

LECTURE 2

Bond Prices, Yields and Portfolio Management (Chapters 10 & 11)

Bond Basics - Money Terms:

- Amount
 - Face Value / Par Value (\$1,000)
 - Market Value quoted as a % of Par or the Face Value (priced at 98 or 98% of \$1,000 = \$980).
- Coupon Rate (Interest Rate) or Coupon Payment
 - Semi Annual Payments (interest payments) – 8.0% or \$40 payment every 6 months
 - J&J (Jan & July)
 - F&A (Feb & Aug)
 - M&S (Mar & Sep)
 - A&O (April & Oct)
 - M&N (May & Nov)
 - J&D (June & Dec)
 - Or J&J 15 means paid on the 15th of January and July.
 - Accrued Interest
 - Interest due on the bond sold between coupon dates
 - Municipal/Corporate Bonds on 30/360 basis and T+3days
 - Treasury Bonds on actual days/365 days and T+1 day
 - Accrued days calculated between last Coupon Day and Settlement Day

Example:

8% F&A 15 Corporate Bond - Par Value = \$1,000

Coupon = 8% therefore bond payment is \$80 per year in \$40 every 6 months

Purchased: Monday, November 1st.

The Bid Price = 98:07 or 98 and 7/32 or 98.21875 % or MV = \$982.19

If 98:07 + it means 98 + 7/32 + 1/64

8/15 → 11/1 → 11/4 → 2/15

The purchase price = \$982.19 + \$3.73 = \$985.92 (Invoice Price)

Based on 30/360 basis:

Aug: 15 days + Sep: 30 days + Oct: 30 days + Nov: 3 days* = 79 days

*3 days is calculated Nov 1 purchased to Nov 4 settlement.

Accrued interest = 79/360 * \$80 = \$17.56

Invoice Price = Purch. Price + Accrued Int = \$982.19 + \$17.56 = \$999.75

- Bond Maturity Terminology
 - Term Bond (0,0,0,0, 100) or Bullet maturity
 - Serial Bond (20,20,20,20,20)
 - Balloon Bond (10,10,10,10,60)

- Bond Redemption Features
 - Refunding Debt
 - Call protection
 - Put Feature
 - Sinking Fund

- External Ratings

	S&P	Moody's
Risk Free →	AAA	Aaa
INVESTMENT GRADE	AA+	Aa1
	AA	Aa2
	AA-	Aa3
	A+	A1
	A	A2
	A-	A3
	BBB+	Baa1
BBB	Baa2	
BBB-	Baa3	
NON-INVESTMENT GRADE	BB+	Ba1
	BB	Ba2
	BB-	Ba3
	B+	B1
	B	B2
DISTRESS	B-	B3
	CCC+	Caa1
	CCC	Caa2
	CCC-	Caa3
	CC	Ca
Defaulted →	C	C
	D	C

} NOTCHES

Types of Bonds:

- Treasury Bonds (10-30yr) & Notes (10 yr)
- Corporate Bonds
 - Call Provisions – Call Price / Call Protection
 - Convertible Bonds – option to convert to common stock
 - Conversion Ratio – number of shares for each bond

Example:

Bond Par Value = \$1,000

Convertible ratio = Par Value / Conversion Price = 40 shares

At Current Stock = \$20 per share so the option to convert is no profitable (\$20 x 40 = \$800 or *Market Conversion Value*)

At Current Stock = \$30 per share so the option to convert is profitable (\$30 x 40 = \$1,200 or *Market Conversion Value*)

- Conversion Parity is the point at which neither a profit nor loss is made at conversion –
 - Parity Price of the Stock = MV of Bond / Conversion Ratio
 - Parity Price of the Bond = MV of Stock x Conversion Ratio
- Conversion Premium is the excess of the bond price over its conversion value. If the bond were selling currently \$950, the stock is \$20 then its premium would be \$150 (\$950 – \$800)

- Zero Coupon Bonds
- Puttable Bonds (option to the bond holders to put the bonds to the Issuer)
- Floating-rate Bonds – T + 2.0%
- PIK Bonds (Paid-in-Kind)

- Preferred Stock (Dividends – Waterfall ahead of the Common Stock)
- Other Domestic Bonds (Municipal, local governments, Tax exempt)
- International Bonds
 - Foreign Bonds
 - Eurobonds (Issued in the currency of one country but sold in other national market) – Eurodollar – dollar-denominated bonds sold outside the U.S.
 - Yankee Bonds (foreign bonds sold in the US)
 - Samurai Bonds (Yen-denominated bonds sold in Japan by non-Japanese issuers)
 - Bulldog Bonds (British Pound-denominated foreign bonds sold in the U.K.)

