

Economics 325
Intermediate Macroeconomic Analysis
Final Exam
Professor Sanjay Chugh
Fall 2008
December 18, 2008

NAME:

The Exam has a total of five (5) questions and pages numbered one (1) through eleven (11). Each question's total number of points is shown below. Your solutions should consist of some appropriate combination of mathematical analysis, graphical analysis, logical analysis, and economic intuition, but in no case do solutions need to be exceptionally long. Your solutions should get straight to the point – **solutions with irrelevant discussions and derivations will be penalized.** You are to answer all questions in the spaces provided.

You may use two pages (double-sided) of notes. You may NOT use a calculator.

Question 1	/ 15
Question 2	/ 20
Question 3	/ 35
Question 4	/ 20
Question 5	/ 10
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TOTAL	/100

1. **A National Service Program (15 points).** Consider the following radical policy proposal: rather than taxes being levied on individuals and the proceeds of those taxes being used by the government to fund various programs, suppose that every individual pays no taxes of any kind but must give ten hours of his time every week to national service. Here you will analyze this national service program in the context of the (one-period) consumption-leisure model we have studied. Thus, there are now **three** uses of the individual's time: work, leisure, and national service (the mandatory 10 hours). **Assume the following:**

- Instituting the national service program has no effect on any prices or wages in the economy.
- Any time spent voluntarily performing national service beyond the required 10 hours is considered leisure.

a. **(8 points)** Using the notation we developed in Chapter 2 (i.e., c to denote consumption, n to denote hours of work per week, l to denote hours of leisure per week, P to denote the nominal price of consumption, and W to denote the nominal hourly wage), construct the representative agent's (weekly) budget constraint in this model with a national service program. Recall that there are 168 hours in one calendar week. Provide brief economic justification for your work.

Solution: The individual is required to give 10 hours per week to national service. Thus he has $(168-10)=158$ hours per week left to allocate to either labor or leisure. Proceeding completely analogously as in the standard model, then, we finally arrive at the budget constraint

$$Pc + Wl = 158W .$$

(Refer to Chapter 2 of the Recitation Notes for the full algebraic derivation: the derivation here is identical except that $t = 0$ by assumption and 168 is replaced by 158).

b. **(7 points)** Now recall the standard consumption-leisure model with no national service program and suppose that both the consumption tax rate is zero and the labor tax rate is zero. How does the slope of the budget constraint in this economy compare with the slope of the budget constraint in the economy with the national service program in part a? Provide brief economic explanation.

Solution: With no taxes and no national service program, the budget constraint is $Pc + Wl = 168W$. Comparing this with the budget constraint in part a above, we see that the slopes of the two budget constraints are identical – the two constraints only differ in their intercepts. The constraint in part a has intercepts which are smaller than the constraint here in part b. The intuition is that in the consumption-leisure model the individual has **time** to allocate between working and not working. The national service program takes away some of this time but otherwise has no effect on the real (inclusive of taxes) wage W / P .

2. Monetary Policy in the MIU Model (20 points). In this question, you will analyze, using indifference curve/budget constraint diagrams, the implications of alternative nominal interest rates on the representative consumer's choices of consumption and **real** money balances.

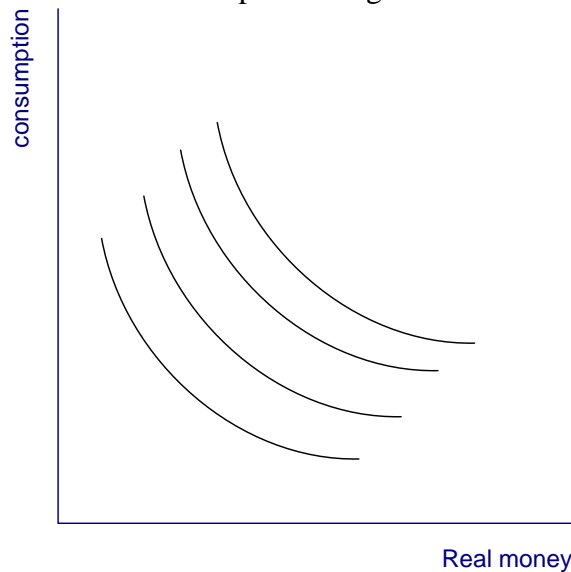
Recall that, with an instantaneous utility function $u(c_t, M_t/P_t)$ (where, as usual, c_t denotes consumption and M_t/P_t denotes **real** money balances), the consumption-money optimality condition (which we derived in Chapter 14) can be expressed as

