

Economics Department 2006 Honors General Exam

This is a 3-hour exam.* Each section of the exam (i.e., the micro section, the macro section, the econometrics section) is of equal point value. Thus you should spend roughly 1 hour on each section of the exam. Within each section, each entire question (e.g., Micro 1, Micro 3) is of equal point value.

*For joint concentrators with economics as the secondary field: This is a 1-hour exam for you. Choose one section of the exam to complete. You will turn in your bluebook one hour after the exam begins.

You must answer TWO of the four Micro questions. If you try to answer more than two micro questions, you will not get any credit for any work done on questions beyond the first two you try to answer.

You must answer TWO of the four Macro questions. If you try to answer more than two macro questions, you will not get any credit for any work done on questions beyond the first two you try to answer.

You must answer ONE of the two Econometrics questions. If you try to answer both econometrics questions, you will not get any credit for any work done on the last question you try to answer.

You must use a SEPARATE blue book for each question, so you will hand in five (5) bluebooks. Make sure your name and the question number (Micro 3, Macro 1, etc.) are on the outside of each of the five bluebooks! The number should refer to the actual question number on the exam.

Neither calculators nor notes are permitted.

Good luck!

Micro Question 1**(30 Minutes)***REMEMBER: Answer only 2 of 4 micro questions.*

Consider a firm that pays a highly-skilled, experienced worker \$20 per hour. She is allowed to work as many hours as she chooses and she chooses precisely 30 hours each week. There has been a recent increase in demand for the firm's output, so the firm would like to induce this worker to work 40 hours each week. She has many job opportunities and would be very difficult to replace, so the firm has to be very careful not to provoke her into quitting. This means that they must devise an offer that will get her to work 40 hours each week and will leave her at least as well off as she is currently.

The firm is considering three alternative types of offers:

1. Increasing the wage rate for each hour worked.
2. Paying a higher overtime wage rate for all hours worked in excess of 30 per week.
3. Paying her a specified weekly salary on the understanding that a workweek consists of 40 hours. She would not earn more income by working more than 40 hours and would be fired if she worked fewer than 40 hours.

The firm is certain that it is feasible to induce her to work 40 hours per week using any of these alternatives.

- a. Use indifference curve/budget line diagrams to show how each of these schemes will lead the worker to choose exactly 40 hours per week.
- b. If the firm is interested in minimizing the cost of achieving this goal, which alternative should it choose? Provide a brief explanation.
- c. Suppose instead that the firm is willing to expend a specified amount of money on one of the three alternatives to induce this worker to work *at least* 40 hours per week, but would like to choose the alternative that makes her as well off as possible. The total amount of money that the firm pays her is to be the same regardless of which alternative is used and the amount is sufficient that she will work 40 or more hours under all three options. Which alternative will make her best off? Provide a brief explanation.

Micro Question 2 (New Blue Book)

(30 Minutes)

REMEMBER: Answer only 2 of 4 micro questions.

Firm X is the only car manufacturer in country A and country B. This firm can move parts and cars across the border freely, so that both markets are supplied by the same plants. However, tariffs prevent all other firms and individuals from shipping cars between the two countries and cars from other countries may not be imported.

- a. Describe in detail the profit-maximizing pricing decision for Firm X. Will the firm choose the same price in both countries? Explain your answer carefully, using any graphs that you find helpful.

- b. Country A, which had not allowed Y-cars to be imported, now persuades Firm Y to begin manufacturing in country A. Country B continues to prevent the importation of all Y-cars, including those produced in A. What are the qualitative effects on each of the following?
 - (i) Firm X's total output
 - (ii) Firm X's sales in country B
 - (iii) the ratio of Firm X's prices in countries A and B. [Assume the own-price elasticity of any demand curve is constant, but the elasticity may change if the demand curve shifts.]

Explain your conclusions analytically.

Micro Question 3 (New Blue Book)

(30 Minutes)

REMEMBER: Answer only 2 of 4 micro questions.

This question is about the impact of discrimination in the marketplace. You are expected to produce a formal, mathematical model, not just to discuss this verbally.

