

if coupon rate < YTM < par value

" > " > "
" = " = "

face value = future value / par

CHAPTERS 6: BONDS

Business Finance 3220

always need to line up different pds

The Limited Bond: Using the BA-II

- Face Value = \$350m
- Maturity = 30 years (see semi-annual payments below)
- YTM = 10.20% per year or 5.10% every six months (APR type of quotation)
- 6.95% Coupon Rate, paid semi-annually
 - That is, every six months interest equals N of 6.95% or 3.475%
 - Annual coupon payment of $350 \times 0.0695 = \$24.325m$ per year $\div 2$ to get per 6m
 - \$12.1625 million every six months.
 - If payments are semi-annual, then there will be $30 \times 2 = 60$ payments.
- REMEMBER: we MUST match up the time periods for N, I/Y and PMT.
- If the coupon payments are semi-annual, the N and the YTM (I/Y) we use must also be semi-annual.

YTM and coupon rate always expressed annually so need to put them in pmt terms

price of bond is PV of bond

The Limited Bond: Using the BA-II

- Pricing the entire issue: $N=30 \times 2=60$, $I/Y=10.2/2=5.1$, $PMT=24.325M/2=12.1625M$, $FV=350M$
- Using those inputs, the price of the entire issue should be: \$244,119,212.70

for one individual bond

- Pricing an individual bond: $N=60$, $I/Y=5.1$, $PMT=69.50/2=34.75$, $FV=1000$
- The price of an individual bond will be: \$697.48
- If the face value per bond is \$1000, and the face value of the entire issue is \$350,000,000, then there are 350,000 bonds.
- $350,000 \times \$697.48 = \$244,119,212.70$

shows counted higher e then earned

standard face value is 1000
exception corporate bond quotes \$100 per
priced below face value b/c coupon rate < YTM

The Limited Bond: Using the BA-II

- What if we had annual payments?
- Then $N=30$, $I/Y=10.2$, $PMT=69.50$.
- PV remains 1000
- Price = $PV = \$698.66$

→ not that big of diff but this one is larger

YTM is what market is demanding

Review Problem 1: BA-II

- What is the price (per \$1,000 face value) of a 5-year bond with a coupon rate of 7.5%, paid semi-annually and a YTM = 8.0%?
- Does it sell at par, a discount, or a premium?

$$n=10 \quad YTM = 8 \div 2 = 4$$

$$FV=1000 \quad pmt = \frac{0.075 \times 1000}{2}$$

$$PV=979.72$$

YTM and coupon rate are very close making smaller discount/price close to FV

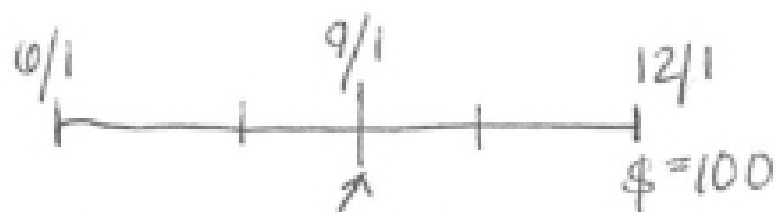
Review Problem 2: BA-II

- What is the price (per \$1,000 face value) of a 5-year bond with a coupon rate of 9.5%, paid annually and a YTM = 7.0%?
- Does it sell at par, a discount or a premium?

$$n=5 \quad FV=1000 \quad pmt = .095 \times 1000 \quad YTM = 7$$

$$PV=1100$$

if I/y goes up then prices will go down
- discount rates go down its discounting at lower rate making PV higher
- rates and prices move opposite directions



high yield junk spec
 BA ↓ BBB ↑
 (below line = junk)
 10/1/2012

if want to sell bond here will have pay ~~100~~ $\frac{100}{2}$ because held for 3 months / he held for 3 months therefore when sell each get their 50

if buying id selling between coupon dates which leads accrued int.

Clean vs. Dirty Prices / Accrued Interest

- Clean price: quoted price
- Dirty price: price actually paid = quoted price plus accrued interest
- Example: Consider \$100,000 par of a corporate bond, assume today is July 15, 2005 and interest is paid on 5/15 and 11/15. 8% coupon rate, paid semi-annually.
 - Price quote is 128.08 → in terms of 100 par value (between 5/15 and 11/15)
 - Number of days since last coupon = 61
 - Number of days in the coupon period = 184
 - Accrued interest = $(61/184)(.04 \times 100,000) = 1326.09$
- Prices (based on the asking price):
 - Clean price = $128.08 \times 100 = 128,080$ per 1000 value @ par
 - Dirty price = $128,080 + 1,326.09 = 129,406.09$
- So, you would actually pay \$129,406.09 for the bond

Chapter 6, Problem 20 sell a premium

- Suppose you purchase a ten-year bond with 5% annual coupons. You hold the bond for four years, and sell it immediately after receiving the fourth coupon. If the bond's yield to maturity was 5% when you purchased and sold the bond....
- A. What cash flows will you pay and receive from your investment in the bond per \$100 face value?
- B. What is the rate of return on your investment?

