1) Suppose that you are bidding on a 5 year Treasury with a 6% coupon rate (assume this bond makes annual interest payments equal to 6% of the face value) and a face value of $1,000.

   a) Using the Vasicek model from the first project, calculate a predicted path for the interest rate over the next five years (assume the change in the interest rate is an annual change – therefore you only need to calculate four interest rates). Use the current 1 year spot rate (you can find this in the *Wall Street Journal*) for your starting value.

   \[ \Delta i_t = \kappa (\theta - i_t) + \sigma \varepsilon_t \]

   \[ \varepsilon_t \in N(0,1) \]

   b) Now, recalculate the value of the bond using the actual yield curve (again, you can find this information in the *Wall Street Journal*).
   c) Why are your answers to (a) and (b) different?

2) Suppose you have a 10 year STRIP (discount bond). The current yield on 10 year bonds is 5.5%.

   a) Calculate the value of the STRIP
   b) Calculate the Dollar duration of the STRIP. If interest rates fell by 1%, what does the duration imply about the bond’s price?
   c) Suppose that the 10 year interest rate fell to 4.5%, calculate the new price of the bond.
   d) Why are your answers to (c) and (d) different?

3) Suppose that you purchase a 3 year Treasury note with a 4% coupon annual coupon payment and a $10,000 face value.

   a) Calculate the price of this bond assuming a 5% yield to maturity
   b) Calculate the duration of this bond.
   c) By how much will this bond drop in value if the interest rate rises by 50 basis points (0.5%)?
   d) What would the key durations for this bond be?

4) Consider the following two assets. Each asset makes one payment, but that payment is defined by the “state of the world”.

<table>
<thead>
<tr>
<th>State</th>
<th>1 Year Spot rate</th>
<th>Payout (Asset 1)</th>
<th>Payout (Asset 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5%</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>7%</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>3</td>
<td>3%</td>
<td>100</td>
<td>105</td>
</tr>
</tbody>
</table>
That is, if state 2 occurs, Asset A pays $100, Asset B pays $110 and the interest rate is 7%.

Assuming each state is equally likely to occur, calculate the value of each asset.

5) Using the *Wall Street Journal* compare the prices/yields of T-Bills and TIPS. What do these spreads suggest about the market’s forecasts of inflation over the coming years?