UNIVERSITY OF CALIFORNIA
Department of Economics

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# ECONOMICS 202A

## FINAL EXAMINATION

The exam consists of two parts. There are 150 points total. Part I has 44 points and Part II has 106 points.

Some parts of the exam are much harder than others. If you get stuck on one part, do the best you can without spending too much time, and then work on other parts of the exam.

PART I. Multiple choice. 44 points.

**In your blue book, give the best answer to 11 of the following 12 questions.**

Note:

-- If you wish, you may add a brief explanation of your answer to AT MOST TWO questions. If you add an explanation to an answer, 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 12 questions, your overall score will be based on your average, not on your 11 best scores.

1. Consider a consumer whose behavior is described by the permanent-income hypothesis. In response to an unexpected, permanent fall in his or her labor income, the consumer will:

A. Borrow against future income to keep his or her consumption unchanged.
B. Immediately reduce consumption by the amount of the fall in labor income.
C. Gradually reduce consumption by the amount of the fall in labor income.
D. Gradually reduce consumption by more than the amount of the fall in labor income.

2. The main prediction of the permanent-income hypothesis that is tested by Campbell and Mankiw and by Hsieh is that:

A. Expected changes in income do not cause expected changes in consumption.
B. Unexpected changes in income cause unexpected changes in consumption.
C. Temporary changes in income cause temporary changes in consumption.
D. Permanent changes in income cause permanent changes in consumption.

3. Consider two consumers who maximize lifetime utility and who are not liquidity constrained. Consumer A's utility function, $u^A(\bullet)$, is quadratic, while Consumer B's utility function, $u^B(\bullet)$, satisfies $u^{B'}(\bullet) > 0$, $u^{B''}(\bullet) < 0$, $u^{B'''}(\bullet) > 0$. Then:

A. Consumer A will never go into debt, but Consumer B may.
B. Consumer B will never go into debt, but Consumer A may.
C. In response to an increase in uncertainty about future income, Consumer A's consumption will not change, but Consumer B's will fall.
D. Consumer A will always have greater savings than Consumer B.

4. In the firm optimization problem in the q-theory model, the transversality condition rules out:

A. Paths where the firm is violating its budget constraint by going further and further into debt.
B. Paths where investment does not satisfy $1 + C'(I(t)) = q(t)$.
C. Paths where the firm is constantly increasing its investment even though the profitability of capital is constantly falling.
D. Paths where investment approaches zero.

5. Consider the q-theory model where K is converging to its long-run equilibrium level from below. Over time, K is rising, and:

A. q is falling, and investment is positive but falling.
B. q is falling, and investment is positive but can be sometimes rising and sometimes falling.

C. q is falling, and investment can be sometimes positive and sometimes negative.
D. q can be sometimes rising and sometimes falling.

6. Consider the q-theory model, and suppose that the economy is initially in long-run equilibrium. Now suppose that from time 0 to time T > 0, there is a gradual upward shift of the $\pi(K)$ function. This will cause the $\dot{q} = 0$ locus:
A. To jump to the right at time 0.
B. To shift gradually to the right from time 0 to time T.
C. To jump to the right at time 0 if it becomes known at time 0 that the $\pi(K)$ function will shift gradually up, and to shift gradually to the right from time 0 to time T if each upward shift of the function is unexpected.
D. The change will have no effect on the $\dot{q} = 0$ locus.

7. If there is asymmetric information between lenders and entrepreneurs in financial markets:
A. For an entrepreneur who is able to obtain outside financing, the expected payoff of the entrepreneur's project has no effect on the entrepreneur's decision of whether to undertake the project.
B. For an entrepreneur who has sufficient funds to finance his or her project without outside financing, the expected payoff of the entrepreneur's project has no effect on the entrepreneur's decision of whether to undertake the project.
C. For an entrepreneur who has sufficient funds to finance his or her project without outside financing, prevailing interest rates in the economy have no effect on the entrepreneur's decision of whether to undertake the project.
D. A project may not be undertaken even though the expected payoff exceeds the prevailing rate of return in the economy.