Bond Yields and Pricing

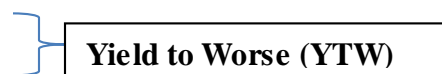
Definitions:

Nominal Yield = Coupon Rate

Current Yield = Coupon Payment / Market Value

Yield to Maturity (YTM)

Yield to Call (YTC)



Bond Value = PV of Coupons + PV of Par Value at Maturity

$$\text{Bond Value} = \sum (\text{Coupon Pmt} / (1 + r)^t) + (\text{Par Value} / (1 + r)^T)$$

Where,

Maturity Date = T – (using PV Factor tables)

Discount Rate = r

Years (t) – (using Annuity Factor tables)

$$\text{Coupon} \times (1/r) [1 - (1 / ((1+r)^T))] + \text{Par Value} \times (1 / ((1+r)^T))$$

or

$$\text{Coupon} \times \text{Annuity Factor} (r, T) + \text{Par Value} \times \text{PV Factor} (r, T)$$

Table:

Example

Par Value: \$1,000

Coupon: 8.0% (4% or \$40 coupon payment every six months)

Maturity: 30 years (60 payments)

$$\text{Price} = \sum [\$40 / (1.04)^t] + [1000 / (1.04)^{60}]$$

$$\text{Price} = \$40 \times \text{Annual Factor} (4\%, 60) + \$1000 \times \text{PV Factor} (4\%, 60)$$

$$\text{Price} = \$ 904.94 + 95.06 = \$1,000$$

If the interest rates will rise to 10%

1	B	C	D	E	F	G	H
2	BOND PRICING						
3							
4	Par/Face Value	\$ 1,000.00		Semi-Annual Coupon =		4.00%	
5	Coupon % =	8.00%		Semi-Annual Payment =	\$	40.00	every 6 mnts
6	Maturity/Term =	30 yrs		Semi-Annual # Payments =		60	pmts
7							
8	Present Value of Coupon Pmts=			\$904.94	=PV(B4/2,G5,-G4)		
9	Present Value of Principal Pmt=			\$95.06	=PV(B4/2,G5,0,-B3,0)		
10	Total			<u>\$1,000.00</u>			

11	11	B	C	D	E
12	Net Present Value		\$904.94	\$95.06	\$1,000.00
13			=NPV(\$B\$4/2,C16:C75)		
14		Long-Form			
15		Period	Coupon Payment	Principal Payment	Total Payment
16		0			\$ (1,000.00)
17		1	\$ 40.00	\$ -	\$ 40.00
18		2	\$ 40.00	\$ -	\$ 40.00
19		3	\$ 40.00	\$ -	\$ 40.00
20		4	\$ 40.00	\$ -	\$ 40.00
21		5	\$ 40.00	\$ -	\$ 40.00
22		6	\$ 40.00	\$ -	\$ 40.00
23		7	\$ 40.00	\$ -	\$ 40.00
24		8	\$ 40.00	\$ -	\$ 40.00
25		9	\$ 40.00	\$ -	\$ 40.00
26		10	\$ 40.00	\$ -	\$ 40.00
27		11	\$ 40.00	\$ -	\$ 40.00
28		12	\$ 40.00	\$ -	\$ 40.00
29		13	\$ 40.00	\$ -	\$ 40.00
30		14	\$ 40.00	\$ -	\$ 40.00
31		15	\$ 40.00	\$ -	\$ 40.00
32		16	\$ 40.00	\$ -	\$ 40.00
33		17	\$ 40.00	\$ -	\$ 40.00
34		18	\$ 40.00	\$ -	\$ 40.00
35		19	\$ 40.00	\$ -	\$ 40.00
36		20	\$ 40.00	\$ -	\$ 40.00
37		21	\$ 40.00	\$ -	\$ 40.00
38		22	\$ 40.00	\$ -	\$ 40.00
39		23	\$ 40.00	\$ -	\$ 40.00
40		24	\$ 40.00	\$ -	\$ 40.00
41		25	\$ 40.00	\$ -	\$ 40.00
42		26	\$ 40.00	\$ -	\$ 40.00
43		27	\$ 40.00	\$ -	\$ 40.00
44		28	\$ 40.00	\$ -	\$ 40.00
45		29	\$ 40.00	\$ -	\$ 40.00
46		30	\$ 40.00	\$ -	\$ 40.00
47		31	\$ 40.00	\$ -	\$ 40.00
48		32	\$ 40.00	\$ -	\$ 40.00
49		33	\$ 40.00	\$ -	\$ 40.00
50		34	\$ 40.00	\$ -	\$ 40.00
51		35	\$ 40.00	\$ -	\$ 40.00
52		36	\$ 40.00	\$ -	\$ 40.00
53		37	\$ 40.00	\$ -	\$ 40.00
54		38	\$ 40.00	\$ -	\$ 40.00
55		39	\$ 40.00	\$ -	\$ 40.00
56		40	\$ 40.00	\$ -	\$ 40.00
57		41	\$ 40.00	\$ -	\$ 40.00
58		42	\$ 40.00	\$ -	\$ 40.00
59		43	\$ 40.00	\$ -	\$ 40.00
60		44	\$ 40.00	\$ -	\$ 40.00
61		45	\$ 40.00	\$ -	\$ 40.00
62		46	\$ 40.00	\$ -	\$ 40.00
63		47	\$ 40.00	\$ -	\$ 40.00
64		48	\$ 40.00	\$ -	\$ 40.00
65		49	\$ 40.00	\$ -	\$ 40.00
66		50	\$ 40.00	\$ -	\$ 40.00
67		51	\$ 40.00	\$ -	\$ 40.00
68		52	\$ 40.00	\$ -	\$ 40.00
69		53	\$ 40.00	\$ -	\$ 40.00
70		54	\$ 40.00	\$ -	\$ 40.00
71		55	\$ 40.00	\$ -	\$ 40.00
72		56	\$ 40.00	\$ -	\$ 40.00
73		57	\$ 40.00	\$ -	\$ 40.00
74		58	\$ 40.00	\$ -	\$ 40.00
75		59	\$ 40.00	\$ -	\$ 40.00
76		60	\$ 40.00	\$ 1,000.00	\$ 1,040.00
77		IRR =			4.00%

