Long-Term Fixed Income Basics

Corporate bonds (also applies to other types)

The Bond Indenture

- The bond indenture is a *three-party contract* between the bond issuer, the bondholders, and the trustee. The trustee is hired by the issuer to protect the bondholders' interests.
- The indenture includes
  - The basic terms of the bond issue
  - The total amount of bonds issued
  - A description of the security
  - The repayment arrangements
  - The call provisions
  - Details of the protective covenants

Bond ratings

		Investment-Quality Bond Ratings				Low-Quality, Speculative, and/or "Junk" Bond Ratings					
		High Grade		Medium Grade		Low Grade		Very Low Grade			
Standard & Poor's		AAA	AA	A	BBB	BB	B	CCC	CC	C	D
Moody's		Aaa	Aa	A	Baa	Ba	B	Caa	Ca	C	
Moody's	**S&P**										
Aaa	AAA	Debt rated Aaa and AAA has the highest rating. Capacity to pay interest and principal is extremely strong.									
Aa	AA	Debt rated Aa and AA has a very strong capacity to pay interest and repay principal. Together with the highest rating, this group comprises the high-grade bond class.									
A	A	Debt rated A has a strong capacity to pay interest and repay principal, although it is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than debt in high-rated categories.									
Baa	BBB	Debt rated Baa and BBB is regarded as having an adequate capacity to pay interest and repay principal. Whereas it normally exhibits adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal for debt in this category than in higher-rated categories. These bonds are medium-grade obligations.									
Ba; B Caa Ca C	BB; B CCC CC C	Debt rated in these categories is regarded, on balance, as predominantly speculative with respect to capacity to pay interest and repay principal in accordance with the terms of the obligation. BB and Ba indicate the lowest degree of speculation, and Ca, CC, and C the highest degree of speculation. Although such debt is likely to have some quality and protective characteristics, these are outweighed by large uncertainties or major risk exposures to adverse conditions. Issues rated C by Moody's are typically in default.									
	D	Debt rated D is in default, and payment of interest and/or repayment of principal is in arrears.									

Note: At times, both Moody's and S&P use adjustments (called notches) to these ratings. S&P uses plus and minus signs: A+ is the strongest A rating and A− the weakest. Moody's uses a 1, 2, or 3 designation, with 1 being the highest.

Credit rating factors

1) Coverage ratios – Times interest earned, Fixed charge coverage, etc.
2) Leverage – Debt/Equity ratio
3) Liquidity – Quick and Current ratios
4) Profitability
5) Cash flow to debt

Yield Spreads

- A bond's credit rating helps determine its yield spread.
- The yield spread is the extra return (increased yield to maturity) that investors demand for buying a bond with a lower credit rating (and higher risk).
- Yield spreads are often quoted in basis points over Treasury notes and bonds. That is:
  - Suppose we see a 5-year Aaa/AAA yield spread equal to 59. This means the YTM on this bond is 59 basis points (0.59%) greater than 5-year U.S. Treasury notes.

Factors Affecting a Bond Coupon Rate (or YTM)

- Bond Rating - Moody's and Standard & Poor's
- Maturity
- Seniority – who gets paid first
- Sinking fund – fund managed by a trustee for repayment (at maturity) or repurchase (on the open market or call) of bonds
- Call Provision – ability of the firm to buy back debt early
  - Deferred call – cannot be called for a specific time
  - Call premium – carries a price premium if called
  - Make whole call
- Protective covenants – list of permissible actions of the firm
  - Positive covenants – what a firm must do
    - maintain collateral in good condition
    - keep minimum level of working capital
    - keep audited financial statements
- - Negative covenants – what a firm cannot do
    - raise dividends
    - issue more debt
    - merge with another company
- Convertibility
- Putable – bondholder can extend the bond

Corporate bond quotes

TRACE – Trade Report and Compliance Engine – www.finra.org/marketdata

						Ratings			Last Sale	
Include in Watchlist	Bond Symbol	Issuer Name	Coupon	Maturity	Callable	Moody's	S&P	Fitch	Price	Yield
☐	DE.JZ	JOHN DEERE CAPITAL CORPORATION	5.40	10/17/2011	No	A2	A-	A-	103.920	4.158
☐	DE.KE	JOHN DEERE CAPITAL CORPORATION	5.35	01/17/2012	No	A2	A	NR	103.574	4.290
☐	DE.IP	JOHN DEERE CAPITAL CORPORATION	7.00	03/15/2012	No	A2	A	A	108.532	4.547
☐	DE.KG	JOHN DEERE CAPITAL CORPORATION	4.95	12/17/2012	No	A2	A	NR	99.000	5.196
☐	DE.IX	JOHN DEERE CAPITAL CORPORATION	5.10	01/15/2013	No	A2	A	A	104.390	4.057
☐	DE.KK	JOHN DEERE CAPITAL CORPORATION	4.50	04/03/2013	No	A2	A	NR	102.114	4.018
☐	DE.IO	DEERE & COMPANY	6.95	04/25/2014	No	A2	A	A	112.718	4.487