8. Modigliani and Miller show that:
A. The expected amount a firm has to pay to debtholders and equityholders for each unit of financing it obtains is the same for debt and equity.
B. Purchasers of assets view debt and equity as perfect substitutes.
C. Because of the presence of complete Arrow-Debreu markets, firms' financing decisions lead to Pareto efficient allocations.
D. The total market value of claims on a firm does not depend on the mix of debt and equity financing that it uses.

9. The long-run effect of a permanent decrease in the rate of money growth will be to cause:
A. Real output to be lower than it otherwise would have been.
B. The real interest rate to be higher than it otherwise would have been.
C. The real money stock to be lower than it otherwise would have been.
D. The real money stock to be higher than it otherwise would have been.

10. If a central bank follows a "Taylor rule," it will:
A. Keep the money supply constant.
B. Keep the money supply growing at k percent per year, where k is some small number.
C. Change the nominal interest rate only in response to changes in inflation.
D. Change the nominal interest rate in response to both changes in inflation and changes in the difference between output and its flexible-price level.

11. One of the "case studies" in Taylor's paper is:
    A. The large increase in oil prices in 1990.
    B. The "credit crunch" during the recovery from the 1990-1991 recession.
    C. The East Asian crisis of 1998.
    D. The bursting of the dot.com bubble in 2000.
    E. September 11, 2001.

12. Ball and Svensson's model of optimal monetary policy implies that:
    A. The socially optimal inflation rate is about 3 percent.
    B. The central bank should set the real interest rate as a nonlinear function of the inflation rate.
    C. If inflation exceeds the socially optimal level, the central bank should attempt to bring it gradually back to the socially optimal level.
    D. If inflation exceeds the socially optimal level, the central bank should attempt to cause it to be below the socially optimal level for a time, so that the price level is back on target.

**PART II. Problems. 106 points. Answer all 5 questions.**

**(10 points) 13. (Time Series)**

a. Consider an AR(1), $x_t = \theta x_{t-1} + \varepsilon_t$, where $\varepsilon_t$ is i.i.d. with mean zero. What is $E[x_{t+3}|\Omega_t]$, where $\Omega_t$ is the information set at time t? Assume that all current and prior values of x and $\varepsilon$ are in the information set $\Omega_t$ so that both $x_t$ and $\varepsilon_t$ are known at time t.

b. Consider an MA(4):

$x_t = \varphi_4\varepsilon_{t-4} + \varphi_3\varepsilon_{t-3} + \varphi_2\varepsilon_{t-2} + \varphi_1\varepsilon_{t-1} + \varepsilon_t$, where $\varepsilon_t$ is i.i.d. with mean zero.

Again, as in part (a), what is $E[x_{t+3}|\Omega_t]$, where $\Omega_t$ is the information set at time t? Assume, again as in part (a), that all current and prior values of x and $\varepsilon$ are in the information set $\Omega_t$, so that both $x_t$ and $\varepsilon_t$ are known at t.

**(25 points) 14. Miller and Orr (and Caplin and Leahy)** Consider a product whose profit-maximizing price p* increases by one unit with probability ½ and decreases by one unit with probability ½ each period. There is a menu cost, $a > 0$, for making a change in price. The loss from charging a price p that differs from the optimum price p* is proportional to the gap between p and p*. In terms of a formula, the loss is $b|p - p^*|$, $b > 0$.

a. Show that the steady-state distribution of the gap between p and p* is a symmetric triangular distribution with mean 0 on the interval [-h, h], where *h* is the upper threshold of (p - p*) (where prices are cut); and where *–h* is the lower threshold of (p – p*) (where prices are raised).

[Note: A good answer to this question sets up and solves a second-order difference equation as we did in class for the Miller-Orr model.]

b. Calculate the optimal value of *h* as a function of the menu cost, *a*, and the parameter *b* . Use the same type of methods as Miller and Orr (including approximating the triangular distribution of part (a) by its continuous counterpart).

Very useful hint: It is likely to be useful in your calculation to remember that a triangular distribution from 0 to *h* with its mode at 0 has mean *h*/3.

