6. When the Fed sells bonds to the public, it increases the supply of bonds, thus shifting the supply curve \( B' \) (\( S_1 \) in the figure) to the right. At the old equilibrium price, \( P_1 \), there is now excess supply of bonds measured by the distance \( AB = Q'' - Q_1 \), in the figure below. An excess supply of bonds causes bond prices to fall. Because the price of a bond is just the present value of all future cash payments, and those cash payments are fixed, the falling bond price implies an increase in the yield to maturity on the bond. The new equilibrium bond price is shown as \( P_2 \) in the figure below. Thus, as the Fed reduces the supply of money by increasing its sale of bonds, market interest rates rise.

11. We know from the theory of asset demand that investors do not like risk. Therefore, an increased riskiness of bonds will reduce the demand for bonds. The demand curve shifts to the left. At the old equilibrium price, \( P_1 \), there is now excess supply of bonds measured by the distance \( AB = Q'' - Q_1 \), in the figure. An excess supply of bonds causes bond prices to fall. Because the price of a bond is just the present value of future cash payments, and those cash payments are fixed, the falling bond price implies an increase in the yield to maturity on the bond. The new equilibrium bond price is shown as \( P_2 \) in the figure below. Thus, an increase in the riskiness of bonds results in an increase in interest rates on those bonds.
Chapter 4: Quantitative Problems 1, 4
1. You own a $1,000-par zero-coupon bond that has 5 years of remaining maturity. You plan on selling the bond in one year, and believe that the required yield next year will have the following probability distribution:

<table>
<thead>
<tr>
<th>Probability</th>
<th>Required Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>6.60%</td>
</tr>
<tr>
<td>0.2</td>
<td>6.75%</td>
</tr>
<tr>
<td>0.4</td>
<td>7.00%</td>
</tr>
<tr>
<td>0.2</td>
<td>7.20%</td>
</tr>
<tr>
<td>0.1</td>
<td>7.45%</td>
</tr>
</tbody>
</table>

a. What is your expected price when you sell the bond?
b. What is the standard deviation?

Solution

<table>
<thead>
<tr>
<th>Probability</th>
<th>Required Yield</th>
<th>Price</th>
<th>Prob × Price</th>
<th>Prob × (Price – Exp. Price)$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>6.60%</td>
<td>$774.41</td>
<td>$ 77.44</td>
<td>12.84776241</td>
</tr>
<tr>
<td>0.2</td>
<td>6.75%</td>
<td>$770.07</td>
<td>$154.01</td>
<td>9.775668131</td>
</tr>
<tr>
<td>0.4</td>
<td>7.00%</td>
<td>$762.90</td>
<td>$305.16</td>
<td>0.013017512</td>
</tr>
<tr>
<td>0.2</td>
<td>7.20%</td>
<td>$757.22</td>
<td>$151.44</td>
<td>6.862609541</td>
</tr>
<tr>
<td>0.1</td>
<td>7.45%</td>
<td>$750.02</td>
<td>$ 75.02</td>
<td>16.5903224</td>
</tr>
</tbody>
</table>

The expected price is $763.07.
The variance is $46.09, or a standard deviation of $6.79.
4. An economist has estimated that, near the point of equilibrium, the demand curve and supply curve for bonds can be estimated using the following equations:

\[ B^d: \text{Price} = \frac{-2}{5} \text{Quantity} + 940 \]

\[ B^s: \text{Price} = \text{Quantity} + 500 \]

a. What is the expected equilibrium price and quantity of bonds in this market?
b. Given your answer to part a., which is the expected interest rate in this market?

**Solution:**
a. Solve the equations simultaneously:

\[ P = \frac{-2}{5}Q + 940 \]

\[ P = Q + 500 \]

0 = \frac{-7}{5}Q + 440, \text{ or } Q = 314.2857

This implies that \( P = 814.2857 \).

b. \[ i = \frac{1000 - 814.2857}{814.2857} = 22.8\% \]

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**Chapter 5: Questions 2, 3, 5**

2. U.S. Treasury bills have lower default risk and more liquidity than negotiable CDs. Consequently, the demand for Treasury bills is higher, and they have a lower interest rate.

3. During business cycle booms, fewer corporations go bankrupt and there is less default risk on corporate bonds, which lowers their risk premium. Similarly, during recessions, default risk on corporate bonds increases and their risk premium increases. (You can show this in a similar manner to the answer to Question 11 in Chapter 4.) The risk premium on corporate bonds is thus anticyclical, rising during recessions and falling during booms.

5. If yield curves on average were flat, this would suggest that the risk premium on long-term relative to short-term bonds would equal zero and we would be more willing to accept the pure expectations theory.

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**Chapter 5: Quantitative Problems 1, 5, 11**

1. (a) The yield to maturity would be 5\% for a one-year bond, 6\% for a two-year bond, 6.33\% for a three-year bond, 6.5\% for a four-year bond, and 6.6\% for a five-year bond.

(b) The yield to maturity would be 5\% for a one-year bond, 4.5\% for a two-year bond, 4.33\% for a three-year bond, 4.25\% for a four-year bond, and 4.2\% for a five-year bond.
The upward-sloping yield curve in (a) would be even steeper if people preferred short-term bonds over long-term bonds because long-term bonds would then have a positive risk premium. The downward-sloping yield curve in (b) would be less steep and might even have a slight positive upward slope if the long-term bonds have a positive risk premium.

5. Debt issued by Southeastern Corporation currently yields 12%. A municipal bond of equal risk currently yields 8%. At what marginal tax rate would an investor be indifferent between these two bonds?

Solution: Corporate Bonds (1 − Tax Rate) = Municipal Bonds

\[ 12\% \times (1 - \text{Tax Rate}) = 8\% \]

\[ 1 - \text{Tax Rate} = 0.67, \text{ or } \text{Tax Rate} = 0.33 \]

12. One year T-bill rates over the next 4 years are expected to be 3%, 4%, 5%, & 5.5%. If 4-year T-bonds are yielding 4.5%, what is the liquidity premium on this bond?

Solution:

\[ 4.5\% = (3\% + 4\% + 5\% + 5.5\%)/4 + LP \]

\[ 4.5\% = 4.375\% + LP \]

\[ 0.125\% = LP \]

Chapter 5: Web Exercise 1