Most Active Investment Grade Bonds

Issuer Name	Symbol	Coupon	Maturity	Rating Moody's/S&P/Fitch	High	Low	Last	Change	Yield%
J P MORGAN CHASE & CO	JPM.JPF	6.000%	Jan 2018	Aa2/AA-/AA-	104.361	102.730	103.501	-0.023	5.526
MORGAN STANLEY	MS.GGO	6.625%	Apr 2018	Aa3/AA-/AA-	105.266	101.898	104.390	-0.388	6.028
SPRINT NEXTEL CORP	S.HM	6.000%	Dec 2016	Baa3/BB/BB+	84.500	83.500	84.000	0.000	8.690
ISTAR FINL INC	ISFI.GZ	5.950%	Oct 2013	Baa2/BBB/BBB	89.375	87.750	88.875	-1.625	8.556
WELLS FARGO & CO NEW	WFC.GDT	5.625%	Dec 2017	Aa1/AA+/AA	103.700	102.517	102.562	0.294	5.280
NUCOR CORP	NUE.GE	6.400%	Dec 2037	A1/A+/NR	101.060	100.819	100.819	-0.360	6.338
UNITED TECHNOLOGIES CORP	UTX.GJ	6.350%	Mar 2011	A2/A/A+	106.957	106.647	106.889	0.229	3.730
AT&T INC	T.KG	5.500%	Feb 2018	A2/A/A	102.550	99.500	99.864	0.029	5.517
AT&T INC	T.KE	4.950%	Jan 2013	A2/A/A	103.433	101.170	101.706	0.294	4.538
GOLDMAN SACHS GROUP INC	GS.YW	6.150%	Apr 2018	Aa3/AA-/AA-	105.677	101.160	104.407	4.657	5.563

Treasury Notes – 2-, 5-, and 10-year
Treasury Bonds – Over 10 years – Currently only 30 years

Treasury Notes and Bonds					
Maturity	Coupon	Bid	Asked	Chg	Asked Yield
8/31/2017	1.875	102.8828	102.9141	−0.1563	1.019
5/15/2018	3.875	110.3125	110.3750	−0.3125	1.317
2/28/2019	1.375	98.6953	98.7109	−0.3516	1.646
2/29/2020	1.250	95.7734	95.8203	−0.3750	1.996
8/15/2021	8.125	140.1328	140.1797	−0.5234	2.231
11/15/2022	1.625	92.1563	92.2031	−0.4063	2.635
8/15/2023	2.500	98.0703	98.1328	−0.4453	2.726
2/15/2024	2.750	99.6094	99.6719	−0.4844	2.788
2/15/2026	6.000	130.2813	130.3594	−0.6875	2.962
8/15/2026	6.750	138.7500	138.8281	−0.7266	2.989
2/15/2027	6.625	137.9219	138.0000	−0.7422	3.048
8/15/2027	6.375	135.6875	135.7656	−0.7422	3.100
8/15/2028	5.500	126.2891	126.3672	−0.7422	3.204
11/15/2028	5.250	123.3828	123.4609	−0.7031	3.230

TIPS – Treasury Inflation Protected Securities

For example, suppose an inflation-indexed note is issued with a coupon rate of 3.5 percent and an initial principal of $1,000. Six months later, the note will pay a coupon of $1,000 × 3.5%/2 = $17.50. Assuming 2 percent inflation over the six months since issuance, the note's principal is then increased to $1,000 × 102% = $1,020. Six months later, the note pays $1,020 × 3.5%/2 = $17.85, and its principal is again adjusted to compensate for recent inflation.

Taxes are paid on the increase in principal during the year in which it occurs

STRIPS – Separate Trading of Registered Interest and Principal Securities

Federal Agency – Fannie Mae, Freddie Mac, Federal Home Loan Bank, Sallie Mae, TVA, etc.

Mortgage and mortgage backed securities

Other securitized

Municipal – $5,000 face value

- General obligation *full faith and credit*

- Revenue *income from the proceeds of what is financed:*
  - *Airport and seaport bonds*
  - *College dormitory bonds*
  - *Industrial development*
  - *Multifamily housing*
  - *Highway and road gas tax*
  - *Student loan bonds*
  - *Stadium bonds*
- Hybrid bonds *revenue bond secured by additional credit guarantees*

- Municipal bonds are often insured

Exempt from Federal tax (maybe state and local tax as well)

$$\text{Equivalent taxable yield} = \frac{\text{Tax-exempt yield}}{\text{1-Marginal tax rate}}$$

$$\textit{Equivalent taxable yield} = \frac{.08}{1-.31} = .1159 \text{ or } 11.59\%$$

$$\text{Critical tax rate} = 1 - \frac{R_M}{R}$$

9% taxable, 7% muni

Critical tax rate = 1 – (.07 /.09) = .2222 or 22.22%

Below 22.22% - taxable bonds

Above 22.22% - muni bonds

CAT bonds

Floating rate

Reverse floaters

Pay-in-kind

Eurobond

Foreign bonds issued in single country and usually denominated in that country's currency

Yankee bonds – US
Samurai bonds – Japan
Rembrandt bonds – the Netherlands
Bulldog bonds – Great Britain

Bond pricing
Price
Par (face) value
Coupon rate (semiannual unless stated otherwise)
Maturity
Market rate (Yield to Maturity – TYM)

Bond pricing
Suppose we have the following bond:

Par = $1,000
Coupon rate = 8%
Maturity = 6 years
YTM = 10%

What is the price of the bond?

