Answer Sheet 3 - Econ 136 - Fall 2002

1. Basics of long-term lending

a. \( P_b = C/r_{LT} = 100/0.04 = \$2500 \)

b. You expect the price of bonds to increase to \( C/0.02 = \$5,000 \) next year. Hence your
\[ g_b^e \equiv \frac{P_b^e - P_b}{P_b} = 5000 - 2500 \over 2500 = 1 = 100\% \] since you expect each bond to double in value. Your expected rate of return from buying a bond this year is \( R_{LT}^e = r_{LT} + g_b^e = 0.04 + 1 = 1.04 = 104\% \), a lot more than 4\% because of your huge expected capital gain. In pictures, your barrel should show an inflow of 4\% per dollar in bonds, and an injection ("negative leakage") of 100\% per dollar in bonds.

c. Now you expect the price of bonds to decrease to \( C/0.05 = \$2,000 \) next year. Hence your
\[ g_b^d \equiv \frac{P_b^d - P_b}{P_b} = 2000 - 2500 \over 2500 = -.20 = -20\% \] since you expect each bond to lose 20\% of its value. Your expected rate of return from buying a bond this year is \( R_{LT}^e = r_{LT} + g_b^d = 0.04 - 0.20 = -16\% \), a lot less than 4\% because of your large expected capital loss. In pictures, your barrel should show an inflow of 4\% per dollar in bonds, and a leakage of 20\% per dollar in bonds. In this case, just holding your Wealth in a demand deposit that pays 0\% interest would be better than including bonds in your portfolio since a zero rate of return is still a lot better than a -16\% rate of return. In pictures, even a flow of \( r = 0 \% \) per dollar into the time-deposit barrel or demand-deposit barrel is larger than the 4\% per dollar flow into the bond barrel minus the 20\% per dollar leakage.

d. The idea of interest-rate risk in long-term lending is straightforward: If the long rate goes down next year (e.g., to 2\%), you will enjoy a capital gain. But if it goes up next year (e.g., to 5\%), you will suffer a capital loss because of the inverse relation between \( r_{LT} \) and \( P_b \). Since you are not sure if the rate will go up or down next year, buying a bond this year entails a risk.

e. Use the formula for the equilibrium value for \( r_{LT} \), namely, \( r_{LT}^* = r_{LT}^{e} \times (1 + r_{ST}^{e}) \), to find \( 0.04 = \frac{r_{LT}^{e} \times (1 + r_{ST}^{e})}{1 + r_{LT}^{e}} \implies 0.04 + 0.04r_{LT}^{e} = r_{LT}^{e} \implies r_{LT}^{e} = 0.04/0.96 \approx 4.2\% \). Notice \( r_{LT}^{e} > r_{LT} \) Why? People must be expecting the long rate to rise enough to generate an expected rate of capital gains equal to -4\% (a capital loss); otherwise the expected rates of return from short-term and long-term lending would not be equal.

2. A CQT World

a. \( \frac{M^d}{P} = \frac{M^s}{P} \implies \frac{1}{5}Y = \frac{M^s}{P} \implies \) the equation of the LM is:
\[ LM: \quad Y = 5\frac{M^s}{P} \]

b. Summing (2) and (3) shows total demand is given by \( Y^d = 990 - 900r + .1Y \). On the IS, firms supply whatever is demanded (that is, \( Y^d = Y^s \)) and a basic national income identity implies whatever is supplied creates income of the same amount (that is, \( Y^s = Y \)); so on the IS: \( Y^d = Y^s \equiv Y \). In particular, for the given economy \( Y^d = 990 - 900r + .1Y = Y \). Or, solving for \( Y \), \( 990 - 900r = .9Y \implies
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\[ IS: \quad Y = 1100 - 1000r \]

c. To finance \( Y = 1000 \) real transactions, Equation (1) implies \( \frac{M^d}{P} = 200 \), hence money-market equilibrium implies \( \frac{M^s}{P} = 200 \). And the equation of the IS implies \( r = \frac{1000}{100} = 10\% \). See FIGURE.

d. In the credit crunch, the LM will shift in by \( \Delta \frac{M^s}{P} \times V = 10 \times 5 = 50 \). So \( Y_{SR} = 950 \) and plugging into the the equation of the IS shows \( r_{SR} = (1100 - 950)/1000 = 15\% \).
e. After the fall in the investment function, total demand decreases to $Y^d = 945 + .1Y - 900r$. Setting this equal to income $Y$ and solving for $Y$ shows the new equation of the IS is:

$$IS_2 \quad Y = 1050 - 1000r.$$  

The economy stays at $Y = Y_{FE} = 1000$ since CQT implies a monetary theory of business cycles: $V$ stays at 5 and the real money supply stays at 200, so the economy can still finance 1000 real transactions. The interest rate $r$ falls to $r = 5\%$ to ensure that investment demand does not fall even though the investment function is now lower. That is, the cost of borrowing falls enough to completely offset the fall in investment opportunities. So money rules the roost in a classical world. See FIGURE.

3. Mr. Keynes’s escape from CQT Using the formula $r_{LT} = \frac{r^0_{LT}}{1 + r^0_{ST}}$, one finds $r^0_{min} = \frac{1}{3} \approx 9.1\%$. Given the fall in investment opportunities to $I_2(r)$, we have seen that $r_{LT}$ must fall to 5\% to keep the economy at full employment. But since lenders have inelastic interest expectations, they are unwilling to lend at such a low rate of interest. The long rate drops to $r^0_{min}$ while the short rate drops all the way to $r_{ST} = 0$. At this point, lenders are indifferent between lending long term at 9.1\% and just sitting idly on speculative balances earning zero interest this year. The amount of money that people lend to firms is determined by the level of firms’ investment demand when $r_{LT} = 9.1\%$; the rest is held idle. From the equation of $IS_2$, we know that when $r = 9.1\%$, $Y_{SR} = 1050 - 91 = 959$. See FIGURE below. In the liquidity trap recession the amount of real idle speculative balances is given by $\frac{M^s}{P} - kY_{SR} = 200 - 959/5 = 3.2\,$. For example, if everything is measured in billions of dollars, this is 8.2 billion dollars of idle balances!
4. Some situations involving uncertainty

a. **Investor uncertainty**  See Uncertainty Handout. The key idea is that lenders put themselves into investors’ shoes, and realize that once investors’ uncertainty clears, the IS curve and hence $r_{LT}$ will increase again. So lenders *rationally* have inelastic interest rate expectations when investors’ uncertainty is high. Indeed, in this case, a temporary recession may be a good thing because investors are not sure where the profitable investment opportunities are. Keeping resources idle rather than committing them to a foolish investment project may be a good thing, conserving the economy’s basic building blocks like raw materials and steel, until their best use is better understood.

b. **Lender uncertainty**  Again see the Uncertainty Handout. Suppose the fall in investment opportunities is permanent, but lenders are uncertain about this (even if investors are not uncertain). Then lenders will only let $r_{LT}$ fall gradually as their uncertainty clears. From the point of view of an omniscient observer, one might call the lenders the “villain” since a recession is inefficient and unnecessary in this case: $r_{LT}$ should immediately fall a lot in this case, to offset the permanent fall in investment opportunities. But lenders are not omniscient (who is?), so it is probably more reasonable to say that a recession in this case is due to lenders’ imperfect information about the current situation in the economy—rather than any villainy.

c. **Household uncertainty**  Again see the Uncertainty Handout.

It is worth emphasizing that, typically, these 3 forms of uncertainty will *all* simultaneously be present after a real shock. That is, firms, lenders, and households will all be uncertain about the future.