’s central bank follows an “inflation targeting” monetary policy while the U.S. central bank doesn’t? More specifically,

(a) Is following an inflation-targeting monetary policy inconsistent with a central bank’s pursuing objectives not just for inflation but for real output too?

(b) Is the observation that a central bank adjusts its policy interest rate in response to fluctuations of real output, either actual or anticipated, sufficient to indicate that the central bank is pursuing objectives not just for inflation but for at least some aspects of real economic activity as well?

In each part of the question, explain fully why the answer is as you state. Also be sure to state explicitly any key assumptions on which your answers rely.
Part V 48 Minutes

Please answer all three equally-weighted questions in this section.

1. (Moral hazard and lending) Suppose a country is populated by entrepreneurs with utility function \( U = C_t \), who live in a small country that can borrow abroad at world interest rate \( r \). Each entrepreneur has initial wealth \( Y_1 \), which can be used to invest in a project that yields output \( Z \) with probability \( \pi(I) \), and yields nothing with probability \( 1 - \pi(I) \); \( \pi'(I) > 0, \pi''(I) < 0 \). Initial wealth \( Y_1 \), however, is insufficient to achieve the efficient level of investment \( \bar{I} \), defined implicitly by \( \pi'(\bar{I}) = 1 + r \). Thus entrepreneurs would like to borrow \( D = \bar{I} - Y_1 \), but they are constrained by the fact that foreign creditors can observe only whether the project actually succeeds or fails, and cannot observe investment \( I \) directly. Potential creditors worry that once the entrepreneur has been given funds, she will sneak them into secret foreign bank accounts rather than invest.

Under this setup, including the information constraints, equilibrium investment is governed by the following two equations:

\[
\pi(I)P(Z) = (1 + r)(I - Y_1) \quad (1)
\]

\[
\pi'(I)[Z - P(Z)] = 1 + r \quad (2)
\]

where \( I - Y_1 = D \) gives the amount the entrepreneur borrows, and \( P(Z) \) is the payment to the creditor if the project succeeds (obviously, \( P(Z) < Z \)).

Equations (1) and (2) govern the determination of \( I \) and \( P(Z) \).

a. How might one use this model to explain the Feldstein-Horioka puzzle that national savings and investment are highly correlated? (In terms of the model, assume that increases in savings translate into higher initial \( Y_1 \).)

b. Suppose a country's government inherits a foreign debt \( D \), that must be paid off by taxes in the second period on successful entrepreneurs. What effect will this have on investment?

c. Briefly, suppose the country has a very large debt \( D \). In this particular framework, is it ever possible that foreign creditors can ever gain by forgiving (writing off) some of the country's debt?

2. Please give very short answers to the following two questions; you can refer to models introduced in the course but no algebra is required.
a. Briefly explain the specification for the gravity model of international trade. How might such a model be used to test the effects of a currency union on international trade? What if the decision to join a currency union is endogenous (why might the decision be endogenous)?

b. Suppose a small country can freely borrow on world markets, but that foreign creditors have no direct means of punishing a debtor country if it does not pay. Might the country still be able to borrow? How does your answer depend on whether the country is able to hold foreign assets in the event of default, and how in turn does it depend on the types of assets a country might hold?

3. (Speculative attacks and indeterminacy of equilibrium) Consider an economy where a government is trying to maintain a fixed exchange rate between pesos (the domestic currency) and the US dollar, at \( e_0 = 0 \). Speculators (a continuum, of mass 1) believe that this exchange rate is too low compared to the one that would prevail under a floating exchange, \( e \) (so here the exchange rate is in pesos/dollar; \( e > 0 \) means the currency would depreciate).

The government is trying to defend this regime with a level of reserves \( \theta \), where \( \theta \in [0, 1] \) is a magnitude well known by all speculators in the model; i.e., it is common knowledge. The uncertainty in the environment comes from what the exchange rate would be if the regime were to fail: \( e \) (so \( e \) is the devaluation of the currency if the regime fails).

Agents do not observe \( e \) perfectly, but only through noisy, private signals. Specifically, each agent observes

\[
e_i = e + \varepsilon_i
\]

where \( \varepsilon_i \sim \mathcal{N}(0, \lambda_e^{-1}) \) (so \( \lambda_e \) is the precision of information).

Since bonds denominated in the domestic currency yield a higher interest rate, there is an opportunity cost \( k \) associated with the "attack strategy" of purchasing one unit of reserves. Speculators' payoffs if they do not attack, \( a_i = 0 \) (hold the domestic peso) are normalized at zero, while the payoffs of the attack strategy, \( a_i = 1 \), are given by

\[
e - k, \text{ if } R = 1 \\
-k, \text{ if } R = 0
\]

where \( R = 1 \) labels the event where the aggregate attack is large enough to cause the regime to fail (devaluation occurs).

a. Imagine that individual traders follow "cutoff strategies" of the type

\[
a_i = 1 \iff e_i \geq \varepsilon \\
a_i = 0 \text{ otherwise}
\]
Compute the aggregate size of the attack $A = \int_0^t a_i dt$ as a function of $\bar{e}$. Characterize the "threshold" level of $e = e^*$ such that the regime fails whenever $e > e^*$, also as a function of $\bar{e}$.

b. Of course, such cutoff strategies $\bar{e}$ need to be determined endogenously in equilibrium. Intuitively, what condition will give you an additional expression linking $e^*$ to $\bar{e}$? Provide such expression explicitly. Hint: the distribution of $e$, from the perspective of an agent that observes $e_t$, is given by

$$ e | e_t \sim N \left( e_t, \lambda_e^{-1} \right). $$

c. How are $e^*$ and $\bar{e}$ solved for in this economy? (You don't need to solve them, just write the expressions that lead to a solution.) Do you think this framework leads to a unique solution $e^*$, such that the regime will survive only when $e \leq e^*$? Link your answer to the notion of "strategic uncertainty".