Name:
Student No.:

SPP/Econ 556
Macroeconomics
Midterm Exam No. 2 - Answers

March 29, 1999

Answer all questions, on these sheets in the spaces or blanks provided. In questions where it is appropriate, **show your work**, if you want partial credit for an incorrect answer. Point values of the questions are shown; there are a total of 70 points possible.

1. (11 points) Explain, derive, and apply Mankiw's equation for the steady-state rate of unemployment,

$$u = \frac{s}{s + f} \tag{1}$$

as follows:

a. First, define each of the terms in this equation

u = the fraction of the labor force that is unemployed

s = the fraction of those employed who are separated from work per unit time

f = the fraction of those unemployed who find jobs per unit time

b. Derive the equation (1) above:

Let the unemployment rate be the ratio of the total unemployed, *U*, to the labor force, *L*, *u*=*U*/*L*. The change per unit time in the total number of unemployed will be the number of employed who lose jobs, *s*(*L*- *U*), minus the number of unemployed who find jobs, *fU*:

$$\frac{dU}{dt} = s(L-U) - fU = sL - (s+f)U = L\left[s - (s+f)\frac{U}{L}\right] = L[s - (s+f)u]$$

In steady state, U is unchanging, so that dU/dt=0 and the expression in square brackets is zero. From this,

$$(s+f)u = s \quad \Rightarrow \quad u = \frac{s}{s+f}$$

c. Finally, suppose that a government job exchange were created that had the effect of tripling the rate at which the unemployed find jobs, but also of causing the employed to become more optimistic about finding other jobs and thus doubling the rate at which they quit. What would this do to the steady state rate of unemployment? Does it matter that job separations are a mixture of workers who quit, the rate of which is doubled here, and workers who are laid off, the rate of which is presumably unchanged?

If all separations are quits, then *s* is doubled while *f* is tripled. This more than doubles the denominator of the above expression for *u* and exactly doubles the numerator. That means that the unemployment rate is reduced.

If some separations are layoffs, the rate of which does not change, then *s* less than doubles. It will still be true (even more so, in fact) that the denominator will increase by more than the proportional increase in *s*, while the numerator will increase by the increase in *s*. So again, the unemployment rate falls.

2. (8 points) NEWSFLASH!!! Ned Gramlich, Governor of the Federal Reserve System, has just gone nuts. He has secretly kidnapped the granddaughter of Fed Chairman Alan Greenspan and is threatening her dire harm (something about making her watch CSPAN) if Greenspan does not increase the rate of monetary expansion from its current average of 4% to 10% a year, as Ned has been advocating unsuccessfully ever since he joined the board. The nation's real GDP has been growing at 3% a year recently and is expected to continue to do that indefinitely. Based **solely** on the Quantity Theory of Money with a constant velocity, answer the following questions.

   a. What, according to the theory, must be the current rate of inflation and why?

      The theory says M×V=P×Y, which, with constant velocity V, implies

      $\frac{\dot{P}}{P} = \frac{\dot{M}}{M} - \frac{\dot{Y}}{Y}$. Therefore the rate of inflation must be 4% – 3% = 1%.

   b. What will this increase in monetary expansion do to the following?

      - The real growth rate of the economy — No effect
      - The nominal interest rate — Increase by 6 percentage points
      - The real interest rate — No effect
      - The rate of inflation — Increase by 6 percentage points

   c. What do you think has gotten into Ned? Using your knowledge of how money and inflation affect different groups within the economy, speculate what it may be about Ned's personal economic situation that would motivate him to do this.

      An unexpected increase in inflation, as this would surely be, has a strong effect in unexpectedly reducing the real value of assets liabilities that are denominated in dollars, to the benefit of debtors and the harm of creditors. Perhaps Ned is heavily in debt.

3. (15 points) Mankiw's Open-Economy Long-Run Model is

$Y = F(\bar{K}, \bar{L})$	(1) Production Function, fixed factor endowments
$C = C(Y - \bar{T})$	(2) Consumption Function, fixed taxes, $0<C'<1$
$I = I(r)$	(3) Investment Function, $I' \leq 0$
$Y = C + I + \bar{G} + NX$	(4) Supply and demand for goods
$r = r^*$	(5) Real interest rate pegged to world capital market
$NX = NX(\varepsilon)$	(6) Net exports depend negatively on real exchange rate, $NX' \leq 0$

a. Using this model, determine the effect of the following changes on the equilibrium level of net exports, *NX*. Indicate the reasoning that led you to your conclusions.

i. Decrease in government purchases, $\bar{G}$.

$\Delta NX > 0$

$\Delta\bar{G} < 0 \Rightarrow \Delta NX > 0$ (from(4), since $\Delta Y = 0$ from(1),

$\Rightarrow \Delta C = 0$(from(2),

& $\Delta r = 0 \Rightarrow \Delta I = 0$)

ii. Increase in the labor force, $\bar{L}$.

