Note: Exam 1 has been rescheduled for September 27, 2001. The remainder of the schedule is precisely as the syllabus reads.

Class Outlines
September 18 and 20 2001

September 18, 2001

Problem Set 1 turned in.

I. Review.

II. Relationship between the price of bonds and interest rates.

a. We say that the price of bonds and interest rates are inversely related.
   i. We looked at an example using a discount bond (e.g. a T-bill). If the price of a T-bill is $9000, and the bond matures at $10000 then the interest rate is calculated as follows:
      1. i_t=[(Maturity Value)-(Price of the Bond)]/(Price of the Bond).
         a. e.g. i_t=(10,000-9,000)/10,000=.111…
   ii. If the price of the T-bill increased to $9500, then by similar reasoning, the interest rate declines to .055… This illustrates that indeed the price of bonds and interest rates are negatively related.

III. IS-LM. Putting it all together.

a. IS curve – with the IS curve we want to relate equilibrium output in the goods and services market to changing interest rates. Consider, however, our old equilibrium condition in the goods and services market:
   i. $Y_t=(1/1-c_1)[c_0-c_1T_t+\underline{I}+\underline{G}]$
      1. Note: nowhere in the above equilibrium condition do interest rates appear. Our assumption that investment is exogenous needs to be dropped.
         a. New model for investment: We write I=I(Y,i), that is investment is a function of both income and the interest rate. How and Why?
            i. Income-investment is positively affected by income. As income increases, we know sales increase. Businesses will react to higher sales by expanding operations. To expand operations businesses will buy factories, machines, etc. This implies more investment.

Likewise, a higher income is likely to lead to higher residential investment as people purchase more homes, etc.

ii. Interest rates – Perhaps the best predictor of investment is interest rates. As interest rates increase, the cost of a new project (which must be financed by a business) increases. Likewise, residential investment is likely to decline. Thus as interest rates increase, investment declines.

b. The new model.
   i. Our new demand curve can now be written as follows:
      1. $D_{GDP}==[c_0-c_1T_t+I(Y,i)+\underline{G}]+c_1Y_t$
      2. Note, to solve for equilibrium output, we would need to know how output enters the equation I(Y,i). We could then isolate output by taking every variable that has a Y in it, factoring out output, and dividing through precisely as we initially did (see exercises 3 and 5 on page 99 and 100 in the text).
   ii. The equation above implies that as interest rates increase, the demand for goods and services declines
   iii. We looked at a graph, and saw that a decline in interest rates led to an outward shift in the demand for GDP in the goods and services market. The result is a higher equilibrium output level.

c. Plotting the IS curve
   i. To plot the IS curve, we do the following.
      1. Start from the goods and services market.
      2. Allow interest rates to change (and thus a shift in D_{GDP}) and keep track of how this impacts equilibrium output.
      3. Plot equilibrium income against interest rates. If correctly done, you will see that equilibrium income declines as interest rates increase. This implies that the IS curve is downward slopping.

IV. The LM curve

a. Recall the equilibrium condition in the financial market:
   i. $M^s=\$Y_t*L(i_t)$, where the dollar sign in front of income indicates that the variable is in nominal terms.
      1. Note: I have warned you that we can not accurately compare nominal incomes between two years because of inflation. To control for inflation, let's make all

variables real variables. To do so, we would multiply by the CPI in the base year and divide by the CPI in the current year. Let's assume that the base year has a value of 1. Thus, to put a variable in real terms, we need only divide by the CPI in the current year. When we do this, we arrive at the following new equilibrium condition:

a. $M^s/P_t=\$Y_t/P_t*L(i_t)$
    i. Note to avoid confusion, I will follow the author's lead. If you see a dollar sign in front of output, it will represent nominal values. Without a dollar sign, the variable is assumed to be in real terms. For example, real GDP can be expressed as Y_t or $=\$Y_t/P_t$.

b. To plot the LM curve, we do the following:
    i. Start with the financial market.
    ii. Allow income to change and ask what happens to the equilibrium interest rate. Keep track of both variables.
    iii. Plot income against the interest rate, where again, the interest rate appears on the vertical or y-axis and income appears on the x-axis or horizontal axis.

c. We looked at an example in class, where we plotted an LM curve.

September 20, 2001

I. Review (the IS curve)

a. Factors that shift the IS curve.
    i. The IS curve plots equilibrium output at different interest rates. However, an exogenous variable can cause a shift in the IS curve, if the exogenous variable appears in the IS equation. Recall our IS equation:
    ii. $Y_t=(1/1-c_1)[c_0-c_1T_t+I(Y,i)+\underline{G}]$
        1. Fiscal Policy
            a. Expansionary (e.g. an increase in government spending or a decline in taxes). Suppose the Federal government cuts taxes. This causes people to want to spend more at every interest rate. Such an affect cause the entire IS curve to shift to the right.
            b. Contractionary (e.g. a decrease in government spending or an increase in taxes). Contractionary fiscal policy leads to a decline in

the demand for GDP at every interest rate. This causes the IS curve to shift to the left (a decrease).

b. We went through a graphical example in which we allowed taxes to change, and illustrated that the IS curve does indeed shift.

II. Review (LM curve)

a. Factors that shift the LM curve
    i. There are only 2 factors that could change the LM curve, a change in prices, or a change in monetary policy. For now, we won't look at prices, because we assumed they are always fixed (a short run assumption that will have to go when we look at the medium run).
        1. Expansionary monetary policy (e.g. Fed buys government bonds).
            a. If we leave income unchanged, we see that an increase in the money supply causes interest rates to decrease. Since the equilibrium interest rate decreases at every income level, we see that the entire LM curve shifts to the right.
        2. Contractionary monetary policy (e.g. Fed sells government bonds).
            a. If we leave income unchanged, a decrease in the money supply causes interest rates to increase at every income level. This causes a backward shift in the LM curve.

III. An example with the IS-LM together.

a. An increase in taxes.
    i. Which curve is affected? Since taxes appear in the IS equation, it affects the IS curve. Note, that taxes do not appear in the LM equation.
    ii. Which way does the curve shift? An increase in taxes decreases disposable income. This causes consumption to decline, which further leads to a decline in the demand for GDP AT EVERY INTEREST RATE. This causes equilibrium output to decrease at every interest rate, which leads to a backward shift in the IS curve.
    iii. Affects? As the IS curve shifts backward, and to the left, the interest rate can not remain where it is. Because income will decline, agents in the financial sector want to hold less money (less need because of lower transactions). They will want to put more of their wealth in bonds. To keep equilibrium (the

money supply has not changed), interest rates must decrease. A decline in interest rates will convince agents to hold the same amount of money, but less bonds. Thus the over all effect of an increase in taxes is a decrease in the interest rate, and a decrease in equilibrium output.