Econ 340: Money, Banking and Financial Markets Midterm Exam, Spring 2009

1. On September 18, 2007 the U.S. Federal Reserve Board began cutting its fed funds rate (short term interest rate) target. This policy move has brought the fed funds rate from 5.25% to 0.25%, in an attempt to stimulate consumer and business spending, reduce interest rate resets on mortgages and shore up the economy.

   (a) *(10 points)* Write down an equation representing interest parity, and provide an intuitive explanation for the equation. That is, explain how market forces ensure that interest parity holds.

   The interest parity condition states that the domestic interest rate equals the foreign interest rate minus the expected appreciation of the domestic currency,

   $$i^D = i^F - \frac{E^e_{t+1} - E_t}{E_t}, \tag{1}$$

   where i^D is the domestic interest rate, i^F is the interest rate on foreign deposits, E_t is the exchange rate (units of foreign currency per unit of domestic currency) at time t (today), and E^e_{t+1} is the expected value of the exchange one period in the future.

   The key assumption for the interest parity model is that foreign bank deposits and domestic bank deposits are *perfect substitutes*. When capital is mobile and bank deposits are perfect substitutes, it must be true that there is no difference in the expected returns on domestic and foreign deposits. In equation (1), the left hand side of the equation is the domestic investors expected return from holding domestic deposits, i.e. the interest rate paid on domestic deposits. The right hand side of equation (1) is the domestic investors expected return from holding foreign deposits, i.e. the interest rate paid on foreign deposits minus the expected appreciation of the domestic currency (depreciation of the foreign currency). To see why this equality must hold, suppose that the domestic return was greater than the expected return on foreign deposits. As a result, investors would only want to hold dollars, and their attempt to purchase dollar deposits would create an excess demand for dollars, causing the dollar to appreciate. As the spot exchange rate appreciates (holding the expected future exchange rate constant), the "expected appreciation" of the domestic currency, $\frac{E^e_{t+1} - \uparrow E_t}{\uparrow E_t} = \frac{E^e_{t+1}}{\uparrow E_t} - 1$, will decline so that the expected foreign return would increase. This upward pressure on the value of the dollar would continue until investors are indifferent between holding dollars and foreign currency, i.e. equation (1) holds again.

(b) *(20 ponts)* Use your interest parity model to explain the impact of the Fed's policy move on the value of the dollar. Provide both a graphical and intuitive explanation of your results.

The FED's action to reduce short term nominal interest rates in the U.S. will cause the return on dollar deposits to decrease. As a result, the demand for dollar assets will decline and the demand curve shifts to the left. For simplicity, we assume that this decrease in the nominal domestic return occurred with no change in inflation or expected inflation, so there is no particular reason for the expected future exchange rate and "expected appreciation" of the dollar to change. So lower return on domestic deposits leads to an excess supply of the dollar (excess demand for the foreign currency). The excess supply $(Q_s - Q_{D2})$ of dollar deposits leads to a decline in the price of dollar deposits, i.e. a depreciation of the dollar from E_1 to E_2. As the spot exchange rate declines, for a given future expected exchange rate, E^e_{t+1}, the expected appreciation of the dollar $(\frac{E^e_{t+1}-E_t}{E_t})$ increases, and the expected foreign return decreases. This decline in the expected foreign return is a movement down the demand schedule from point B towards the new equilibrium where $Q_s = Q_d$ again. The end result is that lower domestic interest rates lead to a depreciation of the domestic currency.

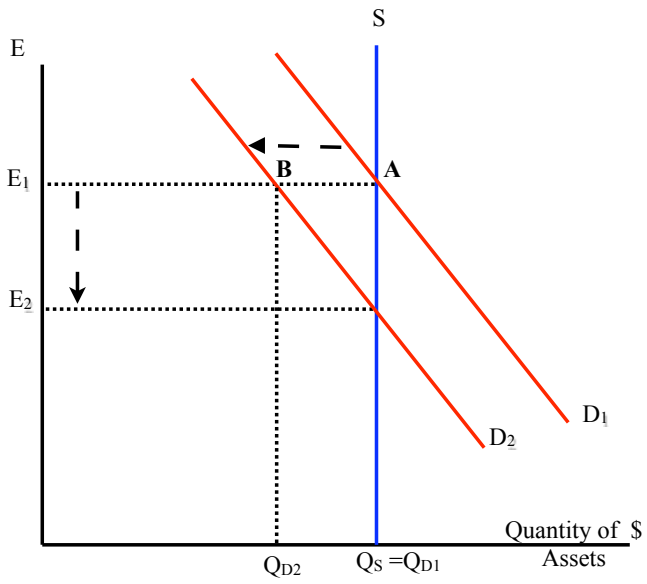

Figure 1: Exchange Rate Determination Using Interest Parity Model

2. If lawmakers ultimately pass President Obama's first budget, U.S. federal deficits will rise significantly over the next several years. When the Federal Government runs a budget deficit, it must sell Treasury bonds to finance that deficit. To analyze the impact of increased government spending, assume the Treasury will be selling nearly \$400, \$800, and \$1,200 billion in new *1-year Treasury bills* in 2010-2012.

   (a) *(15 points)* Use a supply and demand for bonds model to determine what is likely to happen to interest rates on 1-year bills. (Explain your graph)

   When the federal government runs a deficit, it finances that deficit by selling treasury bills. The Obama administration's first buget will increase the U.S. deficit and increase the number of treasury bills being sold. The graph below shows an initial equilibrium between the supply and demand for treasury bills at point A. The supply curve has its usual upward slope and the demand curve is downward sloping reflecting the fact that as bill prices increase, their yields fall making them less appealing as an asset. Recall that tbills are sold at a discount, so their yield to maturity is given by:

$$i = \frac{FV - P}{P}, \tag{2}$$

   where i is the yield to maturity, FV is the face value of the bill, and P is the current price.