$\Delta NX > 0$

$\Delta\bar{L} > 0 \Rightarrow \Delta Y > 0$ (from(1))

$\Rightarrow \Delta C > 0$ but $\Delta(Y - C) > 0$ since $MPC < 1$

$\Rightarrow \Delta NX > 0$ (from(4), since $\Delta G = 0$

& $\Delta r = 0 \Rightarrow \Delta I = 0$)

iii. Increase in foreigners' desire to buy our exports at any given real exchange rate.

$\Delta NX = 0$

The *NX* function shifts, but the value of *NX* itself cannot change, since from equation (4) it must continue to equal

$NX = Y - C - I - G$

and nothing on the right-hand-side has changed. The way this happens is for the real exchange rate, e, which is the relative price of our goods, to rise in value (appreciate) until the increased desire to buy our goods is completely choked off by the higher price.

b. To what extent does this model predict or assume Purchasing Power Parity (PPP)? Do any of your answers in part (a) depend on whether PPP holds or not? Why, or why not?

It does not conform with PPP, which would predict that the real exchange rate is constant. It can be made to conform arbitrarily close to PPP by making the *NX*(e) very elastic (or close to flat, when drawn with e on the vertical axis). Then the real exchange rate will change very little.

None of the answers in part (a) would be changed, however, if we make the the *NX*(e) curve flatter or steeper. They all relay on equation (4), not equation (6). The slope of the curve will matter for the size of the change in e needed to make *NX* do what it has to, but that's not asked about in part (a).

c. To what extent does this model help you to explain the changes in the U.S. trade balance that were reported in the assigned article in the Wall Street Journal for 1998? That is, first, how did the U.S. trade balance compare in 1998 to previous years, and also how did it compare in December 1998 to previous months? Second, what reasons were offered in the newspaper account to explain these changes? And third, how well to these reasons accord with the predictions of this model?

The WSJ reported that the U.S. trade deficit was higher in 1998 than in previous years, but that it improved slightly in December. Reasons given for the high deficit were the high level of income in the U.S. economy together with the weaknesses in both foreign income and foreign exchange rates, while the apparent turnaround in December was said to reflect the beginnings of a recovery abroad. Such changes can be entered into the current model, letting high *K* and/or *L* increase *Y* at home, and shifting the NX function to reflect changes abroad. However, the model will predict that a high *Y* will cause a surplus, not a deficit, in trade, while all effects of shifting NX will be neutralized by exchange rate change. So the model works very poorly for this purpose. [That's because it is a long run model.]

4. (10 points) Suppose that the Marginal Propensity to Consume is 0.85.

   a. What is the government purchases multiplier?

      The multiplier for government purchases is
      $$\frac{1}{1-MPC} = \frac{1}{1-0.85} = \frac{1}{0.15} = 6.66$$

   b. What is the tax multiplier?

      The multiplier for taxes is
      $$\frac{MPC}{1-MPC} = \frac{0.85}{1-0.85} = \frac{0.85}{0.15} = 5.66$$

   c. Suppose that a rise in the interest rate causes desired investment to decrease by $1 billion. If the government wishes to use a change in government purchases to prevent this drop in investment from shifting the planned expenditure curve in the Keynesian cross, in what direction and by how much should it change purchases?

      Since planned expenditure is just $E=C+I+G$, to offset a $1 billion drop in I we just need an equal increase of $1 billion in G.

   d. How would your answer to (c) change if it were taxes, not government purchases, that was to be used?

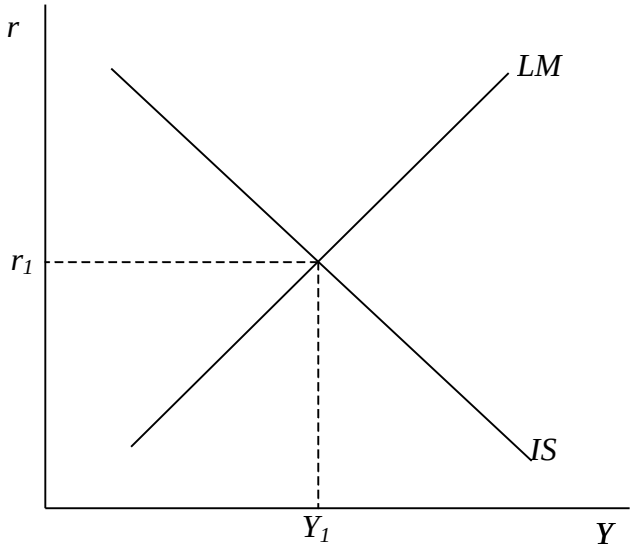
      A tax cut will increase disposable income and raise C, which is what we need to do. However, a cut in taxes of $1 billion will not be enough, since it will increase C by only the MPC times the cut, or $850 million. To get consumption to increase $1 billion, we need a larger cut, $\Delta\bar{T}$, such that $-MPC \times \Delta\bar{T} = \$1 billion$, or $\Delta\bar{T} = -\$1 billion / 0.85 = -\$1.176 billion$

   e. How, again, would your answer to (c) change if it were transfer payments (to the poor, for example), not government purchases, that was to be used?

