Mid-Term Exam Practice Set and Solutions.

What to do with this practice set?

To help students prepare for the mid-term exam, two practice sets with solutions have been handed out. So has an actual exam without solutions. In addition, I am handing out this “representative exam” with solutions to further illustrate the length of, and type of questions included in, the midterm. This exam is based on an actual exam that I might assign to Securities Analysis students.

This set will (naturally) not be graded, but students are strongly encouraged to try hard to solve the questions and to use office hours to discuss any problems they may have doing so. One of the best self-tests for a student of his or her command of the material before a case or the exam is whether he or she can handle the questions of the relevant practice sets. The questions on the exam will cover the reading material, and will be very similar to those here.

Conditions under which the MT exam would take place.

90 minutes from start to finish. Financial calculators and one (1) 1-sided cheat sheet allowed. No hand-held computers, data transmitters, etc.

Question 1 (10 points):

A bill has a bank discount yield of 6.81% based upon the asked price, and 6.90% based upon the bid price. The maturity of the bill (already accounting for skip-day settlement) is 60 days.

(a) Find the bid and asked prices of the bill.
(b) Calculate the bond equivalent yield of the bill as well as its effective annual yield based upon the asked price. Confirm that these yields exceed the discount yield.

Question 2 (10 points):

You have borrowed $20,000 on margin to buy shares in Disney, which is now selling at $80 per share. Your account starts at the initial margin requirement of 50%. The maintenance margin is 35%. Two days later, the stock price falls to $75 per share.

(a) Will you receive a margin call?
(b) How low can the price of Disney shares fall before you receive a margin call?
**Question 3 (5 points):**

On January 10, you sold short one round lot (i.e., 100 shares) of Netscape stock at $14 per share. On March 10, a quarterly dividend of $2 per share was paid by Netscape. On April 10, you covered the short sale by buying the stock at a price of $9 per share. Assume that you paid 50 cents per share in commissions for each transaction. What is the value of your account on April 10? Explain briefly.

**Question 4 (5 points):**

Consider a bond with a 10% coupon rate and with yield to maturity equal to 8%. If the bond’s yield to maturity remains constant, then in one year will the bond price be higher, lower, or unchanged? Why?

**Question 5 (15 points):**

We are in 1999. A large forest product manufacturer has outstanding two Baa-rated, $150 million par amount, intermediate-term debt issues:

<table>
<thead>
<tr>
<th></th>
<th>10.10% Notes</th>
<th>Floating-Rate Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maturity</td>
<td>2003</td>
<td>2000</td>
</tr>
<tr>
<td>Issue date</td>
<td>6-12-93</td>
<td>9-27-92</td>
</tr>
<tr>
<td>Callable (beginning on)</td>
<td>6-15-99</td>
<td>10-01-97</td>
</tr>
<tr>
<td>Callable at</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Sinking fund</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Current coupon</td>
<td>10.10%</td>
<td>9.9%</td>
</tr>
<tr>
<td>Coupon changes</td>
<td>Fixed</td>
<td>Every 6 months</td>
</tr>
<tr>
<td>Rate adjusts to</td>
<td>-</td>
<td>6-month T-bill rate + 1%</td>
</tr>
<tr>
<td>Range since issued</td>
<td>-</td>
<td>12.9%-8.3%</td>
</tr>
<tr>
<td>Current price</td>
<td>73 3/8</td>
<td>97</td>
</tr>
<tr>
<td>Current yield</td>
<td>13.77%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Yield to maturity</td>
<td>15.87%</td>
<td>-</td>
</tr>
<tr>
<td>Price range since issue</td>
<td>100-72</td>
<td>102-93</td>
</tr>
</tbody>
</table>

Given the data above:

(a) What is the minimum coupon rate (of interest) at which the firm could sell a fixed-rate issue at par due in 2003. Assume the same indenture provisions as the 10.10% notes and disregard any tax considerations.

(b) Give two reasons why the floating-rate notes are not selling at par.

(c) Is the risk of call high, moderate, or low for the fixed-rate issue? Why?

(d) Does it make sense to compute the yield to maturity for the floating-rate note? Why or why not?
Question 6 (20 points):

The current yield curve for default-free-zero-coupon bonds is as follows:

<table>
<thead>
<tr>
<th>Maturity (years)</th>
<th>YTM</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>10%</td>
</tr>
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</tr>
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<td>12%</td>
</tr>
</tbody>
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(a) What are the implied one-year forward rates?
(b) Assume that the (pure) expectations hypothesis of the term structure is correct. If market expectations are accurate, what will the pure yield curve, that is, the yields to maturity on one- and two-year zero-coupon bonds, be next year?
(c) If you purchase a two-year zero-coupon bond now, what is the expected total rate of return over the next year? What if you purchased a three-year zero coupon bond? Ignore taxes. (Hint: compute the current and expected future prices).
(d) What should be the current price of a three-year maturity bond with a 12% coupon rate paid annually? If you purchased it at that price, what would your total expected rate of return be over the next year (coupon plus price change)? Ignore taxes.
Question 1:

A bill has a bank discount yield of 6.81% based upon the asked price, and 6.90% based upon the bid price. The maturity of the bill (already accounting for skip-day settlement) is 60 days.