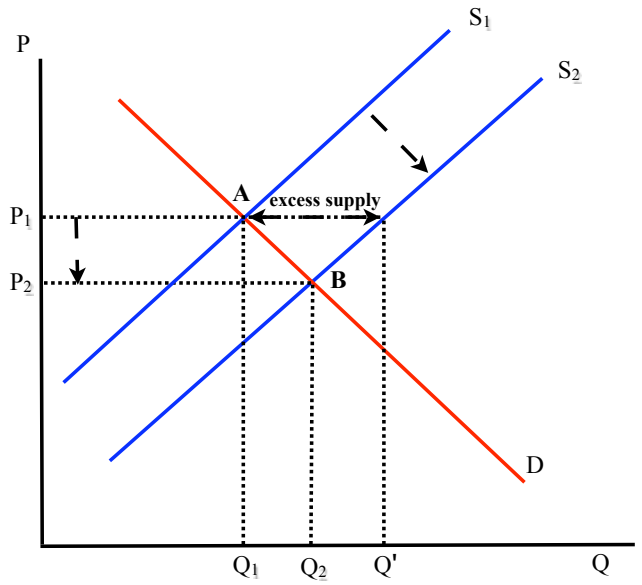

Figure 2: Effects of Defict on Bond Prices

   As federal spending grows faster than tax revenues, the treasury increases its borrowing by selling more treasury bills. The supply curve will shift to the right. That is, the treasury will sell more bills at any price. At the initial price for bills, P_1, the increase in supply creates an excess supply measured by the distance

$Q' - Q_1$. An excess supply for any asset causes its price to fall until the excess supply is eliminated. As the price of tbills fall, the yield to maturity rises making the bills more desirable. As a result, the quantity of bills demanded increases while the quantity supplied decreases until equilibrium is restored at point B. At the new equilibrium, the price of tbills is lower, and the yield to maturity is higher as can be deduced from equation (2).

For each of the next three years, assuming no factors lead to a shift in the demand for tbills, the increasing supply of bills should lead to rising yields.

(b) *(15 points)* Write down and explain an equation representing the liquidity premium model of the term-structure of interest rates. Given your answer to 2. (a) and the actions of the Federal Reserve described in question 1., use your model to predict the shape of the yield curve.

Assuming that bond traders believe the Obama administration's plans, they must expect that yields on short term treasury bills will increase for the next three years. Then, based on the liquidity premium theory of the term structure of interest rates, we should currently observe medium term bond yields higher than yields on short term bills. To see this, note that the liquidity premium theory is based on the assumption that bonds of different maturities are not perfect substitutes. Investors care about both expected returns and the term to maturity of their portfolios. The liquidity premium theory of the term structure posits that longer term bond yields are equal to the expected return from holding a portfolio of short term bonds (approximately equal to the simple average of current and future short term yields) plus a liquidity premium which compensates investors for holding the longer term, less liquid, security. This relationship may be written as,

$$i_{4t} = \frac{i_{1t} + i^e_{1t+1} + i^e_{1t+2} + i^e_{1t+3}}{4} + l_{4t}, \tag{3}$$

where i_{nt} is todays (time period t) yield on a bond with n years to maturity, i^e_{1t+3} is the expected yield on a one-year bill bought three years from today, and l_{nt} is the premium earned for holding the n-year bond instead of the more liquid portfolio of one-year bills. The intuition behind the equality in equation (3) is quite simple. Suppose that the yield on four-year bonds was higher than the expected return from holding the one-year bills plus the liquidity premium. Investors would rush to buy the four-year bond (some of them selling one year bills to do so). The increased relative demand for the longer term security would push its price up and the price on the one-year bill down. As a result, the four-year yield would decrease and the return on the portfolio of one-year bills would increase until the liquidity adjusted returns are the same.

Given the assumption that the Obama administration will increase the deficit over the next three years, my answer in part (a) tells me that the yields on one-year tbills should be rising over the next three years. In other words, $i_{1t} =$

$0.25 < i^e_{1t+1} < i^e_{1t+2} < i^e_{1t+3}$. Using equation (3) above, and assuming a fairly small premium for holding four year notes, I conclude that todays four year note should have a yield to maturity that is above todays one year bill, $i_{4t} < i_{1t}$. If the expected increase in one year bill rates is smooth as I have assumed, then todays yield curve should look something like the figure below.

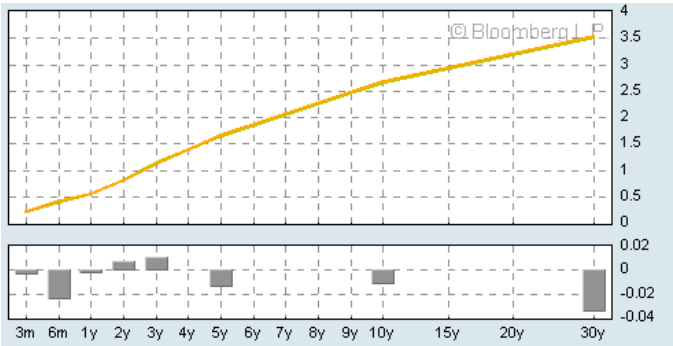

Figure 3: April 1, 2009 Yield Curve