Valuing the Bonds

1	K	L	M	N	O	P
2	VALUING BONDS					
3						
4	Settlement Date=		1/15/2007			
5	Maturity Date=		1/15/2011			
6	Coupon Rate=		4.250%			
7	Yield to Maturity=		4.740%			
8	Redemption value %=		100			
9	Coupon Pmts per year=		2			
10						
11	Flat Price (% Par)		98.234	=PRICE(M4,M5,M6,M7,M8,M9)		
12	Day since last coupon=		0	=COUPDAYBS(M4,M5,2,1)		
13	Days in coupon period=		181	=COUPDAYS(M4,M5,2,1)		
14	Accrued Interest=		0	=(M12/M13)*M6*100/2		
15	Invoice Price=		98.234	=+M11+M14		
16						
17						
18	Settlement Date=		2/15/2007			
19	Maturity Date=		1/15/2011			
20	Coupon Rate=		4.250%			
21	Yield to Maturity=		4.740%			
22	Redemption value %=		100			
23	Coupon Pmts per year=		2			
24						
25	Flat Price (% Par)		98.264			
26	Day since last coupon=		31			
27	Days in coupon period=		181			
28	Accrued Interest=		0.36395028			
29	Invoice Price=		98.628			
30						

Yield to Maturity

81	B	C	D	E	F	G	H
82	YIELD TO MATURITY						
83							
84	Settlement Date=		1/1/2000				
85	Maturity Date=		1/1/2010				
86	Coupon Rate=		8.000%				
87	Bond Pricing=		110				
88	Redemption Value=		100				
89	Coupon pmts per yr=		2				
90							
91	Yield to Maturity=		6.617%	=YIELD(D84,D85,D86,D87,D88,D89)			
92							
93							

Long-Form				
Period	Coupon Payment	Principal Payment	Total Payment	
0			\$ (1,100.00)	
1	\$ 40.00	\$ -	\$ 40.00	
2	\$ 40.00	\$ -	\$ 40.00	
3	\$ 40.00	\$ -	\$ 40.00	
4	\$ 40.00	\$ -	\$ 40.00	
5	\$ 40.00	\$ -	\$ 40.00	
6	\$ 40.00	\$ -	\$ 40.00	
7	\$ 40.00	\$ -	\$ 40.00	
8	\$ 40.00	\$ -	\$ 40.00	
9	\$ 40.00	\$ -	\$ 40.00	
10	\$ 40.00	\$ -	\$ 40.00	
11	\$ 40.00	\$ -	\$ 40.00	
12	\$ 40.00	\$ -	\$ 40.00	
13	\$ 40.00	\$ -	\$ 40.00	
14	\$ 40.00	\$ -	\$ 40.00	
15	\$ 40.00	\$ -	\$ 40.00	
16	\$ 40.00	\$ -	\$ 40.00	
17	\$ 40.00	\$ -	\$ 40.00	
18	\$ 40.00	\$ -	\$ 40.00	
19	\$ 40.00	\$ -	\$ 40.00	
20	\$ 40.00	\$ 1,000.00	\$ 1,040.00	
IRR =			3.3085%	6.617%

81	K	L	M	N	O	P	Q
82	YIELD TO CALL Vs YIELD TO MATURITY						
83							
84			YTC			YTM	
85	Settlement Date=		1/1/2000			1/1/2000	
86	Maturity Date=		1/1/2010			1/1/2030	
87	Coupon Rate=		8.00%			8.00%	
88	Coupon Pmt =	\$	40.00			\$ 40.00	
89	Number of semiannual		20 periods			60 periods	
90	Call Provision		110.00			1,000.00	
91	Final Payment		1,100.00			1,000.00	
92	Price		1,150.00			1,150.00	
93							
94	YIELD =		<u>6.6434%</u>			<u>6.8192%</u>	
95							
96							
97							

→ =YIELD(M85,M86,M87,M92/10,M91/10,2)