Econ 3010. Keeping-up-assignment (KUA) 4

1. Assume that we measure US GDP and household wealth in billions of dollars. This ways, we do not have to write all the zeros. The total wealth is $W = 20,000$ and the households can distribute the wealth between illiquid bonds and liquid, but non-interest bearing money. The money demand equation is $M^d = SY(.55 - i)$, where $SY$ is nominal GDP and $i$ is the interest rate on bonds. Since the stock of wealth in any particular year is largely fixed, the bond demand is just the wealth minus the money demand, $B^d = W - M^d$.

(a) If nominal GDP is $SY = 10,000$ and the interest rate is $i = 0.05$, what is money demand? What is bond demand?

(b) If nominal GDP is $SY = 10,000$ but the interest rate decreases to $i = 0.03$, what happens to money and bond demand? Why does a falling interest rate increase money demand?

(c) If the interest rate is $i = 0.05$ but nominal GDP increases to $SY = 12,000$, what happens to money and bond demand? Why does increasing income increase money demand?

2. In the previous problem, we just assumed a particular interest rate. In fact, the interest rate depends on money supply and demand. In order to explore this idea, assume again that wealth $W = 20,000$, nominal GDP $SY = 10,000$, and $M^d = SY(.55 - i)$.

(a) If the Federal Reserve Bank sets the money supply at $M = 5,000$, what is the equilibrium interest rate? (hint: set $M = M^d$ and solve for $i$).

(b) Draw the (vertical) money supply curve and the money demand curve into a diagram with the quantity of money $(M, M^d)$ on the horizontal axis and the interest rate $(i)$ on the vertical axis. Mark the equilibrium interest rate you found in part (a).

(c) Next to the money diagram, draw the corresponding bond diagram. Note that the bond demand is $B^d = W - M^d = 20,000 - M^d = ...$ (plug in for $M^d$). It is upward sloping since a higher interest rate makes bonds more attractive. Add a vertical bond supply curve $B'$ so you get the same interest rate as the money diagram. Since you know the bond demand and the interest rate, compute what the bond supply must be (solve $B' = B^d$ when $i$ is the equilibrium value). Write the answer below the bond supply curve.
(d) Finally, assume that the Federal Reserve Bank spends $200 in an expansionary open market operation: it buys up $200 worth of bonds from the public in exchange for money. The private bond supply falls by $200 as the Feds take them off the market and the money supply increases from \( M = 5,000 \) to \( M' = 5,200 \). Redo parts (a)-(c) by computing the new interest rate \( i' \), shifting the graphs appropriately, and writing the new interest and money/bond supplies in the diagrams. What happened to the interest rate?

**NOTE:** When you think about it from the money market perspective, it is pretty intuitive that when the money supply increases, the price of borrowing a money unit falls. In order to see why the interest rate also falls from the bond market perspective, note that a bond is an IOU piece of paper with a certain “face value” \( F \) (say, $100), which the bond issuer will pay to the bond owner when the bond matures (say, in February 2017). The interest rate or return per dollar invested is \( i = \frac{(F - P_b)}{P_b} \), where \( P_b \) is the bond price. When the Feds buy up the extra $200 worth of bonds, the bond demand rises, pushing up the bond price \( P_b \) and decreasing the interest rate \( i = \frac{(F - \uparrow P_b)}{\uparrow P_b} \). This why the interest rate also falls in the bond market.