$$\frac{u_{m_t}(c_t, M_t/P_t)}{u_{c_t}(c_t, M_t/P_t)} = \frac{i_t}{1+i_t},$$

where, again as usual, i_t is the nominal interest rate, $u_c(\cdot)$ denotes the marginal utility of consumption, and $u_m(\cdot)$ denotes the marginal utility of **real** money balances.

- a. **(6 points)** Suppose the central bank is considering setting one of two (and only two) **positive** nominal interest rates: i_t^1 and i_t^2 , with $i_t^2 > i_t^1$. On the indifference map below, qualitatively (and clearly) sketch relevant budget lines and show the consumer's optimal choices of consumption and real money under the two alternative policies. **On the diagram below, note the point on the vertical axis marked "FIXED" – this denotes a point that must lie on EVERY budget constraint. Clearly label your diagram, including the slopes of the budget lines.**

Solution: Examining the right-hand-side of the above, it is clear that the smaller is i , the flatter is the budget line. Starting from the FIXED point, draw two budget lines, with the budget line with slope i_1 flatter than the budget line with slope i_2 . On the flatter budget line, the consumer's optimal choice of money balances and consumption is higher than on the steeper budget line.



Question 2 continued

- b. (7 points) You are a policy adviser to the central bank, and any advice you give is based only on the goal of maximizing the utility of the representative consumer. The central bank asks you to help it choose between the two nominal interest rates i_t^1 and i_t^2 (and only these two). Referring to your work in the diagram above, which nominal interest rate would you recommend implementing? **Briefly** explain.

Solution: Again as is clear from the diagram, choosing the smaller value of i allows the representative consumer to attain a higher level of utility (a higher indifference curve), so i^1 is preferred to i^2 .

- c. (7 points) Suppose instead the central bank is willing to consider setting any nominal interest rate, not just either i_t^1 or i_t^2 . What would your policy recommendation be? **Briefly** justify your recommendation, **and also in the diagram in part (a) sketch and clearly label a new budget line consistent with your policy recommendation.**

Solution: Setting $i = 0$ (or, technically speaking, very very very close to zero) would make the budget line completely flat, and allow the consumer to obtain the highest possible utility. Note that, because indifference curves are downward sloping, if $i < 0$, then there would not be a point of tangency between the budget line and an indifference curve – there would no equilibrium. (Indeed, $i = 0$ is the lowest that nominal interest rates can ever go (something known as the “zero-lower-bound” on interest rates – were they to go lower, a monetary economy (ie, one in which money is used as a medium of exchange) would not exist. A topic for a more advanced course in monetary economics.)

3. **The Fiscal Theory of Exchange Rates (35 points).** In this question, you will use the fiscal theory of exchange rates to analyze some consequences of a fixed exchange rate system. The model is just as we have studied in class – in particular, consumption is constant at $\bar{c} = 11$ in every period, real money demand is described by the function, $M_t / P_t = \phi(\bar{c}, i_t)$, PPP holds, and the foreign price level is equal to one in every period (i.e., $P_t^* = 1$ in every period t). The domestic country runs a fiscal deficit of $DEF = -5.5$ (a **negative** deficit is a **surplus...**) every period, and there is no political will to ever change this deficit. The real money demand function is given by $\phi(\bar{c}, i_t) = \bar{c} - 10 \cdot i_t$, and the exchange rate that the country is pegging (for as long as it can) is $E = 2$ units of domestic currency per unit of foreign currency. Finally, the foreign real interest rate is $r^* = 0.10$, the government starts period 1 with foreign reserves of $B_0^G = 22$, and foreign reserves can never go below zero.

