CENTRAL EUROPEAN UNIVERSITY
Macroeconomics I and II, 2003 - 2004
Sample Exam
1. 24 points (6 points each)

Are the following statements True, False, or Uncertain? Explanation determines grade. The answers should be concise, preferably not exceeding five sentences.

A. Government bonds are net wealth.

B. Immediately after a permanent, anticipated corporate tax cut, investment will be falling steadily until it reaches its long run value.

C. In the Classical Dichotomy aggregate demand policies cannot affect real variables in the short run, so the LM curve is vertical.

D. In the Solow growth model with no exogenous technological progress, an increase in the saving rate reduces the long-run level of income, but increases the long run level of consumption.
2. 20 points

Consider an economy where the aggregate production function, dropping time subscripts takes the form of

\[ Y = F(K, AL) = \begin{cases} 
K - \frac{1}{2AL} K^2, & \text{if } K < AL \\
\frac{1}{2} AL, & \text{otherwise}
\end{cases} \]

A. Show that this production function has constant returns in \( K \) and \( L \) in the region where \( K < AL \).

B. Suppose capital does not depreciate and population does not change. If \( A = 0.1A \) and \( \dot{K} = 0.2Y \)

i. Write the production function in intensive form.

ii. What is the steady state of this economy?

iii. What is the growth rate of income per capita, \( \frac{Y}{L} \), in the steady state?

iv. Write down (no need to solve) an equation in terms of \( k \) and \( A \) for the dynamics of per capita income, \( \frac{d}{dt} \left( \frac{Y}{L} \right) \), in transition from \( k(0) = 0.5 \) towards the steady state.

v. Characterize the dynamics of the economy (capital, income, consumption), if now \( A = 0 \) and \( \dot{K} = sY \) for some constant savings rate, \( s \).
Consider the investment decision of a firm in a two-period world. The firm can initiate the investment today, or postpone it until next year. The investment is irreversible. Assume that the cost of investment is fixed at $I$ dollars, and that the proceeds from the investment sell at the fixed price of $P$. Suppose however that the interest rate used to discount future costs and revenues may change in an unpredictable manner. In particular, under interest rate uncertainty, today’s gross interest rate is $R$ percent, but next year it falls to $R - x$ percent with probability $q$, or increases to $R + x$ percent with probability $1 - q$, with $R > 1 > x > q > 0$.

A. Is the expected value of the project higher under interest rate uncertainty than under certainty, that is, when the interest rate remains constant at $R$ percent? Why?

B. Assuming that the interest rate is constant throughout, does a higher interest rate make investing today more likely? Explain.

C. Find the ‘switchover’ price under interest rate uncertainty, $P^*$. Compare this price to the corresponding price threshold obtained in the absence of uncertainty, $P'$. Which one is higher? Explain.

D. Can you identify a ‘Bad News’ principle in this example? A ‘Good News’ one?

E. What are the implications of the above findings for macroeconomic policy?
4. 16 points

Suppose Linda lives for four periods. She receives an income of $100, $200 and $300 in the first three periods and retires with zero income in the fourth one. Linda is maximizing her lifetime utility. Assume that the interest rate and the time discount rate are zero throughout. There is no uncertainty.

A. Assuming quadratic preferences and perfect capital markets, how much is Linda saving and consuming in each period? Explain.

B. What is her consumption profile if she is unable to borrow?

C. Suddenly, Linda’s income gets raised by $40 in period 1. How is she allocating this increment in wealth if she can freely borrow? What if she cannot borrow? What if the increment in period 1 were $80? Explain.
5. 24 points

Are the following statements True, False, or Uncertain? The answers should be concise, preferably not exceeding five sentences. Explanation determines grade.

A. Countercyclical markups reduce real rigidities.

B. The Real Business Cycle model driven by technological shocks is disproved by the empirical finding that microeconomic labor supply is elastic.

C. A contraction in aggregate demand reduces welfare by no more than the menu cost.

D. The assumptions of nominal price stickiness and staggered price setting are sufficient to explain why systematic monetary policy can affect output.