- a. If some employers dislike hiring minorities, what will be the impact of those discriminatory tastes on the wages and employment of minorities and on the profits of employers?
- b. How would this change if some employers like hiring non-minority applicants?
- c. Will either type of discriminatory employer survive in the market in the long run?
- d. If customers, rather than employers, care about whether products are produced by minorities, what will this do to minority wages and employment, and to employer profits? What does this say about whether market forces are likely to eliminate discrimination?

Micro Question 4 (New Blue Book)**(30 Minutes)***REMEMBER: Answer only 2 of 4 micro questions.*

Consider a modified prisoner's dilemma game of the form:

		Player B	
		Be Nice	Cheat
Player A	Be Nice	5,5	0,6
	Cheat	6,0	1,1

In each cell, the first number refers to Player A's payoff, and the second refers to Player B's.

- What are the Nash equilibria of this game?
- If the game is repeated by the same two players, and payoffs in the second period equal payoffs in the first period times a discount factor d then what are the Nash equilibria of this new two-stage game? What are the subgame perfect equilibria of this game? How does d determine the set of equilibria?
- What sort of strategy commitments would players like to make if they could?
- Speculate on how the game (without strategy commitments) would change if there are more periods. How about if the number of periods is infinite?

Macro Question 1 (New Blue Book)

(30 Minutes)

REMEMBER: Answer only 2 of 4 macro questions.

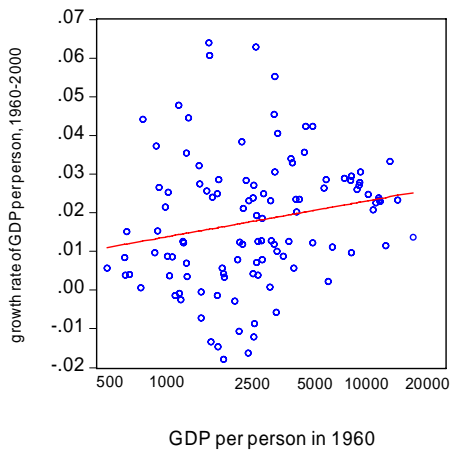
Consider an economy described by the following aggregate production function

$$Y = K^\alpha L^{1-\alpha}$$

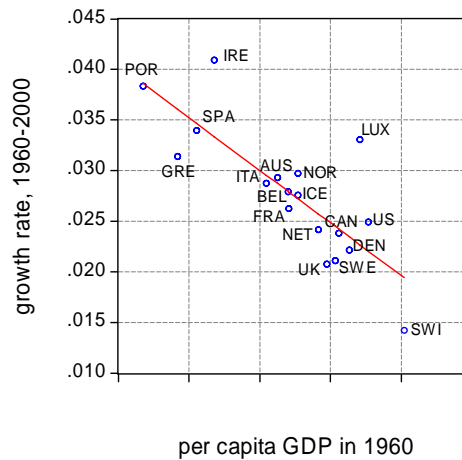
Assume that the saving rate is s , the depreciation rate is δ , and the rate of growth of L is n .

- Let $k \equiv K/L$ denote capital per worker. Write down an expression for the capital accumulation equation (Δk), involving only k and the exogenous parameters s , δ , and n .
- Let k^* be the steady-state capital per worker. What are the effects (increase/decrease/no-effect) of s and n on k^* ? Provide graphical representations of your answers.
- An important question about economic growth is whether poor countries tend to catch up to rich countries, and the Solow model predicts convergence: a negative correlation between initial GDP and subsequent growth. However, the graphs below suggest that whereas this prediction explains the observed growth patterns in similar economies, it fails when we examine a dissimilar set of economies:

Growth rate vs level of GDP per person



a broad group of countries



OECD countries

source: R. Barro's lecture notes

What do you think is wrong with the Solow model? What changes can we make to improve its predictions?

d. Consider the data below. If the factors of production are paid their marginal products, what is the value of α implied by our production function for the US economy? Explain.

US national income by type in 2003, selected figures

Type of income	Trillions of dollars	% of national income
Compensation of employees	6.29	2/3
National income	9.68	1

source: R. Barro's lecture notes

e. In the past 25 years or so, a large number of immigrants have moved from Mexico to its northern neighbor, the US. What do our production function and the neoclassical model predict about the real wage and the rental price of capital in the US as a result of this immigration? Explain.