- a. **(3 points)** As long as the fixed exchange rate is in place and is expected to remain in place, what is the numerical value of the domestic nominal interest rate? Briefly justify your answer.

Solution: Use the interest parity condition. If the peg is expected to remain in place, that means $E_{t+1}^e = E_t$, so the interest parity condition tells us that the domestic nominal interest rate equals the foreign real interest, so $i_t = r^* = 0.10$ during this time.

- b. **(3 points)** As long as the fixed exchange rate is in place and is expected to remain in place, what is the numerical value of the domestic country's BOP surplus or BOP deficit? Briefly justify your answer.

Solution: Recall the government budget constraint is $B_t^G - B_{t-1}^G = \frac{M_t - M_{t-1}}{E_t} - DEF_t$.

Seignorage revenue is zero during this period, so the government budget constraint reduces to $B_t^G - B_{t-1}^G = -DEF_t$. The left-hand side is the change in foreign reserves during period t , which is **our definition of the balance of payments**. That is, a country's BOP during a particular period equals the change in its foreign reserves during that period. With $DEF = -5.5$, there is a BOP **surplus** of 5.5 every period.

Question 3 continued

- c. (4 points) Based on your answer in part b, is the **floating** exchange rate higher than, lower than, or equal to $E = 2$? Briefly justify your answer. (Note: You do **not** need to compute any numerical values here.)

Solution: Because the country is running a BOP surplus, it is accumulating foreign reserves, meaning the domestic currency is being held weaker than at the floating rate. The floating rate is thus smaller than $E = 2$.

- d. (5 points) If markets/investors for some reason **never expect** a change in the nominal exchange rate, how many periods will the fixed exchange rate last? Briefly justify your answer.

Solution: With a BOP surplus, the domestic central bank is **accumulating** foreign reserves. There is no economic upper limit on how many foreign reserves a central bank can hold, so in principle, the fixed exchange rate could last forever.

Question 3 continued

The following applies to the remainder of this question: suppose the government of the domestic country **announces in period T-1 that in period T and forever beyond**, the nominal exchange rate will be 1.9 units of domestic currency per unit of foreign currency, and markets/investors believe this announcement. For reference, note that $1.9 / 2 = 0.95$.

- e. **(5 points)** How does the domestic nominal interest rate in period T-1 compare to the domestic nominal interest rate in period T-2 (i.e., is it smaller than, larger than, or equal)? Briefly justify your answer, and provide economic intuition for what you find, **including a brief economic explanation for why i_{T-1} differs from r^* if it does**. (Note: You do **not** need to compute any numerical values here.)

Solution: Use the interest parity in period T-1 to compute the nominal interest rate:

$$1 + i_{T-1} = (1 + r^*) \frac{E_T^e}{E_{T-1}}$$

Because markets/investors believe the government's announcement, $E_T^e = 1.9$, the above tells us that $i_{T-1} < r^*$. Thus the nominal interest rate **falls below** the world interest rate when markets expect an **appreciation** of the currency in the near future (going from $E = 2$ to $E = 1.9$ is an **appreciation** of the domestic currency). Because the domestic currency is expected to become **stronger** in the near future, markets/investors require/demand **less** interest compensation in order to hold bonds denominated in the domestic currency.

- f. **(5 points)** Based on what you found in part e, is the domestic government's seignorage revenue in period T-1 larger than, smaller than, or equal to its seignorage revenue in period T-2? Briefly justify your answer, and provide economic intuition for what you find, **including a brief economic explanation for why seignorage revenue differs from zero if it does**. (Note: You do **not** need to compute any numerical values here.)

Solution: Because the nominal interest rate **falls** in period T-1 compared to period T-2, real money demand in period T-1 is **larger than** in period T-2. Thus, seignorage revenue is **positive** and hence larger than in period T-2. This is because as markets/investors come to expect a strengthening of the domestic currency, demand for the domestic currency rises, which in turn means (in equilibrium) the central bank must supply more domestic currency.