E. Business cycles are regular sequences of ups and downs in economic activity.

F. Inflation is bound to fall in recessions.
Consider an economy consisting of a constant population of infinitely lived individuals. The representative individual maximizes the expected value of \[
\sum_{t=0}^{\infty} \frac{u(C_t)}{(1 + \rho)^t}
\] with \(\rho > 0\). Assume that the instantaneous utility function takes the form of \(u(C_t) = C_t - \theta(C_t + \lambda_t)^2\), where \(\lambda_t\) is an i.i.d. white noise ‘taste shock’. Output is linear in capital, \(Y = AK\). There is no depreciation. For simplicity, also assume that \(A = r = \rho\), where \(r\) is the interest rate.

A. Find the consumption Euler equation.

B. Use the method of undetermined coefficients to derive \(K_{t+1}\) as a function of \(K_t\) and \(\lambda_t\).

C. Calculate and plot the effects of a one-time negative taste shock on the time path of output, capital, investment and consumption, all as a function of \(A\).

D. In one sentence or two, evaluate the implied dynamics in consumption.

E. Assume that the taste shock takes place at time \(t\). Then, in the spirit of Campbell and Mankiw (1987), consider \(P = \frac{E_{t+1}[Y_{t+1}] - Y_t}{Y_{t+1} - Y_t}\) as a measure of persistence in output fluctuations. Find \(P\) in this model. How does this compare to the finding of Campbell and Mankiw? Is output more or less persistent here than in a random walk reference model? What does your answer imply for RBC modeling?
7. 12 points

Suppose output is given by \( y = \chi + (k + \varepsilon_k)z + u \), where \( z \) is some policy instrument controlled by the government and \( k \) is the expected value of the multiplier for that instrument. \( \varepsilon_k \) and \( u \) are independent, mean-zero disturbances that are unknown when the policymaker chooses \( z \), and have variances \( \delta_k^2 \) and \( \delta_u^2 \), respectively. Finally, \( \chi \) is a disturbance that is known when \( z \) is chosen. The policymaker minimizes \( E[(y - y^*)^2] \).

A. Find \( E[(y - y^*)^2] \) as a function of \( \chi \), \( k \), \( y^* \), \( \delta_u^2 \) and \( \delta_k^2 \).

B. Find the first-order condition for \( z \), and solve for \( z \).

C. How, if at all, does \( \delta_u^2 \) affect the way policy should respond to shocks (that is, to the realized values of \( \chi \)). Thus, how does uncertainty about the state of the economy affect the case for ‘fine tuning’?
Consider a policymaker whose objective function is

\[ 
\sum_{t=0}^{\infty} \beta^t (y_t - \alpha \pi_t^2) \], \text{ where } \alpha > 0 \text{ and } 0 < \beta < 1. 

Output is determined by the Lucas supply curve as

\[ y_t = \bar{\pi} + b (\pi_t - \pi_t^*), \] \text{ with } b > 0. 

Expected inflation is determined as follows. If \( \pi \) happened to equal \( \hat{\pi} \) (where \( \hat{\pi} \) is a parameter) in all previous periods, then \( \pi^e = \hat{\pi} \). If \( \pi \) ever differs from \( \hat{\pi} \), then \( \pi^e = \frac{b}{\alpha} \) in all subsequent periods.

A. What is the equilibrium in all subsequent periods if \( \pi \) differs from \( \hat{\pi} \)?

B. Suppose \( \pi \) has always been equal to \( \hat{\pi} \), so that \( \pi^e = \hat{\pi} \). If the monetary authority chooses to depart from \( \pi = \hat{\pi} \), what value of \( \pi \) does it choose? What level of its lifetime objective function does it attain under this strategy? If the monetary authority continues to choose \( \pi = \hat{\pi} \) in every period, what level of its lifetime objective function does it attain?

C. For what values of \( \hat{\pi} \) does the monetary authority choose \( \pi = \hat{\pi} \)? Do values of \( \alpha \), \( b \), and \( \beta \) exist, such that if \( \hat{\pi} = 0 \), the monetary authority chooses \( \pi = 0 \)?
9. 6 points

Discuss the policy implications of first-generation and second-generation currency crisis models.