

Economics 202B Final Exam

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The final exam consists of two parts (Part I and Part II). Please answer each part in a separate blue book. Be sure to indicate on the outside of each book the Part to which it corresponds.

We have written the exam to take 160 minutes (= one point per minute). Since the exam is scheduled for 180 minutes, this gives you 20 minutes of extra time.

PART I (ROMER - 84 POINTS)

Section A. Multiple choice (18 points)

In your blue book, give the best answer to 6 of the following 7 questions.

Note:

-- If you wish, you may add a brief explanation of your answer to AT MOST ONE question. In that case, your grade on that question will be based on your answer and explanation together. This means that an explanation can either raise or lower a grade.

-- If you answer all 7 questions, your overall score will be based on your average, not on your 6 best scores.

1. According to Auerbach, Gale, and Orszag, one way for the U.S. Federal government to change policy so that the government budget constraint would be approximately satisfied in expectation would be to:

A. Permanently reduce all government spending (other than interest on government debt) by 10.8% relative to its currently forecast path.

B. Permanently reduce all government spending (other than interest on government debt) by 10.8% relative to its current level.

C. Permanently reduce spending on social security, Medicare, and Medicaid by 10.8% relative to its currently forecast path.

D. Permanently reduce spending on social security, Medicare, and Medicaid by 10.8% relative to its current level.

E. Permanently reduce all government spending (other than interest on government debt) by 10.8% of GDP relative to its currently forecast path.

F. Permanently reduce all government spending (other than interest on government debt) by 10.8% of GDP from its current level.

2. The Barro tax-smoothing model predicts that in response to news that government purchases as a share of GDP have unexpectedly and permanently fallen by some amount:

A. Taxes as a share of GDP will fall immediately by the amount of the fall in purchases as a share of GDP.

B. Taxes as a share of GDP will fall gradually by the amount of the fall in purchases as a share of GDP.

C. Taxes as a share of GDP will fall gradually by an amount larger than the fall in purchases as a share of GDP.

D. Taxes as a share of GDP will fall gradually by an amount smaller than the fall in purchases as a share of GDP.

3. In Becker and Mulligan's model:
- A. Budget deficits occur because of strategic forces similar to those in the Tabellini-Alesina model.
 - B. Budget deficits occur because taxes are more obvious or salient to voters than deficits are.
 - C. Government spending is determined by interest-group lobbying.
 - D. Government spending is determined by incumbents' desire to get reelected.
 - E. Both deficits and government spending are determined by a benevolent social planner.
4. The following does NOT contain an important element of rent-seeking:
- A. An inventor applies for a patent.
 - B. A farmer responds to an increase in the price of corn by planting more corn.
 - C. An airline charges more for a round-trip that does not involve a Saturday-night stay than for a round-trip that does.
 - D. (A) and (B).
 - E. (A) and (C).
 - F. (B) and (C).
 - G. None of the above (that is, (A), (B), and (C) all contain an important element of rent-seeking).
5. A positive correlation between measured social infrastructure and income per person could arise from:
- A. A positive effect of social infrastructure on income per person.
 - B. A positive effect of income per person on social infrastructure.
 - C. A third factor that has a positive effect on both social infrastructure and income per person.
 - D. Measurement error in our measure of social infrastructure that is positively correlated with some other factor that has a positive effect on income per person.
 - E. (A) and (B).
 - F. (A), (B), and (C).
 - G. (A), (B), and (D).
 - H. All of the above.
6. In the Alesina-Drazen model, the possibility of inefficient deficits arises from:
- A. Disagreement about who taxes will be levied on.
 - B. Disagreement about the composition of government spending.
 - C. The use of deficit-financed pork-barrel spending to obtain a majority vote for a government budget.
 - D. Temporarily high government spending to avert a financial crisis.

7. If the initial stock of government debt is zero, a budget policy of the following form always fails to satisfy the government budget constraint:

- A. The total deficit (that is, the deficit including interest payments) is positive forever.
- B. The total deficit is positive forever, and always growing.
- C. The primary deficit is positive forever, but asymptotically approaches zero.
- D. (A) and (B).
- E. (B) and (C).
- F. All of the above.
- G. None of the above.

