Midterm Exam

You have 65 minutes to complete this 60 minute exam. Be sure to “box in” your answers. Show your work (so that partial credit can be granted if the final answer is incorrect).

1. [20 minutes] Suppose one is examining the term structure of a 3 year discount bond, and the expectations hypothesis of the term structure holds.

\[ i_{3t} = \frac{(i_t + i_{t+1} + i_{t+2})}{3} \quad (1) \]

Suppose yesterday,

\[ i_{3t} = 0.15 \]
\[ \bar{i} = 0.05 \]

1.1 (5 minutes) Calculate the average value of \( i_{t+1} \) and \( i_{t+2} \).

1.2 (5 minutes) Returning to equation (1), suppose today the yield to maturity on the 3 year discount bond has increased by \( \Delta i_{3t} \), while the yield to maturity on a one year bond is unchanged from yesterday. Derive the algebraic expression for the implied change in the expected one year yield, assuming that the short term expected yield on the one year bond in period \( t+2 \) is unchanged.

1.3. (5 minutes) Assume the 3 year bond yield is given by:

\[ i_{3t} = \frac{(i_t + i_{t+1} + i_{t+2})}{3} + rp_{3t} \quad (2) \]

And going from one day to the next day the yield on the 3 year discount bond has increased by \( \Delta i_{3t} \). Can one say whether the increase is due to change in expected future rates, or due to a change in the risk premium? Why or why not?

1.4 (5 minutes) Draw the yield curve, for 3 months to 30 years (at 3, 6, 12 months, 2, 5, 10, 30 years). Use the following table from 10/6/2016:

<table>
<thead>
<tr>
<th>US Treasury Bonds Rates</th>
<th>Yield</th>
<th>Yesterday</th>
<th>Last Week</th>
<th>Last Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Month</td>
<td>0.25</td>
<td>0.27</td>
<td>0.18</td>
<td>0.20</td>
</tr>
<tr>
<td>6 Month</td>
<td>0.41</td>
<td>0.41</td>
<td>0.49</td>
<td>0.41</td>
</tr>
<tr>
<td>2 Year</td>
<td>0.83</td>
<td>0.81</td>
<td>0.70</td>
<td>0.70</td>
</tr>
<tr>
<td>3 Year</td>
<td>0.97</td>
<td>0.94</td>
<td>0.82</td>
<td>0.82</td>
</tr>
<tr>
<td>5 Year</td>
<td>1.26</td>
<td>1.22</td>
<td>1.08</td>
<td>1.09</td>
</tr>
<tr>
<td>10 Year</td>
<td>1.72</td>
<td>1.68</td>
<td>1.54</td>
<td>1.51</td>
</tr>
<tr>
<td>30 Year</td>
<td>2.44</td>
<td>2.40</td>
<td>2.25</td>
<td>2.20</td>
</tr>
</tbody>
</table>
2. [10 minutes] Consider the Aggregate Demand-Aggregate Supply framework. Suppose we are not in a liquidity trap (and do not end up in a liquidity trap), and the Fed does NOT target the interest rate. Show what happens if oil prices suddenly increase for one period and stay permanently higher. You can assume for simplicity expected inflation is always zero.

2.1 (5 minutes) Show what happens in an IS-LM and AD-AS graph in the period the shock occurs.

2.2 (5 minutes) Show what happens over time to output, the price level, and the interest rate.

3. [30 minutes] Suppose the economy is described by the following equations:

Real Sector

(1) \[ Y = Z \] Output equals aggregate demand, an equilibrium condition
(2) \[ Z = C + I + G \] Definition of aggregate demand
(3) \[ C = c_o + c_1Y_D \] Consumption fn, \( c_1 \) is the marginal propensity to consume
(4) \[ Y_D = Y - T \] Definition of disposable income
(5) \[ T = t_1 Y \] Tax function; \( t_1 \) is marginal tax rate.
(6) \[ I = b_0 - b_1i \] Investment function
(7) \[ G = GO_0 \] Government spending on goods and services, exogenous

And the LM curve is given by:

(8) \[ i = \frac{\mu_0}{h} - \left( \frac{1}{h} \right) \left( \frac{M_0}{P_0} \right) + \left( \frac{1}{h} \right) Y \]

3.1 (5 minutes) Solve for the IS curve (\( Y \) on the left hand side)
3.2 (5 minutes) Solve for equilibrium income.
3.3 (5 minutes) Show what the multiplier is for a change in government spending on goods and services.
3.4 (5 minutes) Assume \( h < \infty \). Is investment higher or lower after the fiscal policy?
3.5 (5 minutes) Show, either mathematically or graphically, what the multiplier is if the Federal Reserve Board targets the interest rate.
3.6 (5 minutes) Suppose money demand depends on wealth, which is the sum of money base and government bonds:

\[ b = \frac{\mu_0}{h} - \left( \frac{1}{h} \right) \left( \frac{M_0}{P_0} \right) + \left( \frac{1}{h} \right) (MB_0 + B_0) + \left( \frac{1}{h} \right) Y \]

Assuming the budget is initially in balance. How does the increase in government spending affect output and the interest rate? Show graphically what happens.