(a) Find the bid and asked prices of the bill.
(b) Calculate the bond equivalent yield of the bill as well as its effective annual yield based upon the asked price. Confirm that these yields exceed the discount yield.

Answer:

This is question 4 in PS#1

(a) \( P = 10,000 \left[1 - r_{BD} \left(\frac{n}{360}\right)\right] \), where \( r_{BD} \) stands for the discount yield. Thus,

\[
P_{\text{ask}} = 10,000 \left[1 - 0.0681 \left(\frac{60}{360}\right)\right] = $9,886.50
\]

\[
P_{\text{bid}} = 10,000 \left[1 - 0.0690 \left(\frac{60}{360}\right)\right] = $9,885.00
\]

(b) \( r_{\text{BEY}} = \left[\frac{10,000 - P}{P}\right] \left(\frac{365}{n}\right) \). Thus,

\[
r_{\text{BEY}} = \left[\frac{10,000 - 9,886.50}{9,886.50}\right] \left(\frac{365}{60}\right) = 6.98\%, \text{ which exceeds the discount yield of 6.81\%.}
\]

In order to obtain the effective annual yield, \( r_{\text{EAY}} \), you should note that the 60-day growth factor for invested funds is \( \frac{10,000}{9,886.50} = 1.01148 \). Annualizing this growth rate will result in:

\[
(1 + r_{\text{EAY}}) = (1.01148)^{\left(\frac{365}{60}\right)} = 1.0719, \text{ which in turns gives } r_{\text{EAY}} = 7.19\%.
\]

Question 2:

You have borrowed $20,000 on margin to buy shares in Disney, which is now selling at $80 per share. Your account starts at the initial margin requirement of 50%. The maintenance margin is 35%. Two days later, the stock price falls to $75 per share.

(a) Will you receive a margin call?
(b) How low can the price of Disney shares fall before you receive a margin call?

Answer:

(a) You will not receive a margin call. You borrowed $20,000 and with another $20,000 of your own equity, you bought 500 shares of Disney at $80 a share for a total investment of $40,000. At $75 a share, the market value of the account is $37,500, your equity is $17,500, and the percentage margin is 47%, which is above the required percentage maintenance margin of 35%.

(b) A margin call will be issued when:

\[
P = \frac{500P - 20,000}{500P} = 0.35, \text{ that is when } P = $61.54.
\]
**Question 3 (5 points):**

On January 10, you sold short one round lot (i.e., 100 shares) of Netscape stock at $14 per share. On March 10, a quarterly dividend of $2 per share was paid by Netscape. On April 10, you covered the short sale by buying the stock at a price of $9 per share. Assume that you paid 50 cents per share in commissions for each transaction. What is the value of your account on April 10? Explain briefly.

**Solution:**

Account balance (without considering interest rate in the period):

- January 10: Short sell of 100 shares: $1,400
- January 10: Transaction cost on the short sale: ($50)
- March 10: Dividend payment: ($200)
- March 10: Transaction cost on dividend payment: ($50)
- April 10: Purchase of 100 shares: ($900)
- April 10: Transaction cost on the stock purchase: ($50)

<table>
<thead>
<tr>
<th>Date</th>
<th>Transaction Description</th>
<th>Amount</th>
</tr>
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<tbody>
<tr>
<td>January 10</td>
<td>Short sell of 100 shares</td>
<td>$1,400</td>
</tr>
<tr>
<td>January 10</td>
<td>Transaction cost on short sale</td>
<td>($50)</td>
</tr>
<tr>
<td>March 10</td>
<td>Dividend payment</td>
<td>($200)</td>
</tr>
<tr>
<td>March 10</td>
<td>Transaction cost on dividend payment</td>
<td>($50)</td>
</tr>
<tr>
<td>April 10</td>
<td>Purchase of 100 shares</td>
<td>($900)</td>
</tr>
<tr>
<td>April 10</td>
<td>Transaction cost on the stock purchase</td>
<td>($50)</td>
</tr>
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April 10: Net Account Value: $150

**Question 4:**

Consider a bond with a 10% coupon rate and with yield to maturity equal to 8%. If the bond’s yield to maturity remains constant, then in one year will the bond price be higher, lower, or unchanged? Why?

**Answer:**

The bond price will be lower. As time passes, the bond price, which now must be above par value, will approach par.

**Question 5:**

We are in 1999. A large forest product manufacturer has outstanding two Baa-rated, $150 million par amount, intermediate-term debt issues:

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Given the data above:

(a) What is the minimum coupon rate (of interest) at which the firm could sell a fixed-rate issue at par due in 2003? Assume the same indenture provisions as the 10.10% notes and disregard any tax considerations.
(b) Give two reasons why the floating-rate notes are not selling at par.
(c) Is the risk of call high, moderate, or low for the fixed-rate issue? Why?
(d) Does it make sense to compute the yield to maturity for the floating-rate note? Why or why not?