Macro Question 2 (New Blue Book)**(30 Minutes)***REMEMBER: Answer only 2 of 4 macro questions.*

Policymakers in the government view economic stabilization as one of their most important responsibilities. The following three questions will help us to think about this topic. The three questions are unrelated to one another, so if you get stuck on one question, move on to another one.

a. UnemploymentLet L = # of workers in labor force E = # of employed workers, U = # of unemployed workers $u = U/L$ = unemployment rate s = fraction of employed workers that become separated from their jobs
(separation rate) f = fraction of unemployed workers that find jobs (finding rate)

(i) We say that the labor market is in long-run equilibrium if u is constant. Show that the natural rate of unemployment, u^* , is given by $u^* = s / (f + s)$.

(ii) Unemployment insurance (UI) pays part of a worker's former wages for a limited time after losing his job. What is the effect of increasing UI on u^* ? Use the result in (i) to answer this question.

b. Monetary policyMoney demand, M^d , is given by

$$M^d = P \cdot L(r, Y)$$

where P is the price level and $L(r, Y)$ is the demand for money.

Suppose that the introduction of ATM machines reduces the demand for money at every combination of interest rates, r , and output, Y . If the Fed could control the interest rate, what could it do to offset this shock in the *short run*?

c. Fiscal stimuli and Ricardian equivalence

The household budget constraint at a point in time is

$$C_t + C_{t+1}/(1+r) = Y_t + Y_{t+1}/(1+r)$$

where C_t and Y_t denote consumption and income at time t , respectively.

- (i) How does the inclusion of a government sector modify the original budget constraint? Assume that its sole role is to collect lump-sum taxes, T_t , and make government expenditures, G_t .
- (ii) Consider a stimulating plan where the government cuts current taxes, but government expenditures stay the same. What are the substitution and income effects of this plan on current consumption, C_t ? Assume that Ricardian equivalence holds.
- (iii) A higher G_t is considered a fiscal stimulus too. If Ricardian equivalence holds, what are its substitution and income effects on C_t ?
- (iv) Give two reasons why Ricardian equivalence might fail.

Macro Question 3 (New Blue Book)**(30 Minutes)***REMEMBER: Answer only 2 of 4 macro questions.*

Consider a closed economy where savings is a constant fraction of income (s), population grows at the constant rate n , capital depreciates at the rate δ , and the aggregate production function takes the following form:

$$Y = AK + BK^\alpha L^{1-\alpha}$$

where A and B are positive constants and $0 < \alpha < 1$.

- Does this production function exhibit constant returns to scale? Does it exhibit constant or diminishing returns to capital? Explain.
- Write the capital accumulation ($\frac{\dot{k}}{k}$) equation and substitute the per capita production function. (Note: $\frac{\dot{k}}{k}$ denotes $\Delta k/k$.)
- Suppose that $sA < (\delta + n)$. Does this model predict positive long-run growth? Does it predict convergence? You can draw a graph with $\frac{\dot{k}}{k}$ on the vertical axis and k on the horizontal axis to answer these questions.
- Answer question (c) for the case $sA > (\delta + n)$.
- Answer question (c) for the case $\alpha = 1$.

Macro Question 4 (New Blue Book)**(30 Minutes)***REMEMBER: Answer only 2 of 4 macro questions.*

Consider a closed economy as described by the IS-LM model:

$$Y = C(Y - T) + I(r) + G \quad IS$$
$$\frac{M}{P} = L(r, Y) \quad LM$$

where Y is current income, consumption (C) is a function of current disposable income, T is taxes, investment (I) is a function of the interest rate (r), G is government spending, M is money supply, P is the price level that is constant in the short run, and the demand for real money balances (L) is a function of income and the interest rate.

a. Suppose the government decides to reduce taxes in the current period, without changing its level of spending. Describe the short run effects of this tax cut on the following variables (you must explain and graph the IS-LM diagram to get credit):

- (i) income
- (ii) consumption
- (iii) interest rate
- (iv) investment

b. Now suppose that consumers are forward-looking, thus consumption is a function not only of current income but also of future income and the interest rate. In this case, what would be the short-run effects of a tax cut on the above variables? (Assume the government reduces taxes in the current period, without changing its present and future level of spending).

c. Would your answer in (b) be different if many consumers in the economy were credit constrained? Explain.