Timeline: 0, 1, 2, 3, 4. Cash flows: 6, 6, 6, 6, 106. $N=10$, $pmt=6$, $FV=100$, $I/Y=5$. $cmpt PV = 107.72$. $+X$ at year 4.

hold pd = 4
 $n=4$
 $PV = 107.72$
 $pmt = 6$
 $FV = 105.08$
 $cmpt I/Y = 5\%$
 when bought sold bond YTM was 5% so rate of return earned equals YTM
 A very uncommon rates char

$\frac{8\%}{2} = 4\% \times 100,000 = 4000 (\frac{61}{184})$
 Accrued int = 1326.09

X will be price sell bond at in yr 4
 $N=6$, $I/Y=5$, $FV=100$, $pmt=6$
 $cmpt PV = 105.08$

count initially and to go up in the over time
 describe graph
 $FV=1000$
 $n=25$
 $mt=0$
 $I/Y=7\%$

Chapter 6, Problem 23 zero coupon = no int rate

- Suppose you purchase a 30-year, zero-coupon bond with a yield to maturity of 6%. You hold the bond for five years before selling it.
- A. If the bond's yield to maturity is 6% when you sell it, what is the rate of return of your investment? 6%
- B. If the bond's yield to maturity is 7% when you sell it, what is the rate of return of your investment?
- C. If the bond's yield to maturity is 5% when you sell it, what is the rate of return of your investment?

Timeline: 0, 5, 30. -174.11 at 0, 184.25 at 5. $if make 295.30$, $I/Y = 11.14\%$

Chapter 6, Problem 26

- HMK Enterprises would like to raise \$10 million to invest in capital expenditures. The company plans to issue five-year bonds with a face value of \$1000 and a coupon rate of 6.5% (annual payments). Here are the YTM for five-year bonds of the following credit ratings: AAA: 6.2%, AA: 6.3%, A: 6.5%, BBB: 6.7%, BB: 7.5%
- A. Assuming the bonds will be rated AA, what will their price be? 1008.36
- B. How many bonds will they have to issue to raise \$10M? (round) $9918 \rightarrow 10000000$
- C. What must the rating of the bonds be for them to sell at par? 6.5%
- D. Suppose that when the bonds are issued, the price of each bond is \$959.54. What is the likely rating of the bonds? Are they junk bonds? $I/Y = 7.5\%$

in B int rate ↑ which put ↓ pressure on bond
 in C int rate ↓ which put ↑ pressure on bond
 in zero coupon P still comes up a little bit

Extra Problem: YTM and its components

- Bond P is a premium bond with a 12 percent coupon. Bond D is a 6 percent coupon bond currently selling at a discount. Both bonds have annual payments, have a YTM of 9 percent, and have five years to maturity.
- If the "Current Yield" is defined as (annual coupon)/price, what is the current yield for bonds P and D?
- If the "Capital Gains Yield" is defined by $(P_1 - P_0)/P_0$, then what is the expected capital gains yield for bonds P and D?

$N=5$, $I/Y=9$, $FV=1000$, $pmt_P=120$, $PV=1116.69$, $pmt_D=60$, $PV=883.31$

Extra Problem: bond with odd cash flows

- A bond has a face value of \$20,000 and matures in 20 years. The bond makes no payments for the first six years, then pays \$1,100 every six months over the subsequent 8 years, and finally pays \$1,400 every six months over the last six years.
- If the required return on this bond is 7% compounded semiannually, what is the current price of the bond?

Timeline: 0, 6, 14, 20. Cash flows: 0, 1100, 1400.

capital gains yellow how much gain / lose over time of bond
 $CY = \frac{\text{coupon}}{\text{price}}$, $CGY = \frac{P_1 - P_0}{P_0}$

$CY + CGY = YTM$
 $+ X = 9$
 $D: \frac{883.31}{60} = 6.79 + 2.21 = 9$

on last page get pmt and maturity.
 $CF_0 = 0$
 $CF_1 = 0$, $CF_2 = 12$
 $CF_3 = 1100$, $CF_4 = 16$
 $CF_5 = 1400$, $CF_6 = 12$
 $+ 20000 = 214000$ 40 pds