Question 3 continued

- g. (5 points) Based on what you found in part f, is the domestic country's BOP in period T-1 larger than, smaller than, or equal to its BOP in period T-2? **Explain precisely, including why,**

Solution: In period T-2, because seignorage revenue was zero, the BOP **surplus** was 5.5, as computed in part c above. In period T-1, the fiscal **surplus** (i.e., a negative DEF) is still in place, but the government also collects **positive** seignorage revenue, hence the government budget constraint shows us that the BOP **surplus** becomes even larger than it was in period T-2.

- h. (5 points) Does the expectation of a change in the exchange rate (from 2 units of domestic currency per unit of foreign currency to 1.9 units of domestic currency per unit of foreign currency, as described above) mean that the exchange rate system will last longer than without this change in expectations, shorter than without this change in expectations, or is it impossible to tell? **Explain precisely your logic.**

Solution: Because the peg could have lasted indefinitely before the expectation of the appreciation, it can also last indefinitely with this change in expectations. In short, the change in expectations (in and of itself) has nothing to do with the longevity of the fixed exchange rate in this case.

4. **Fiscal Policy (20 points).** President-elect Obama and his primary economic advisers have publicly stated that large fiscal stimuli will be put in place once the new administration takes office. The precise details of the fiscal stimulus are still to be worked out, but they seem likely to include both tax cuts as well as increased government spending in the next couple of years.

Suppose it is early 2009, and the new administration has been seated. At the beginning of 2009, the lifetime consolidated budget constraint of the government is:

$$\frac{B_{2008}}{P_{2009}} = (t_{2009} - g_{2009}) + \frac{t_{2010} - g_{2010}}{1 + r_{2010}} + \frac{t_{2011} - g_{2011}}{(1 + r_{2010})(1 + r_{2011})} + \frac{t_{2012} - g_{2012}}{(1 + r_{2010})(1 + r_{2011})(1 + r_{2012})} + \dots$$

PDV of fiscal deficits

$$+ sr_{2009} + \frac{sr_{2010}}{1 + r_{2010}} + \frac{sr_{2011}}{(1 + r_{2010})(1 + r_{2011})} + \frac{sr_{2012}}{(1 + r_{2010})(1 + r_{2011})(1 + r_{2012})} + \dots$$

PDV of seignorage

The notation here is as in Chapter 15: t denotes real lump-sum tax collections, g denotes real government spending, sr denotes real seignorage revenue, r denotes the real interest rate, B denotes nominal (one-period) government bonds, and P denotes the nominal price level of the economy (i.e., the nominal price of one basket of consumption). Subscripts indicate time periods, which we will consider to be calendar years. Note, of course, the ellipsis (...) in each line of the above equation.

As indicated above, the first line of the right-hand-side is the present discounted value of all fiscal deficits the government will ever run starting from 2009 onwards, and the second line of the right-hand-side is the present-discounted value of all seignorage revenue that will ever result from the monetary policy actions of the Federal Reserve starting from 2009 onwards.

The primary economic advisers to President-elect Obama will be Treasury Secretary(-designee) Timothy Geithner, National Economic Council Chairman Lawrence Summers, and Council of Economic Advisers Chairwoman Christina Romer.

Question 4 continued

- a. **(5 points)** Geithner, because of his background as current President of the New York Federal Reserve, is likely to advocate that, no matter what fiscal policy actions the new administration takes, they should be designed in such a way as to have no effects on the conduct of monetary policy whatsoever. If this is so, what type of fiscal policy – a Ricardian fiscal policy or a non-Ricardian fiscal policy – would Geithner be advocating? **Briefly explain.**

Solution: The policy is Ricardian because it is being conducted in a way to ensure that tax revenues and/or government spending adjust (in a PDV sense) to, by themselves, ensure lifetime government budget balance.

