

Mid-Term Exam

This is a closed book exam. The exam totals 120 points. Time: 6:00 p.m. to 8:45 p.m. Location: CBA 1-206.

Question 1: Factor Payments in the Solow Model (20 points).

Assume that both labor and capital are paid their marginal products. Let w denote $\partial F(K, AL)/\partial L$ and r denote $[\partial F(K, AL)/\partial K] - \delta$. In addition, suppose that all capital income is saved and all labor income is consumed. Thus, $\dot{K} = [\partial F(K, AL)/\partial K]K - \delta K$.

1. Show that this economy converges to a balanced growth path. Explain.
2. Is k on the balanced growth path greater than, less than, or equal to the golden-rule level of k ? What is the intuition for this result? Explain.

Question 2: The Productivity Slowdown and Saving (20 points).

Consider a **Ramsey-Cass-Koopmans economy** that is on its balanced growth path. The dynamics of the economy is described by,

$$\frac{\dot{c}_t}{c_t} = \frac{f'(k_t) - \rho - \theta g}{\theta} \quad (1)$$

$$\dot{k}_t = f(k_t) - c_t - (n + g)k_t \quad (2)$$

Suppose that there is a permanent fall in g .

1. How, if at all, does this affect the $\dot{k} = 0$ curve?
2. How, if at all, does this affect the $\dot{c} = 0$ curve?
3. What happens to c at the time of the change?
4. Find an expression of the impact of a marginal change in g on the fraction of output that is saved on the balanced growth path. Can one tell whether this expression is positive or negative?

Question 3: Real Business Cycles and Keynesian Models (20 points).

1. “The central propagation mechanism in the basic Real Business Cycle (RBC) model is the intertemporal substitution in labor supply.” True, False or Uncertain? Clearly explain your answer. (First, define the term ‘intertemporal substitution’ in labor supply).
2. Using IS-LM/AD-AS and the labor market. Describe the effects on the economy of a technology shock. In other words, implement the RBC model in the IS-LM framework.
3. State and briefly explain the criticisms to the RBC models.

Question 4: A Real Business Cycles (RBC) model with Additive Shocks (20 points).

Following Blanchard and Fischer (1989, MIT Press, pp. 329-331), consider an economy consisting of a constant population of infinitely lived individuals. The representative individual maximizes the expected value of $\sum_{t=0}^{\infty} \beta^t u(c_t)$. The momentary utility function is quadratic and defined as $u(c_t) = c_t - \theta c_t^2$ where $\theta > 0$. Assume that c_t is always in the range where $u'(c_t)$ is positive. β is the subjective discount rate and it is defined as $\beta \equiv 1/(1+\rho)$, where ρ is the rate of time preference. Output is linear in capital, plus an additive disturbance: $Y_t = AK_t + e_t$, where $e_t = \phi e_{t-1} + \varepsilon_t$, where $-1 < \phi < 1$ and where the ε_t 's are mean-zero, i.i.d. shocks. There is no depreciation; thus $K_{t+1} = K_t + Y_t - C_t$, and the interest rate (r) is constant. Assume that $r = \rho$.

Find the first-order condition (Euler Equation) relating c_t to the expectation of c_{t+1} .

Question 5: Time Preference and the Interest Rate (20 points).

A representative household is faced with the following problem,

$$\max \sum_{t=0}^{\infty} \beta^t u(c_t) \quad 0 < \beta < 1 \quad (3)$$

c_t is consumption, and $u(\cdot)$ is strictly increasing, strictly concave function with $u'(0) = \infty$. The consumer has A_0 assets at the beginning of period 0, and faces a market real interest rate of r in each period $t = 0, 1, 2, \dots$. The consumer earns no labor income during her lifetime, so her period t budget constraint is given by,

$$A_{t+1} = (1 + r)(A_t - c_t) \quad (4)$$

where A_t is the quantity of assets at the beginning of period t .

Using the Euler Equation and if $\beta(1 + r) > 1$, describe the behavior of the consumption path c_t .

Question 6: The Liquidity Trap and the Pigou Effect (15 points).

Assume that the nominal interest rate is so low that the opportunity cost of holding money is negligible. Suppose that as a result people are indifferent concerning the division of their wealth between money and other assets, and that they are therefore willing to change their money holdings without any change in the interest rate.

1. The liquidity trap (Keynes 1936).

In this situation, what is the slope of the AD curve? If prices are completely flexible, is aggregate demand irrelevant to output?

1. The Pigou effect (Pigou 1943).

Since the public's holdings of high-powered money (M/P) are one component of wealth, a fall in the price level increases real wealth. Suppose that, in addition, planned expenditure depends on real wealth as well as the variables in $E = E(Y, i - \pi^e, G, T, M/P)$, and $0 < E_Y < 1$, $E_{i-\pi^e} < 0$, $E_G > 0$, and $E_T < 0$. If prices are completely flexible, is aggregate demand irrelevant to output?

Question 7: The Mundell Effect (5 points).

In the IS-LM model, how does a fall in expected inflation π^e affect Y ?