AMERICAN UNIVERSITY
Department of Economics

Comprehensive Examination | **Summer 2009**
Econ 01C | **Exam Page Total: 4**

MAINSTREAM THEORY II

Carefully read the directions for each section. Both sections offer some choice.

SECTION A: SHORT ANSWERS

DO FOUR (4) SHORT ANSWER QUESTIONS. All short-answer questions are equally weighted. (Time allotted: 30 minutes each.)

1. Give an intuitive proof of the existence of a utility representation of a continuous, strictly monotonic preference relation. (Define your terms.)

2. Describe the Schelling segregation model. (Outline an algorithm to implement the model.) What are the key lessons of the model?

3. What is a social-dilemma game? (Give a couple examples.) What interest do such games have for economists?

4. Prove that the bidder with the highest valuation wins the item in every Nash equilibrium of a first-price sealed-bid auction of perfect information. Is it possible for the bidder with the lowest valuation to win the item in a second-price sealed-bid auction of perfect information?

5. There are two states of the world and two assets. Returns on asset 1 are $r_1 = (a, 2 - a)$ for $0 \leq a \leq \frac{1}{2}$. Returns on asset 2 are $r_2 = (1, 1 + a)$. Prices are q_1 and q_2. Consider a put on asset 1 at strike price $p \in (\frac{1}{2}, 1.5)$. What are the returns on $r_1(p)$? Price the put by arbitrage.

6. Show that the following preferences violate expected utility theory and give the conditions under which prospect theory explains this behavior.

   $$A = (\$1m) \succ B = (.1, \$5m; .89, \$1m; .01, 0)$$

   and

   $$B' = (.1, \$5m; .9, 0) \succ A' = (.11, \$1m; .89, 0)$$

7. Briefly derive the fundamental dynamic equation of the Solow growth model, and then characterize the steady state. Determine the steady-state effects on Y/AN, Y/N, and Y when the exogenous population growth rate ($\hat{N}$) undergoes a one-time, permanent decrease. (Here, A measures labor productivity and N is the labor input, so that AN can be thought of as "effective" units of labor, and Y is output.) Graphically illustrate each variable's time path following the change. (Assume that the depreciation rate, δ, the technology growth rate, $\hat{A}$, and the labor force growth rate, $\hat{N}$, are positive constants.)

8. Briefly compare and contrast New Keynesian, New Classical, and traditional approaches to the Phillips curve. (Focus on differences in predictions.)

9. A *macroeconomic planner* wants to maximize

$$\sum_{t=0}^{\infty} \beta^t \ln(c_t)$$

subject to

$$k_{t+1} = Ak_t^{\alpha} - c_t$$

and given an initial capital stock k_0. Briefly interpret the model setup. Derive an Euler equation that relates consumption levels in adjacent periods along an optimal path.

10. The loss functions from the rational partisan model of Alesina (1987) can be written as follows:

$$Z^L = \left[\frac{1}{2}(\Pi_t - \delta)^2 - \beta Y_t\right], \quad Z^R = \left[\frac{1}{2}\Pi_t^2\right]$$

where Z^L (Z^R) is the loss function for the left-wing (right-wing) political party in a 2-party system, Y_t is output growth at time t, Π_t is inflation at time t, and δ, β are positive constants. Assume further that:

$$Y_t = \gamma(\Pi_t - w_t) + \hat{Y}$$

where w_t is the wage rate at time t, $\hat{Y}$ is the growth rate of potential output, and γ is greater than zero. Let $w_t = \Pi_t^e = E(\Pi_t | I_{t-1})$ where e denotes expectations and I the information set.

   a. Find the value for inflation (Π_t) under L and R governments when t is not an election year.

   b. Find the value of Π_t and Y_t for L and R governments when t is an election year.

   c. Is the Alesina model an example of an opportunistic or partisan political business cycles model? What is the difference?

11. Provide a precise definition of the pure expectations hypothesis of the term structure in words and equations.

   Traditional empirical work on the expectations hypothesis (such as that by Cook and Hahn or Kuttner, for example) has found that a change in the Fed's target for the funds rate affects interest rates across the term structure. A puzzle in this work has been the finding that an increase (decrease) in the funds rate is associated with an increase (decrease) in longer-dated instruments. Explain why this is a puzzle that is inconsistent with neoclassical theory.