Section B. Problems (66 points)

Answer all 3 questions.

(12 points) 8. Consider an economy described by the Solow model that is on its balanced growth path. Now suppose that Congress adopts an immigration reform package with two features: (1) A "guest worker" program that leads to an immediate jump in the number of workers in the United States; (2) Tougher immigration laws that cause the rate of population growth (after the initial jump in the number of workers) to be permanently lower.

Sketch the resulting path of output per worker (or, if you prefer, the log of output per worker) and what that path would have been if these developments had not occurred.

Explain your answer.

(24 points) 9. This problem asks you to consider the Tabellini-Alesina model with extreme preferences, with two variations: utility is quadratic, and, in part (b), the preferences of the period-2 policymaker are known before the period-1 policymaker chooses D .

Specifically:

-- Preferences are extreme -- that is, the only values of α (the weight in the utility function on military spending) in the population are 0 and 1. Individuals with $\alpha = 1$ are "hawks"; individuals with $\alpha = 0$ are "doves."

-- The period-1 policymaker is a hawk.

-- Utility is quadratic. Specifically, each hawk's objective function is $E[(M_1 - (a/2)M_1^2) + (M_2 - (a/2)M_2^2)]$, and each dove's objective function is $E[(N_1 - (a/2)N_1^2) + (N_2 - (a/2)N_2^2)]$. Assume $a > 0$ and $1 - 2aW > 0$.

-- As in the Tabellini-Alesina model:

-- The period-1 policymaker chooses M_1 , N_1 , and D subject to $M_1 + N_1 = W + D$, $M_1 \geq 0$, $N_1 \geq 0$, and $-W \leq D \leq W$.

-- The period-2 policymaker chooses M_2 and N_2 subject to $M_2 + N_2 = W - D$, $M_2 \geq 0$, $N_2 \geq 0$.

a. Suppose the probability that the period-2 policymaker is a hawk is π (where $0 \leq \pi \leq 1$).

Find the value of D chosen by the period-1 policymaker as a function of π , W , and a .

b. Suppose that, in contrast to the usual Tabellini-Alesina model, the preferences of the period-2 policymaker are known before the period-1 policymaker chooses D . (As in the basic model, however, the period-2 policymaker cannot make any commitments about his or her choice of M_2 and N_2 .) With probability π (where π is the same as in part (a)), the period-2 policymaker is known to be a hawk; with probability $1 - \pi$, he or she is known to be a dove.

i. What value of D will the period-1 policymaker choose if it is known that the period-2 policymaker will be a hawk?

ii. What value of D will the period-1 policymaker choose if it is known that the period-2 policymaker will be a dove?

iii. Are hawks better off, worse off, or equally well off (or is it not possible to tell) in case (b) than in case (a)? Explain. (Hint: use logic, not math.)

iv. Are doves better off, worse off, or equally well off (or is it not possible to tell) in case (b) than in case (a)? Explain.

(30 points) 10. This question asks you to think about, and take a first pass at starting to model, an idea about a possible source of deficits.

Consider the following argument:

If the United States issues debt today, some of the burden of the taxes needed to repay that debt will fall on people who migrate to the United States after the debt is issued. Since these immigrants are not represented in the political process today, this is a reason that the political process will tend to create deficits.

(10 points) a. First, discuss this argument in general terms. Does the argument seem logically correct -- that is, has it identified a possible source of deficits? If not, why not? If so, does it seem that the deficits would be inefficiently high, or would they be Pareto efficient but higher than they would be without immigration? Does the argument imply that emigration will tend to create surpluses? Do you have any other general comments about the argument?

(20 points) b. Now, try to model this idea. The goal is to get as far as you can in coming up with a simple model that can shed light on the argument above, not to be general or to be sufficiently realistic that we would be willing to perform quantitative exercises with your model.

