

Harvard University
Department of Economics

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

Spring Term 2001

**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.

You should spend about 26 minutes on each of Parts I, II, and III, and 80 minutes on each of
Parts IV and V.

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

1. You have **THREE** hours.

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

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

Part I

True, False or Uncertain? Explain briefly. Explanation determines grade.

1. In the fixed-price IS-LM model, if the demand for money does not depend on income, then a \$100-billion increase in both government spending and taxes increases equilibrium income by exactly \$100 billion.
2. In the Lucas imperfect information model, people observe the prices of the goods they buy but not the prices of the goods they produce, so surprise monetary changes have real effects.
3. According to the Gray contracting model, if random changes in the money supply are the only source of shocks, then the nominal wage set by a long-term contract should be indexed fully to the price level.
4. According to the Taylor-Calvo-Rotemberg models of time-contingent price adjustment, a period of lower-than-normal output is a necessary cost of reducing the rate of inflation.

Part II

One part of the economic cost of inflation is commonly understood to arise from the fact that some forms of money — most obviously currency, but typically some forms of deposits as well — pay interest at a rate (perhaps zero, as for currency) that adjusts imperfectly as the rate of inflation changes, and that may not adjust at all.

- (a) Explain how this cost increases when the economy's steady-state inflation rate rises from one positive level to another — say, from 2% per annum to 4% per annum.
- (b) Is social surplus or private surplus the better concept to use for this purpose? Why?
- (c) What empirical magnitudes are important in determining how much this cost increases as the inflation rate rises? In each case, say whether a larger value of that magnitude causes this part of the cost of inflation to be greater or smaller, and whether it causes the increase in the cost as inflation rises (again, say, from 2% per annum to 4% per annum) to be greater or smaller.
- (d) Briefly state an argument to the effect that the conventional way of conceptualizing this problem is likely to overstate this part of the cost of inflation.
- (e) Briefly state an argument to the effect that the conventional way of conceptualizing this problem is likely to understate this part of the cost of inflation.

Part III

2010c

David Laibson
May, 2001

Instructions. These two questions are equally weighted. Together, they represent 1/3 of the 2010c segment of the exam. Hence, they represent 1/3 of 1/3 of the material on the general. You should spend about 26.67 minutes on this material (1/3 of 1/3 of 4 hours).

1. Assume that an economy had a steady state labor productivity growth rate of 1.5% per year. (Labor productivity is output per worker.) Imagine that an information technology revolution permanently raised this growth rate to 3% per year. How would this change in the growth rate affect the steady state growth rate of consumption? Justify your assumptions and explain your reasoning.

2. Consider Merton's continuous-time consumption and asset allocation problem. The consumer has two assets: a risk free asset and a risky asset. If the consumer invests fraction θ of her wealth in the risky asset and instantaneously consumes c , her wealth, x , evolves according to

$$dx = [(r + \theta\pi)x - c]dt + \theta\sigma x dz,$$

where r is the risk-free return, π is the equity premium, and σ is the standard deviation of equity returns. Using Ito's Lemma, derive the continuous-time Bellman Equation for this problem assuming that γ is the discount rate and $V(x)$ is the value function. Since I haven't yet specified a particular utility function — $u(c)$ — you should express the Bellman Equation in terms of $u(c)$, $V(x)$, $V'(x)$, and $V''(x)$. Interpret all of the terms in the Bellman Equation.

Part IV

Robert Barro: Questions for Macro General Examination, May 2001

I. Questions related to convergence (40 minutes)

- A. The neoclassical growth model is usually viewed as predicting convergence of per capita product across countries. Which elements of the model lead to this prediction and which may go in the opposite direction? Explain the difference between absolute and conditional convergence. Does the model imply that an economy's growth rate will decline as its per capita product rises?
- B. Suppose that the property of absolute convergence holds across a group of economies. Does this property imply that the dispersion of per capita product across the economies will tend to diminish over time? How does this question relate to Galton's paradox about the dispersion of heights and other characteristics across persons in the population?
- C. Discuss empirical approaches that have been used to estimate the extent of conditional convergence from cross-country data. What are the inferences that can be drawn from this evidence? What are some of the problems in the empirical approaches?

II. Public Debt and Money in the Neoclassical Growth Model (40 minutes)

Suppose for this question that the path of real government purchases of goods and services is given exogenously. Assume that the public debt is denominated in real units and is very short term. Assume also that the economy begins with a capital intensity below its steady-state level.

- A. How does the economy's time path of capital intensity, consumption, and real interest rates relate to the government's path of fiscal deficits and to the level of the government's initial stock of real public debt? Explain in your answer the role of an infinite or finite horizon for households. Also, make clear what restrictions you are assuming with respect to feasible time paths of the government's debt.
- B. In the Sidrauski-type model of money and growth, differences in inflation and real money balances have no impact on capital intensity, the real interest rate, and consumption in the steady state. How does this result relate to the assumption that households have an infinite horizon? How does this result about money relate to the one about public debt in part A. of this question?
- C. Empirically, holding constant an economy's level of per capita product and some other variables, a higher rate of inflation seems to go along with a lower growth rate of per capita GDP. How can you explain this finding within the analysis of part B. of this question?

Part V

Economics 2010d

Alberto Alesina

May 9, 2001

1. Consider a Dornbusch overshooting model described by the following equations with standard notation, and with an exogenous and constant money supply:

$$m_t - p_t = -\eta i_{t+1} + \phi y_t$$

$$i_{t+1} = i^* + e_{t+1} - e_t$$

$$y_t^d = \bar{y} + \delta(e_t + p^* - p_t - \bar{q})$$

$$p_{t+1} - p_t = \psi(y_t^d - \bar{y}) + e_{t+1} - e_t$$

- (a) Briefly describe the intuition underlying these equations.
 - (b) Derive the equilibrium levels of nominal and real exchange rates, and show the results graphically with the saddle path for the two cases: (1) $\phi\delta < 1$ and (2) $\phi\delta > 1$;
 - (c) Discuss the effects of a permanent increase in the money supply in case (1) above. Trace out the effects of this policy change on all the endogenous variables.
 - (d) Discuss the effect of an unexpected permanent increase of \bar{y} in case (2) above. Trace out the effects of this policy change on all the endogenous variables.
2. Consider the “war of attrition” model discussed in class. Answer the following questions by sketching an analytical derivation:
 - (a) What happens to the time of stabilization if the distortions from inflation increase?
 - (b) Suppose that the pre-stabilization costs are a function of political groups’ income, and the two groups have different income level. What happens as the difference in income between the two groups increases?
 - (c) What happens to the expected time of stabilization if the number of groups increases?
 - (d) Discuss how in this model foreign aid can be counter-productive.