Lecture #1

Introduction – Debt & Fixed Income

- BONDS
- LOANS (Corporate)

Chapter 1

BONDS:

Six sectors:

Fed, State, Local

- U.S. Treasury Sector
    - Issued by U.S. Government
    - T-Bills, Notes, Bonds
    - The largest issuer in the world
    - Key benchmark for interest rates around the world/asset classes
- Agency Sector
    - Issued by Government sponsored / affiliates
- Municipal Sector
    - Issued by State/Local Government
    - Tax-backed debt / Revenue sectors
    - Referred to as Tax exempt sector (federal income tax exempt)

- Corporate Sector
    - Issued by corporations (U.S. and non-U.S)
    - Bonds, Medium Term Notes, Structured Notes, CPs
    - Investment Grade / Non-Investment Grade (HY)

- Asset Backed Security Sector
    - Issued by corporations / investment intermediaries
        - CDOs/CLOs/CMBS
    - Backed by certain assets/investment pools

- Mortgage Sector
    - Issued by financial intermediaries

        - CMOs
    - Issued by government agencies
        - Ginnie Mae - GNMA (Gov. Nat. Mortgage Assoc.)
        - Fannie Mae / Freddie Mac
    - Backed by mortgage loans / pool of loans
    - Residential / Commercial mortgage
    - Prime/sub-prime

MONEY TERMS:

- Amount
- Coupon Rate / Interest Rate
- Call Provisions
- Maturity / Term
- Amortization

DEFINITIONS:

- The **issuer** is the entity (company or govt.) who borrows an amount of money (issuing the bond) and pays the interest.
- The **principal** of a bond - also known as maturity value, face value, par value - is the amount that the issuer borrows which must be repaid to the lender.
- The **coupon** (of a bond) is the interest that the issuer must pay.
- The **maturity** is the end of the bond, the date that the issuer must return the principal.
- The **issue** is another term for the bond itself.
- The **indenture** is the contract that states all of the terms of the bond

BOND RISKS:

- Interest Rate Risk
- Reinvestment Income / Reinvestment Risk (Call provisions)
- Credit Risk
- Inflation Risk
- Exchange-Rate Risk
- Liquidity Risk
- Volatility Risk
- Risk Risk (Risk of not knowing)

EXTERNAL RATING

	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
	B-	B3
DISTRESS	CCC+	Caa1
	CCC	Caa2
	CCC-	Caa3
	CC	Ca
	C	C
Defaulted	D	C

NOTCHES

CHAPTER 2

REVIEW: Time Value of Money

Future Value

$$P_n = P_o (1+r)^n$$

Example
P0 = $10,000,000 (initial investment)
r= 9.2% Interest rate (expected interest return)
n= 6 years (time)
Pn = Future value at n time

10,000,000 * (1 + .092) ^ 6 = $10,000,000 * (1.69565) = $16,956,500

Future Value of an ordinary Annuity

This formula gives the future value (FV) of an ordinary annuity (assuming compound interest):

$$P_n = A\ [\ (1+r)^n - 1\ /\ r\ ]$$

A = annuity income

Example
Purchase Bonds for $20,000,000 at 10% per year fixed income for 15 years (maturity) – assuming the payment is once a year:

If reinvestment the annual interest payments at 8.0%

Pn = $2,000,000 * [(1.08)^15 – 1] / 0.08 = $54,304,250

Present Value

$$P_0 = P_n\ [1/(1+r)^n]$$

r= .10
n=7
Pn = $5,000,000 (Future Value)

PV = $5,0000,000 * [1 / (1.10)^7] = 5,000,000 / (1.948717) = $2,565,791

Present Value when series of FVs

$$PV = \sum P_t\ /\ (1+r)^t$$

Example:
PV = $1,000
R=6.25%
Annual Cash Flows = $100

CF = yr 1: 100 , yr 2: 100, yr 3: 100, yr 4: 100, yr 5: 1,100

PV of each payment
[100 / (1+ 0.0625)^1] + [100 / (1 + 0.0625)^2] + ………..] = $1,156.89

Present Value of an Ordinary Annuity

Many financial arrangements stipulate structured payment schedules, which is to say payment of the same amount at regular time intervals. The term "annuity" is often used to refer to any such arrangement when discussing calculation of present value. The expressions for the present value of such payments are summations of geometric series.

$$PV = A * [(1- (1 / (1+r)^{n}))/r]$$

Annuity (A) = $100
r = 0.09 or 9.0%
n = 8

PV = 100 [(1 – (1/(1.09)^8)/0.09) = $553.48

Pricing a Bond:

- Expected Cash Flows (Coupon payments + principal
- Yield (price at discount or premium)
- Call provisions (YTM, YTC or YTW)

CHAPTER 3 – Calculating Yield

Money Terms:
- Amount
  - Face Value / Par Value ($1,000)
  - Market Value quoted as a % of Face Value (priced at 98 or 98% of $1,000)
- Coupon Payments / Coupon (Interest Rate)
  - ZERO COUPON PAYMENTS
  - Semi Annual Payments (interest payments)

- Accrued Interest
  - Accr. Int. = (Annual Coupon /2) x (Days since last Coupon pmt / Days Separating Coupon Pmts)

Example:
Par Value = $1,000
Coupon = 4.25% therefore bond payment is $42.50 per year in $21.25 every 6 months
The Bid Price = 98:07 or 98 and 7/32 or 98.21875 % or MV = $982.19
Bought it 32 days since the last coupon.

Accrued Interest pmt on the bond = $21.25 x (32/182) = $7.47.
The purchase price = $982.19 + $3.73 = $985.92 (Invoice Price)

Bond Pricing

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

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

Where,
Maturity Date = T – (using PV Factor tables)
Discount Rate = r
Years (t) – (using Annuity Factor tables)

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:

<u>Example (page 299 - 10.2)</u>

Par Value: $1,000
Coupon: 8.0% (4% or $40 coupon payment every six months)
Maturity: 30 years (60 payments)

Price = Σ [$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	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 # Paymants =		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			$1,000.00			

11	11	B	C	D	E
12	Net Present Value		$904.94	$95.06	$1,000.00
13			*=NPV(B4/2,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**					
94		**Period**	**Coupon Payment**	**Principal Payment**	**Total Payment**		
95		0			**$ (1,100.00)**		
96		1	$ 40.00	$ -	$ 40.00		
97		2	$ 40.00	$ -	$ 40.00		
98		3	$ 40.00	$ -	$ 40.00		
99		4	$ 40.00	$ -	$ 40.00		
100		5	$ 40.00	$ -	$ 40.00		
101		6	$ 40.00	$ -	$ 40.00		
102		7	$ 40.00	$ -	$ 40.00		
103		8	$ 40.00	$ -	$ 40.00		
104		9	$ 40.00	$ -	$ 40.00		
105		10	$ 40.00	$ -	$ 40.00		
106		11	$ 40.00	$ -	$ 40.00		
107		12	$ 40.00	$ -	$ 40.00		
108		13	$ 40.00	$ -	$ 40.00		
109		14	$ 40.00	$ -	$ 40.00		
110		15	$ 40.00	$ -	$ 40.00		
111		16	$ 40.00	$ -	$ 40.00		
112		17	$ 40.00	$ -	$ 40.00		
113		18	$ 40.00	$ -	$ 40.00		
114		19	$ 40.00	$ -	$ 40.00		
115		20	$ 40.00	$ 1,000.00	$ 1,040.00		
116		**IRR =**			**3.3085%**	6.617%	