**(21 points) 15. (Consumption behavior and asset demands)** Consider a consumer who lives for two periods. The consumer's instantaneous utility function is quadratic, $u(c_t) = c_t - (1/2)ac_t^2$, $a > 0$. The consumer's lifetime utility is $U = u(c_1) + u(c_2)$. Assume that $c_1$ and $c_2$ are always in the range where $u'(c) > 0$.

The consumer's period-1 labor income, $Y_1$, is certain, and is equal to $\bar{Y}$. The consumer's period-2 labor income, $Y_2$, is uncertain, with mean $\bar{Y}$ and variance $\sigma_Y^2 > 0$. The consumer's initial wealth is zero.

a. Assume the consumer can borrow and lend at an interest rate of $r = 0$, and that there are no other financial assets. What is $c_1$?

b. Assume that in addition to the safe asset with a real return of zero, there is a second, risky asset whose return has a mean of $\bar{r} > 0$ and variance $\sigma_r^2 > 0$. The payoff to the risky asset is uncorrelated with $Y_2$. Without doing any math, explain whether the consumer will purchase a strictly positive amount, a strictly negative amount, or none of this asset.

c. Consider the same situation as in part (b). Let S denote the consumer's holdings of the safe asset and E his or her holdings of the risky asset. Set up, but do not solve, the consumer's problem of choosing $c_1$, S, and E to maximize expected lifetime utility.

**(25 points) 16. (Investment with kinked adjustment costs)** Consider the q-theory model of investment. Assume, however, that adjustment costs are kinked. Let $c^+ > 0$ denote the marginal adjustment cost for the first unit of positive investment and $c^- > 0$ denote the marginal adjustment cost for the first unit of disinvestment.

Assume that initially the economy is in long-run equilibrium at the point where $q = 1 + c^+$ and $\pi(K) = r(1 + c^+)$.

Suppose that at some time, which we will call time 0, there is an unexpected upward shift of the $\pi(\bullet)$ function that is known to be temporary: it is known that the $\pi(\bullet)$ function will switch back to the original function at time $T > 0$.

a. i. How, if at all, is the set of points such that $\dot{q} = 0$ different from time 0 to time T than it is before and after time 0 and after time T?

ii. How, if at all, is the set of points such that $\dot{K} = 0$ different from time 0 to time T than it is before and after time 0 and after time T?

b. Describe qualitatively the behavior of q and K over time. (Note: Assume that the upward shift of the profit function is sufficiently small and/or short-lived that K never exceeds the value that implies $\pi^A(K) = r(1 - c^-)$, where $\pi^A(\bullet)$ is the original profit function.)

**(25 points) 17. (A dynamic-programming approach to monetary policy)**

Consider a central bank that seeks to maximize

(1) $$\sum_{s=0}^{\infty} \beta^s [y_{t+s} - (a/2)\pi_{t+s}^2],$$

where $0 < \beta < 1$ and $a > 0$. The behavior of inflation is governed by:

(2) $$\pi_{t+1} = \pi_t + \lambda y_t,$$

where $\lambda > 0$. The central bank can choose y each period.

Let $V(\pi_t)$ denote the value function for this problem. That is, $V(\pi_t)$ is the maximum value of (1) the central bank can obtain, given $\pi_t$.

Since the central bank's objective function is quadratic, let us guess that the value function is quadratic:

(3) $$V(\pi_t) = A - B\pi_t - C\pi_t^2.$$

a. What is the Bellman equation for this problem (given the conjectured form of the value function)?

b. Using your answer to part (a), find the first-order condition for the central bank's choice of $y_t$.

c. Using your answer to part (b), solve for $y_t$ as a function of the state variable ($\pi_t$), the parameters of the conjectured value function (A, B, and C), and the exogenous parameters ($\beta$, a, and $\lambda$). (Note: Not all of $\pi_t$, A, B, C, $\beta$, a, and $\lambda$ will necessarily appear in the resulting expression.) What will $\pi_{t+1}$ be?

d. i. Sketch how you would use your results to determine if the value function is in fact quadratic. ii. Sketch how you would determine the values of A, B, and C if the value function were quadratic.