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LECTURE 1 BOND PRICES, YIELDS AND INTEREST RATES

Bond Prices, Yields and Portfolio Management (Chapters 14 & 15)

Bond Basics – The Four (4) Money Terms

1. Amount/Principal

- 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.

2. Cost of Borrowing/ Interest rates:

- 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 15ht of January and July.
- o Accrued Interest and Quoted Bond Prices
 - 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:

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

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

 $8/15 \longrightarrow 11/1 \rightarrow 11/4 \longrightarrow 2/15$

The purchase price = \$982.19 + \$3.73 = \$985.92 (Invoice Price) Based on 30/360 basis:

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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 = Purchase Price + Accrued Interest = \$982.19 + \$17.56 = \$999.75

3. Maturity/Term and 4. Payments

- Bond Maturity Terminology
 - Term Bond (0,0,0,0, 100) or Bullet maturity (Most common)
 - 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

Types of Bonds:

- Treasury Bonds (10-30yr) & Notes (10 yr)
- Corporate Bonds
 - o Call Provisions on Corporate Bonds-Call Price / Call Protection
 - Convertible Bonds option to convert to common stock
 - <u>Conversion Ratio</u> 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*

- <u>Conversion Parity</u> is the point at which neither a profit nor loss is made at conversion
 - Parity Price of the Stock = MV of Bond / Conversion Ratio
 - \circ Parity Price of the Bond = MV of Stock x Conversion Ratio

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• <u>Conversion Premium</u> 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)

OTHER TYPES OF BONDS

- o Zero Coupon Bonds
- Puttable Bonds (option to the bond holders to put the bonds to the Issuer)
- \circ 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.)
- Other exotic bonds (Inverse Floaters, Asset-Backed Bonds, Catastrophe Bonds, Index Bonds)

Bond Yields

- Nominal Yield = Coupon Rate
- Current Yield = Coupon Payment / Market Value
- Yield to Maturity (YTM)
- Yield to Call (YTC) _____ Yield to Worse (YTW)

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

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

Where, Maturity Date = T - (using PV Factor tables)Discount Rate = r

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Years (t) – (using Annuity Factor tables)

Coupon x $(1/r) [1 - (1 / ((1+r)^T)]] + Par Value x (1 / ((1+r)^T)) or$ Coupon x Annuity Factor (r, T) + Par Value x 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)

 $Price = \Sigma [\$40 / (1.04) ^t] + [1000 / (1.04) ^60]$

Price = \$40 x Annual Factor (4%, 60) + \$1000 x PV Factor (4%, 60)

Price = \$ 904.94 + 95.06 = \$1,000

If the interest rates will rise to 10%

1	В	С	D	E	F		G	Н	
2	BOND PRICI	NG							
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	Semi-Annual	pmts					
7									
8	Present Value of Co	oupon Pmts=		\$904.94 =	=PV(B4/2,G5,-G	<i>34)</i>			
9	Present Value of Pri	incipal Pmt=		\$95.06 =PV(B4/2,G5,0,-B3,0)					
10	Total			\$1,000.00					

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11	11	в с			D			E	
12	Net Present Value		\$904.94		\$95.06		\$1,000.00		
13		=NPV(\$B\$4/2,C16:C75)							
14		Long-Form Coupon Principal							
15		Period		yment		/ment	Tot	al Payment	
16		0					\$	(1,000.00)	
17		1	\$	40.00	\$	-	\$	40.00	
18		2	\$	40.00	\$	-	\$	40.00	
19 20		3 4	\$	40.00	\$	-	\$	40.00	
20 21		5	\$ \$	40.00 40.00	\$ \$	-	\$ \$	40.00 40.00	
22		6	\$	40.00	\$	-	\$	40.00	
23	Ļ	7	\$	40.00	\$	-	\$	40.00	
24		8	\$	40.00	\$	-	\$	40.00	
25		9	\$	40.00	\$	-	\$	40.00	
26 27		10 11	\$ \$	40.00 40.00	\$ \$	-	\$ \$	40.00 40.00	
28		12	э \$	40.00	\$	-	э \$	40.00	
29		13	\$	40.00	\$	-	\$	40.00	
30		14	\$	40.00	\$	-	\$	40.00	
31		15	\$	40.00	\$	-	\$	40.00	
32 33		16 17	\$ \$	40.00 40.00	\$ \$	-	\$ \$	40.00	
33 34		17	э \$	40.00	э \$	-	э \$	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 40		23 24	\$ \$	40.00 40.00	\$ \$	-	\$ \$	40.00 40.00	
40		24	э \$	40.00	э \$	-	э \$	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 47		30 31	\$ \$	40.00 40.00	\$ \$	-	\$ \$	40.00 40.00	
48		32	э \$	40.00	\$	-	э \$	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 54		37 38	\$ \$	40.00 40.00	\$ \$	-	\$ \$	40.00 40.00	
55		39	э \$	40.00	\$	-	э \$	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 61		44 45	\$ \$	40.00 40.00	\$ \$	-	\$ \$	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 67		50 51	\$ \$	40.00 40.00	\$ \$	-	\$ \$	40.00 40.00	
67 68		51	э \$	40.00	э \$	-	э \$	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 74		57	\$ \$	40.00	\$	-	\$ ¢	40.00	
74 75		58 59	\$ \$	40.00 40.00	\$ \$	-	\$ \$	40.00 40.00	
76		60	э \$	40.00		,000.00	э \$	1,040.00	
77		IRR =	-		÷ .			4.00%	