   Romer and Romer (2000) attempt to resolve this puzzle by estimating the following equations:

   a. $\pi(t) = a + a_P \pi_P(t) + a_F \pi_F(t) + e(t)$

   b. $\pi_F(t) = b + \beta \Delta FF(t) + b_P \pi_P(t) + \varepsilon(t)$

   c. $\pi_P(t+1) = c + \gamma \Delta FF(t) + c_P \pi_P(t) + c_F[\pi_F(t+1) - \pi_F(t)] + u(t+1)$

where $\pi(t)$ is actual inflation between t and $t+1$, $\pi_P(t)$ is the private sector's forecast for inflation between t and $t+1$, $\pi_F(t)$ is the Fed's forecast for inflation between t and $t+1$, FF is the Federal funds rate, t indexes time, and e, ε, and u are white noise errors.

Discuss how these equations constitute a test of the expectations hypothesis and provide an interpretation of their results.

12. Central bank independence (CBI) can be seen as a solution to the well-known time inconsistency problem first formulated by Kydland and Prescott (1977). What is time inconsistency and how can it arise in monetary policy? How can CBI help to resolve the time inconsistency problem? What are the measured effects of CBI on economic outcomes? Provide a detailed answer to these questions.

SECTION B: LONG ANSWERS

DO TWO (2) LONG ANSWER QUESTIONS.

1. What is the Generalized Axiom of Revealed Preference (GARP)? What is GARP's significance for consumer theory? (Address both theory and empirics.) How might you go about testing GARP with consumer data? (Provide an algorithm, and illustrate it's use.) Be sure to include a full discussion of the concept of "transitive closure", including a discussion of its computation from a given Boolean matrix representation of a binary relation.

2. The Alphabeta research and development consortium has two (noncompeting) members, firms 1 and 2. The rules of the consortium are that any independent invention by one of the firms is shared fully with the other. Suppose that there is a new invention, the "Zigger," that either of the two firms could potentially develop. To develop this new product costs a firm $c \in (0, 1)$. The benefit of the Zigger to each firm i is known only by that firm. Formally, each firm i has a type θ_i that is independently drawn from a uniform distribution on $[0, 1]$, and its benefit from the Zigger when its type is θ_i is $(\theta_i)^2$. The timing is as follows: The two firms each privately observe their own type. Then they each simultaneously choose either to develop the Zigger or not.

   Define a Bayesian Nash equilibrium and describe how it solves the problem of a game of incomplete information. Solve for the Bayesian Nash equilibrium of this game. What is the probability that exactly one firm develops the Zigger? Both firms? Neither firm?

3. An infinitely lived consumer has access to three assets: one risk free, and two risky. Derive the Euler equation for the consumption behavior of an optimizing consumer. Derive the consumption CAPM relationships between the asset returns. Supplement your algebraic derivation with detailed intuitive interpretations. Will the consumer ever hold a risky asset with a lower return than the risk free asset? (Explain in detail.)

4. Suppose that the central bank adjusts the nominal interest rate according to a simple inflation-based rule, as follows:

   $$i_t = \rho + \varphi_\pi \pi_t$$

   where π is inflation, ρ is the household's (constant) discount rate, t indexes time, and $\varphi_\pi > 0$.

   a. Use the Fisher equation, $i_t = r_t + E_t\{\pi_{t+1}\}$, where r is the real interest rate and $E\{\cdot\}$ is the expectations operator, to derive the steady state solution for π_t in the case that $\varphi_\pi > 1$. Determine whether this nominal interest rate rule yields a deterministic solution for the price level, or leads to price level indeterminacy.

   b. What happens when $\varphi_\pi < 1$?

   c. Does this nominal interest rate rule exhibit the "Taylor principle"? Explain your answer.

   d. Does this interest rate rule resemble the type of monetary policy rule suggested by John Taylor in his well-known 1993 article? Provide a detailed discussion of Taylor's rule and compare it with the one you derived in this problem.