      Transfer payments have exactly the effects of negative taxes, in that while they do not change expenditure directly, the do alter disposable income and change consumption through the MPC. Therefore, the needed *increase* in transfer payments is $1.176 billion.

5. (16 points) In each case below, you are given the IS-LM diagram with an initial equilibrium. Show how one or both of the curves change for the following exogenous changes in the model. Then, from that and the rest of the model, determine the qualitative changes (+,–,0,?) in the indicated variables. Give reasons for your results, where asked.

   a. A cut in taxes. (S below refers to *national savings*, not just private savings.)



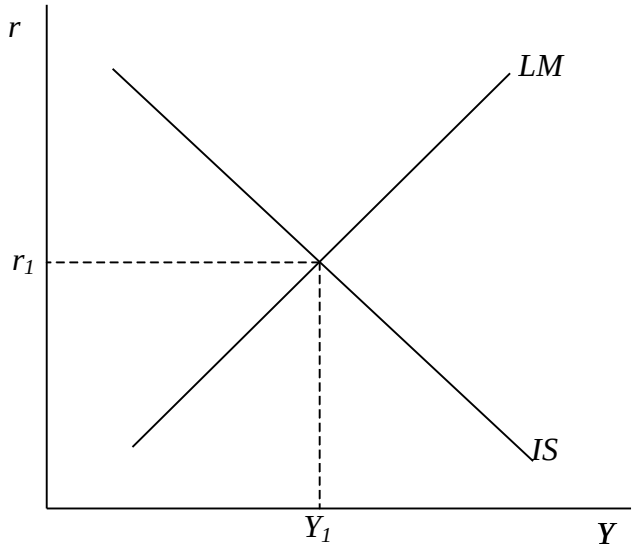
Y ___+___

r ___+___

S ___–___ Why? Because S=I and I has fallen due to the rise in r.

L ___0___ Why? Because L=M/P and M and P are unchanged.

b. A downward shift in the demand for money, less being demanded at any given interest rate and income.



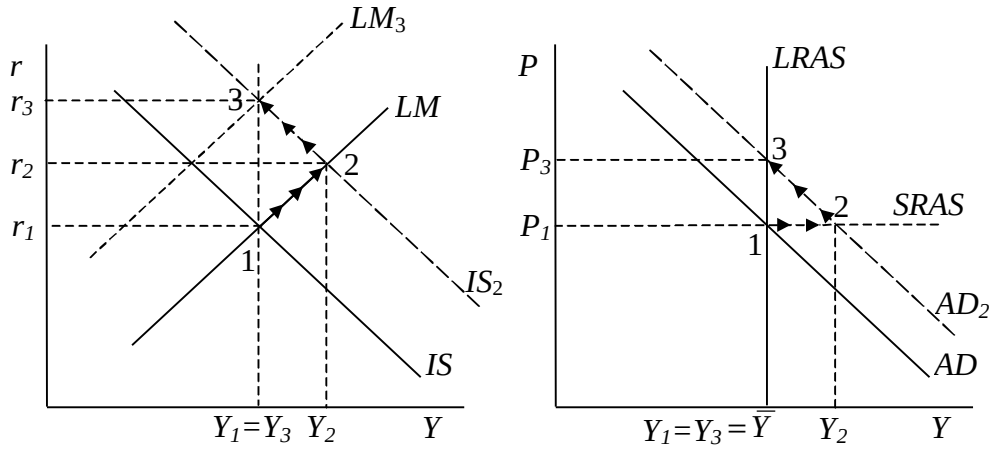
Y ___+___

r ___–___

I ___+___ Why? Due to the fall in r.

L ___0___ Why? Because L=M/P and M and P are unchanged.

6. (10 points) Using the AD-AS model with its IS-LM foundation, and starting from a long-run equilibrium as shown, show in the diagrams below how the economy will respond to a sustained cut in taxes. In the space below that, write enough of an explanation so that we can tell that you know what is going on, such as when various curves shift, and why. Be sure that you identify clearly the corresponding equilibria in both short run and long run in both diagrams.



Starting at point 1 (r_1, Y_1, P_1), the tax cut shifts IS right to IS_2. Output and interest rate rise along LM to point 2. Meanwhile, P is fixed at P_1, and AD shifts right to AD_2, showing short-run equilibrium at point 2 with income Y_2 there as well.

Over time, because $Y > \bar{Y}$, price rises, and we move up AD_2 to point 3, with the higher price P_3 and income back to $\bar{Y} = Y_1$. In IS-LM, the price increase reduces the real money supply, M/P, and shifts LM left, until it too intersects IS_2 at Y_1 – at point 3 – with still higher $r=r_3$.