Valuing the Bonds

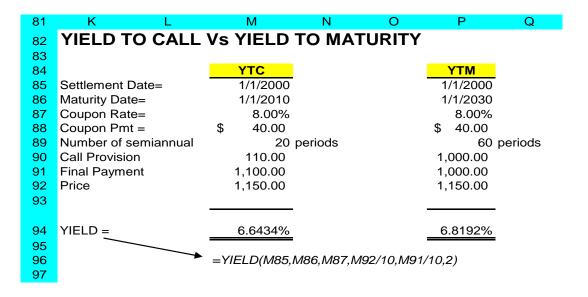
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1	K L	М	Ν	0	Р
2	VALUING BONDS	6			
3					
4	Settlement Date=	1/15/2007			
5	Maturity Date=	1/15/2011			
6	Coupon Rate=	4.250%			
7	Yield to Maturity=	4.740%			
8	Redemption value %=	100			
9	Coupon Pmts per year=	2			
10					
11	Flat Price (% Par)		•	14,M5,M6,M7	,
12	Day since last coupon=			YBS(M4,M5	,
13	Days in coupon period=			YS(<i>M4,M5,2</i>	2,1)
14	Accrued Interest=	0	=(M12/M1)	3)*M6*100/2	
15	Invoice Price=	00.004		1 /	
15		90.234	=+ <i>M</i> 11+ <i>M</i>	14	
10					
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					

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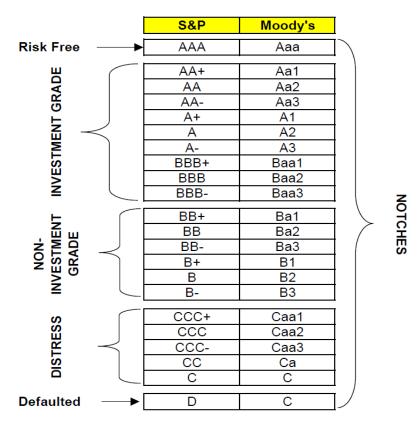
81 B C D E F G H 82 YIELD TO MATURITY 83 84 Settlement Date= $1/1/2000$ 85 Maturity Date= $1/1/2010$ 86 Coupon Rate= 8.000% 87 Bond Pricing= 110 88 Redemption Value= 100 90 Coupon pmts per yr= 2 91 Yield to Maturity= $6.617\% = YIELD(D84,D85,D86,D87,D88,D89)$ 92 93 Image: Set the se	Yield to Maturity											
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	116		<u>IRR =</u>						<u>3.3085%</u>	6.617%		



Professor Chris Droussiotis

Bond Risks

Ratings



- Credit Risk
- Interest Rate Risk
- Refinancing/Repayment Risk
- Liquidity Risk
- CDS/CDOs Hedging and Diversifying

Professor Chris Droussiotis

THE TERM STRUCTURE OF INTEREST RATES

Initial Concepts of Interest Rates and Timing:

- The pattern of Interest Rates
- The Yield Curve and Future Interest Rates
- \circ HPR / IRR
- Forward Rates (FRAs and IROs) Hedging the uncertainty

