Midterm 1 answers

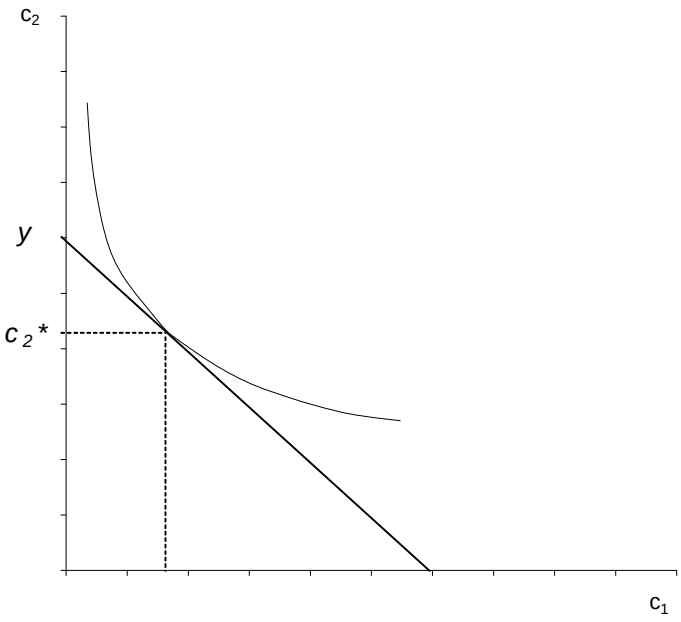
Student's name: _____

You have 50 minutes. The exam is worth 20 points, there are 3 problems. Show your work, but be concise and do not waste your time. Good luck!

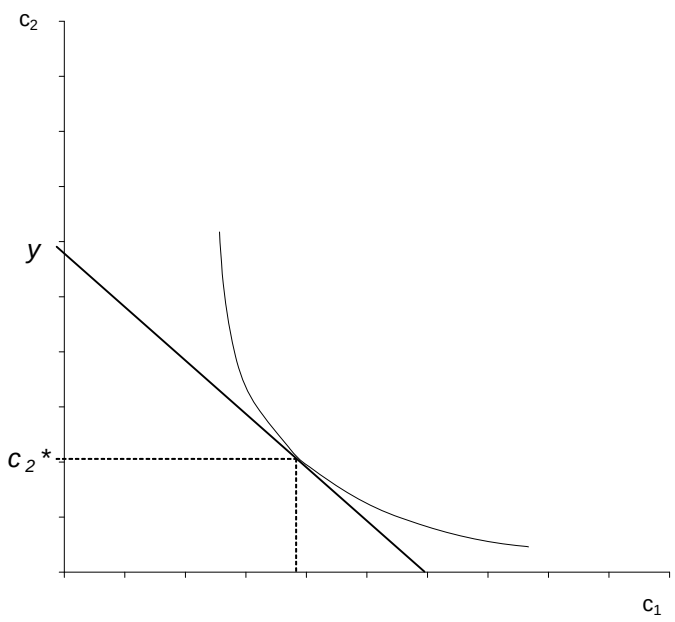
Problem 1 (4 points)

Consider two economies, A and B. Both economies have the same population, supply of fiat money, and endowments. In each economy, the number of young people born in each period is constant at N and the supply of fiat money is constant at M. Furthermore, each individual is endowed with y units of the consumption good when young and zero when old. The only difference between the economies is with regard to preferences. Other things being equal, individuals in economy A have preferences that lean toward first-period consumption; individual preferences in economy B lean toward second-period consumption. We will also assume stationarity. More specifically, the lifetime budget constraints and typical indifference curves for individuals in the two economies are represented in the following diagram.

Economy A



Economy B



Note that in graphs I switched A and B relative to the text, but as long as your answers were consistent with your assumptions, I accepted them.

a) Will there be a difference in the inflation rates in the two economies? If so, which economy will have the higher inflation rate? Give an intuitive interpretation of your answer.

ANSWER: Since N and M are constant, the rate of return on fiat money in a stationary equilibrium will be one in each country. Intuitively, the economies are identical in the sense of how they change over time. They do not change. Even if each country has a different price level, p_t, that value does not change over time; therefore, the gross rate of inflation, p_{t+1}/p_t, equals 1.

b) Will there be a difference in the price level in the two economies? If so, which economy will have the higher price level? Give an intuitive interpretation of your answer.

ANSWER: The value of money (reverse of price level) in economies A and B are, respectively, $N(y - c_1^A)/M$ and $N(y - c_1^B)/M$, where c_1^A and c_1^B are first-period consumption in economies A and B, respectively. The assumption on preferences implies that $c_1^A > c_1^B$ so that $(y-cA1) < (y-cB1)$. This, in turn, implies that the value of money in economy A will be lower (price level higher) than the value of money in economy B. Intuitively, the demand for money will be larger in economy B than in economy A. This is because individuals in economy B want to hold relatively more money to finance their higher second-period consumption. Since all else is equal between the two economies (importantly, the supply of money and population), money will have a higher value in economy B than in economy A.