Among the modeling choices you may need to make are: Discrete time or continuous time? Should the economy end at some date or go on forever? Should there be uncertainty, and if so, about what? Should there be heterogeneity, and if so, of what sort?

Note: I do not expect you to fully construct and solve a model. Just make as much progress as you can.

Part II (Jones – Answer all parts. 76 Points)

1. *An Idea-Based Growth Model (25 points)*

Consider an idea-based growth model that uses goods instead of labor as the key input into R&D:

$$Y_t = A_t^\sigma K_t^\alpha L_t^{1-\alpha} \quad (1)$$

$$Y_t = C_t + I_t + R_t \quad (2)$$

$$\dot{K}_t = I_t - \delta K_t, \quad (3)$$

$$\dot{A}_t = \bar{v} R_t^\lambda A_t^\phi, \quad (4)$$

$$L_t = \bar{L}_0 e^{nt}, \quad (5)$$

$$U_0 = \int_0^\infty u(c_t) e^{-(\rho-n)t} dt. \quad (6)$$

We assume the parameters are such that the optimal allocation is well-defined and we require $\lambda/(1-\phi) \cdot \sigma/(1-\alpha) < 1$. (The reason for this restriction should become clear later.)

- (a) (12 points) Define the optimal allocation of resources for this economy.
- (b) (13 points) Solve for the growth rate of output per worker along the balanced growth path. HINT: You do not need to solve for the optimal allocation of resources to do this. Just assume the optimal allocations are constant in the appropriate sense.

2. *Technology Transfer and Development (25 points)*.

Consider the following model of technology transfer and economic development:

$$Y_t = A_t^\sigma K_t^\alpha L_t^{1-\alpha} \quad (7)$$

$$\dot{K}_t = I_t - \delta K_t \quad (8)$$

$$\frac{\dot{A}_t}{A_t} = \bar{v} \left(\frac{R_t}{Y_t} \right)^\beta \left(\frac{W_t}{A_t} \right)^\theta \quad (9)$$

$$W_t = \bar{W} e^{\gamma t} \quad (10)$$

$$Y_t = C_t + I_t + R_t \quad (11)$$

$$L_t = \bar{L} e^{\bar{n}t} \quad (12)$$

In this model, most of the variables have the usual interpretation. I'll comment on what is different. First, W_t is the world's stock of knowledge, assumed to grow exogenously. A_t is a country's own stock of knowledge, which is learned from the rest of the world by conducting "research" R_t . Letters with a "bar" over them and greek letters are exogenous parameters, assumed to be positive (and not too large, when necessary).

- (a) (8 points) Define formally a rule-of-thumb allocation of resources in this economy.
- (b) (12 points) Solve for output per worker along the balanced growth path for this rule of thumb allocation.
- (c) (5 points) For small values of θ , this model may deliver large differences in incomes across countries in steady state. In what sense is this statement true, and why?

3. *Dynamic Programming (26 points)*.

Consider the following economic environment, which features an “AK” growth model with a slightly nonstandard accumulation equation for capital:

$$Y_t = AK_t, \quad \text{“AK” Production of Output, Consumption} \quad (13)$$

$$K_{t+1} = K_t^{1-\delta} I_t^\delta, \quad \text{Production of New Capital} \quad (14)$$

$$C_t + I_t = Y_t, \quad \text{Resource constraint} \quad (15)$$

$$U = \sum_{t=0}^{\infty} \beta^t u(C_t), \quad \text{Utility} \quad (16)$$

where A and β are positive constants and δ is between zero and one. Assume β is sufficiently small so that preference orderings are well-defined, and assume $u(\cdot)$ satisfies the usual neoclassical properties. There is nothing stochastic in this model.

- (a) (7 points) Set up the optimal allocation problem for this economy using the Bellman approach. Be sure to indicate the state and control variables.
- (b) (6 points) What is the first-order condition?
- (c) (6 points) What is the condition for the state variable that uses the envelope theorem?
- (d) (7 points) Manipulate these last two expressions to get an Euler equation for consumption, i.e. an expression relating the marginal utility of consumption today to the marginal utility tomorrow.