**Answer.**

(a) The minimum coupon rate would be 15.87% -- that is, the yield to maturity of the current outstanding Fixed Rate Issue.

(b) Floating Rate Notes may not sell at par for any of the following reasons:
- The yield spread between 6-month Treasury bills and other money market instruments of comparable maturity could be wider than when the bond was issued;
- The credit standing of Georgia-Pacific may have eroded relative to Treasury securities, which have no credit risk. Therefore, the 1% premium (over T-bills) would become insufficient to sustain the issue at par;
- The coupon increases are implemented with a lag, that is, once every six months. During a period of rising interest rates, even this brief lag will be reflected in the security price.

(c) The risk of call is low. Intermediate-term interest rates would have to decline by more than a third (15.87% to 10.10%) by June 15, 1999 to make call of the Fixed Rate Issue attractive.

(d) The concept makes little sense for floating-rate notes. The yield to maturity incorporates the return from a fixed stream of coupon interest payments and the accretion (i.e., the accumulation) of depreciation between the present price of the bond and its par value to be received at maturity. Because the Floating Rate Note consists of a variable stream of interest payments to maturity, the effective maturity for comparative purposes with other debt securities is closer to next coupon reset date than the final maturity date. Therefore, yield-to-maturity is an indeterminable calculation for a Floating Rate Note, whereas “yield-to-recoupon date” is a more meaningful measure of total return.
**Question 6:**

The current yield curve for default-free-zero-coupon bonds is as follows:

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(a) What are the implied one-year forward rates?

(b) Assume that the pure expectations hypothesis of the term structure is correct. If market expectations are accurate, what will the pure yield curve, that is, the yields to maturity on one- and two-year zero coupon bonds, be next year?

(c) If you purchase a two-year zero-coupon bond now, what is the expected total rate of return over the next year? What if you purchased a three-year zero coupon bond? Ignore taxes. (Hint: compute the current and expected future prices).

(d) What should be the current price of a three-year maturity bond with a 12% coupon rate paid annually? If you purchased it at that price, what would your total expected rate of return be over the next year (coupon plus price change)? Ignore taxes.

**Answer:**

(a) We obtain forward rates from the following table:

<table>
<thead>
<tr>
<th>Maturity (years)</th>
<th>YTM</th>
<th>Price</th>
<th>Forward Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10%</td>
<td>$909.09</td>
<td>N-A (short rate = 10%)</td>
</tr>
<tr>
<td>2</td>
<td>11%</td>
<td>$811.62</td>
<td>12.01%</td>
</tr>
<tr>
<td>3</td>
<td>12%</td>
<td>$711.78</td>
<td>14.03%</td>
</tr>
</tbody>
</table>

(b) If the expectations hypothesis holds, then forward rates = expected future short rates. We obtain next year’s prices and yields by discounting each zero’s face value at the forward rates for next year that we derived in item (a):

<table>
<thead>
<tr>
<th>Maturity (years)</th>
<th>Price</th>
<th>YTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$892.78 [= 1000/1.1201]</td>
<td>12.01%</td>
</tr>
<tr>
<td>2</td>
<td>$782.93 [= 1000/(1.1201 x 1.1403)]</td>
<td>13.02%</td>
</tr>
</tbody>
</table>

Note that this year’s upward sloping yield curve implies, according to the expectations hypothesis, a shift upward in next year’s curve.
(c) The 2-year zero will be a 1-year zero next year, and will therefore sell at \( \frac{1000}{1.1201} = 892.78 \). Similarly, the current 3-year zero will be a 2-year zero and will sell for $782.93. The expected total rates of returns are:

- 2-year bond = \( \frac{892.78}{811.62} - 1 = 10\% \)
- 3-year bond = \( \frac{782.93}{711.78} - 1 = 10\% \)

(d) The current price of the bond should equal the value of each payment times appropriate discount factor (i.e., the present value of $1 to be received at the "maturity" of that payment). The present value schedule can be taken directly from the prices of zero-coupon bonds calculated above, such that

\[
\text{Current price} = 120 \times (0.90909) + 120 \times (0.81162) + 1,120 \times (0.71178)
\]
\[
= 109.09 + 97.39 + 797.19
\]
\[
= 1,003.68
\]

Similarly, the expected prices of zeros in 1 year can be used to calculate the expected bond value at that time:

- Expected price 1 year from now = \( 120 \times (0.89278) + 1,120 \times (0.78293) \)
  \[
  = 107.1336 + 876.8816
  \]
  \[
  = 984.02
  \]

- Total expected rate of return = \( \frac{[120 + (984.02 - 1,003.68)]}{1,003.68} \)
  \[
  = \frac{(120 - 19.64)}{1,003.68}
  \]
  \[
  = 10\%
  \]