- b. **(5 points)** The less even-keeled that he is, Summers may very well recommend that the new fiscal stimulus measures should **not** take into account any consequences they may have for the conduct of monetary policy. If some combination of tax cuts and government spending increases is enacted and Summers' advice is followed, what are likely to be the consequences for the Federal Reserve's monetary policy in 2009 and beyond? **In particular, will the Fed likely have to expand or contract the nominal money supply? Briefly explain.**

Solution: By lowering the PDV of fiscal surpluses (i.e., increasing the PDV of fiscal deficits) and given a fixed B/P (if you assumed this, this is fine; if they made some more sophisticated argument (ie, FTPL) as to why B/P may NOT be fixed, then will need to trace through that argument), the PDV of seignorage revenue must rise to balance the lifetime government budget constraint. Increased seignorage requires an increase (at some point) in the nominal money supply.

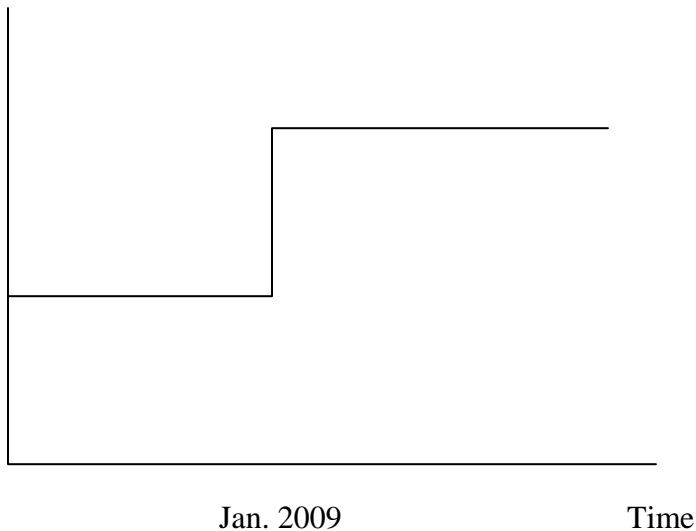
Question 4 continued

- c. (5 points) The objective academic macroeconomist that she is, Romer is likely to point out that because fiscal policy plans (for both t and g) will almost surely be revised as the years unfold (that is, fiscal policy plans adopted in 2009 can be revised in later years), it may be impossible to know beforehand what the eventual consequences for monetary policy of a particular fiscal policy action adopted at the start of 2009 might be. **In no more than three sentences/phrases, use the government budget constraint presented above to interpret what Romer's statement means.**

Solution:

- d. (5 points) If, after the announcement of the new fiscal plans in early 2009, the nominal price level of the economy behaves as shown in the following diagram, which of the following is most relevant explanations: the fiscal theory of the price level, the fiscal theory of inflation, or the fiscal theory of exchange rates? **Briefly justify your answer.**

Solution: This illustrates the FTPL because there is a one-time jump in P (at the time of the fiscal reform).



4. The Keynesian-RBC-New Keynesian Evolution (10 points). Here you will briefly analyze aspects of the evolution in macroeconomic theory over the past 25 years. Address each of the following **in no more than three sentences each**.

- a. **(5 points)** Describe **briefly** what the Lucas critique is and how/why it led to the demise of (old) Keynesian models.

Solution: The old Keynesian models were large estimated systems of equations, and the estimated coefficients could not (because they were just based on historical observations) take into account how behavior might change if policy changed. In the 1970's, this led to the downfall of such models as policy-makers tried more and more to exploit these relationships, but the "coefficients" began to vary a lot (for some reason...) with policy, eventually causing the profession (through the Lucas critique) to understand that such models really were not all that useful for policy advice after all.

- b. **(5 points)** **Briefly** define and describe the neutrality vs. nonneutrality debate surrounding monetary policy today. Which type of shock does this debate concern?

Solution: The RBC view holds that money shocks do not affect real variables (i.e., consumption or GDP) in the economy (neutrality), while the New Keynesian view holds that they do (nonneutrality) because prices take time to adjust (are "sticky").