Econometrics Question 1 (New Blue Book)**(60 Minutes)***REMEMBER: Answer only 1 of 2 econometrics questions.*

This question revolves around an experiment run in Minnesota to try and examine the efficacy of various police responses to domestic violence calls. Essentially, when police respond to a call they have some leeway in what they do — they can arrest the offender, take the offender away for a cooling off period, or attempt to talk sense into the offender. But which is best?

The experimental setup involved randomly assigning one of these three responses when called to a domestic violence situation. The randomization was undertaken using color-coded notepads. Officers used this to determine the response. The outcome variable of interest was a binary variable, simply whether or not they were called again to the same problem later. So an outcome of zero is good (no return call), one not so good.

The regression to determine the effect was:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 W_{1i} + \beta_4 W_{2i} + u_i$$

where $X_{1i} = 1$ for taking away for a cooling off period (zero otherwise), $X_{2i} = 1$ for talking to the offender (zero otherwise), $W_{1i} = 1$ if there was a gun involved, and $W_{2i} = 1$ if there was evidence of substance abuse (both zero otherwise). (Note that although the Y variable is a zero-one variable, we do not need to use binary dependent variable methods since all the right hand side variables are also binary, there are no functional form issues in this very special case).

- a. Explain how the randomization in the experimental setup helps ensure that the OLS estimates for β_1 and β_2 are unbiased.
- b. Give a reason why it is useful to include the additional variables W_{1i} , W_{2i} . Is there a problem if we omit them?
- c. Why is there no variable for the cases where the officers arrest the perpetrator?
- d. It turns out that the police did not always do what the color-coded pad suggested — no surprise since it would be quite unethical to give a “good talking to” to someone who appeared very likely to commit an act of violence. This means that we have data on both the treatment assigned (dummy variables Z_{1i} and Z_{2i} , which are dummies for assigning a cooling off period or a talking to respectively) and the actual treatment given (X_{1i} and X_{2i} as above). Why does this lead to a bias in the OLS estimates for β_1 and β_2 ?

- e. Suppose that officers always made an arrest when it appeared to them that violence was likely regardless of the random assignment. In what direction do you think the bias in the OLS estimates would be?
- f. The actual random assignments (Z_{1i} , Z_{2i}) could be used as instruments to estimate the regression using two-stage least squares. Do these variables make for good instruments? Why or why not?
- g. Explain the two OLS regressions that would need to be run to obtain the two-stage least squares estimates for β_1 and β_2 .

Econometrics Question 2 (New Blue Book)**(60 Minutes)**

REMEMBER: Answer only 1 of 2 econometrics questions.

In “Estimates of the Economic Return to Schooling from a New Sample of Twins,” Orley Ashenfelter and Alan Krueger use data on $N = 149$ families with $T = 2$ twins in each family. Let Y_{it} denote the log of earnings of twin t in family i , and let ed_{it} denote the years of education of twin t in family i . A fixed-effects estimator can be obtained from a least-squares regression of Y on ed and a set of dummy variables.

- a. How are these dummy variables defined? Briefly discuss when, if ever, a constant term would be included along with the dummy variables.
- b. What is the motivation, in terms of omitted variable bias, for using the fixed-effects estimator? Explain how the estimator deals with omitted variable bias.
- c. Standard programs are available that can be applied to the twin data to obtain a maximum-likelihood estimate in a random-effects model. Describe the likelihood function that is being maximized. Evaluate the advantages and disadvantages of the random-effects estimator on the twin data, compared with the fixed-effects estimator.
- d. Likelihood theory supplies a standard, large-sample approximation for obtaining .95 intervals based on the information matrix evaluated at the maximum-likelihood estimate. Under suitable assumptions, an exact .95 interval is available for the education coefficient in the fixed-effects model. Use this exact interval to evaluate the quality of the large-sample approximation.