Problem 2 (8 points)

Consider 2-period OLG economy with population growing at a rate of $n=2\%$ per year, and endowments of $y=10$ units of consumption good for young and 0 units for old. Each period, the newly printed money is given to the old of that period as a lump-sum transfer. Total money supply is growing at a rate of $\mu=5\%$ per period. For all questions, consider only stationary consumption allocation: $c_{1,t}=c_1$ and $c_{2,t}=c_2$ in all periods t.

a) What is the inflation rate in this economy? What is the real rate of return on fiat money in this economy?

ANSWER: Inflation rate is found by dividing the money market clearing condition in t+1 over itself in period t : $\frac{p_{t+1}}{p_t} = \frac{M_{t+1}N_t(y-c_1)}{M_t N_{t+1}(y-c_1)} = \frac{\mu}{n} = \frac{1.05}{1.02} = 1.03$. *Gross real rate of return on fiat money is the inverse of the gross rate of inflation, i.e., it is 0.97 or -3% in terms of the net rate.*

b) Is equilibrium consumption allocation optimal? Explain.

ANSWER: Feasibility constraint with growing population is $c_1 + \frac{1}{n}c_2 \le 10$ *whereas individual lifetime budget constraint is* $c_1 + \frac{p_{t+1}}{p_t}c_2 \le 10 + \frac{p_{t+1}}{p_t}a$, *where a is the size of the money transfer to old in units of good. Since 1/n=1/1.02 and inflation is 1.03, these two constraints do not coincide. This means that equilibrium allocation is not optimal.*

c) Can monetary policy implement the optimal consumption allocation?

ANSWER: Yes, if it chooses the money supply growth such that the individual budget constraint coincides with feasibility constraint. For that it must be that $\frac{p_{t+1}}{p_t} = \frac{\mu}{n} = \frac{1}{n}$, *or* μ*=1 (money supply must be constant). Note that in principle monetary policy cannot implement lump-sum tax (or any other tax) since taxation is not an instrument of monetary policy (but of fiscal policy).*

d) Suppose that individual endowments and consumptions are growing 3% per year. How would your answer to c) change? Explain.

ANSWER: The answer would not change, because for constant money supply, inflation equals to the reciprocal of the total endowment growth in the economy (which is 5% now), and the feasibility and budget constraints still coincide.

Problem 3 (8 points)

Consider a 2-country OLG economy used in class with countries CA and US. Each country is a 2-period OLG economy with endowments: *(y,0)* and *(y,0)* units of the same good (e.g., apples). Assume that countries' populations and total money supplies are constant and equal. Assume free international trade in goods. Foreign currency controls are in place.

a) Suppose CA hosts a worldwide entertainment event and 2% of US population visits CA for 1 year. What is the effect on the CA dollar exchange rate during the event? (HINT: note that resulting population growth in CA equals population fall in US).

ANSWER: During the event population growth in CA is n_t^{CA} *=1.02, and in US* n_t^{US} *=0.98. From the law of one price and market clearing conditions for each country we know that* $e_{t+1}/e_t = \pi_t^{US}/\pi_t^{CA} = n_t^{CA}/n_t^{US} = 1.02/0.98 = 1.04$ *. Hence CA$ is appreciating 4% during the year of the event.*

b) In addition to a), suppose that to finance the event, CA's government uses seignorage revenue by printing new money and giving it in each period to current old. Total money supply in CA rises by 2%. What is the inflation rate in CA? What is the effect on the exchange rate?

ANSWER: During the event inflation rate in CA is $\pi_t^{CA} = \mu_t^{CA} / n_t^{CA} = 1.02/1.02 = 1.00$ (0% on net). From the law of one price and market clearing conditions for each country we know that $e_{t+1}/ e_t = \pi_t^{US} / \pi_t^{CA} = (n_t^{CA} / \mu_t^{CA}) / n_t^{US} = (1.02/1.02)/0.98 = 1.02$. Hence CA$ is appreciating 2% during the year of the event.

c) Is there a better way to finance the event in Canada? Explain.

ANSWER: Yes, by imposing lump-sum taxes on people (old or young). This policy will implement optimal allocation. In contrast, inflation in b) acts as a distortionary tax on consumption of old and hence implies suboptimal consumption allocation.

d) In addition to b), what should the US government do to fix the US dollar exchange rate at 1?

ANSWER: From the law of one price and market clearing conditions for each country under the fixed exchange rate we know that US government's money supply growth rate should be $\mu_t^{US} = \mu_t^{CA} / n_t^{CA} * n_t^{US} = 1.02/1.02*0.98 = 0.98$. Hence US government should decrease the money supply by 2% a year. Fall in money supply will increase its value relative to CA$ and bring the exchange rate to parity.