What if the YTM is 6%?

Bond fact:
If the YTM is greater than the coupon rate, the bond will sell at a discount (below par.) If the YTM is less than the coupon rate, the bond will sell at a premium (above par.)

Malkiel's bond price theorem #1:
There is an inverse relationship between interest rates and bond prices. If interest rates increase, bond prices decrease. If interest rates decrease, bond prices increase.

Malkiel's bond price theorem #2:
An increase in a bond's yield to maturity results in a smaller price change than a price decrease from an increase in the yield to maturity of the same magnitude.

Suppose we have the following bond:

Par = $1,000
Coupon rate = 8%
Maturity = 10 years
YTM = 8%

What is the price of the bond?

What if the YTM falls to 7%?

What if the YTM increases to 9%?

Malkiel's bond price theorem #3:
Interest rate risk is the risk that if interest rates increase, bond prices will decrease. All else the same, a longer term bond will have more interest rate risk than a shorter term bond.

Suppose we have the following two bonds:

Par = $1,000
Coupon rate = 7%
Maturity = 3 years
YTM = 7%

Par = $1,000
Coupon rate = 7%
Maturity = 25 years
YTM = 7%

What is the price of each bond?

Suppose interest rates fall to 6%. What will happen to the price of each bond? What is the new price of each bond?

1,000 FV
35 PMT
6 N
3 I/Y
CPT PV
$1,027.09

1,000 FV
35 PMT
50 N
3 I/Y
CPT PV
$1,128.65

Suppose interest rates increase to 8%. What will happen to the price of each bond? What is the new price of each bond?

1,000 FV
35 PMT
6 N
4 I/Y
CPT PV
$973.79

1,000 FV
35 PMT
50 N
4 I/Y
CPT PV
$892.59

Malkiel's bond price theorem #4:
The sensitivity of bond prices to changes in yields increases at a decreasing rate as maturity increases. In other words, interest rate risk is less than proportional to maturity.

Suppose we have the following bonds:

Par = $1,000	Par = $1,000	Par = $1,000
Coupon rate = 7%	Coupon rate = 7%	Coupon rate = 7%
Maturity = 2 years	Maturity = 12 years	Maturity = 22 years
YTM = 7%	YTM = 7%	YTM = 7%

What is the price of each bond? $1,000 of course, of course.

Suppose the YTM decreases to 6 percent. What is the price of each bond now?

1,000 FV	1,000 FV	1,000 FV
35 PMT	35 PMT	35 PMT
4 N	24 N	44 N
3 I/Y	3 I/Y	3 I/Y
CPT PV	CPT PV	CPT PV
$1,018.58	$1,084.68	$1,121.27

Notice, the difference in the price between the 2 year and 12 year bond is $66.10 and the difference in price between the 12 year and 22 year bond is only $36.59

Malkiel's bond price theorem #5:
All else the same, there is an inverse relationship between the coupon rate an interest rate risk. A bond with a lower coupon has more interest rate risk than a bond with a higher coupon.

Suppose we have the following two bonds:

Par = $1,000	Par = $1,000
Coupon rate = 3%	Coupon rate = 12%
Maturity = 25 years	Maturity = 25 years
YTM = 8%	YTM = 8%

What is the price of each bond?

1,000 FV	1,000 FV
15 PMT	60 PMT
50 N	50 N
4 I/Y	4 I/Y
CPT PV	CPT PV
$462.95	$1,429.64

Suppose the YTM changes to 6 percent. What is the price of each bond now?

1,000 FV	1,000 FV
15 PMT	60 PMT
50 N	50 N
3 I/Y	3 I/Y
CPT PV	CPT PV
$614.05	$1,771.89
%Δ = 32.64%	%Δ = 23.94%

Suppose the YTM changes to 10 percent. What is the price of each bond now?

1,000 FV	1,000 FV
15 PMT	60 PMT
50 N	50 N
5 I/Y	5 I/Y
CPT PV	CPT PV
$361.04	$1,182.56
%Δ = 22.01%	%Δ = 17.28%

Malkiel's bond price theorem #6:
The sensitivity of a bond's price to a change in its yield is inversely related to the yield to maturity at which the bond is currently selling. A low YTM will result in a greater interest rate sensitivity while a high YTM will result in a lower interest rate sensitivity.

Suppose we have the following two bonds:

Par = $1,000	Par = $1,000
Coupon rate = 8.5%	Coupon rate = 8.5%
Maturity = 20 years	Maturity = 20 years
YTM = 3%	YTM = 13%

What is the price of each bond?

1,000 FV	1,000 FV
42.50 PMT	42.50PMT
40 N	40 N
1.5 I/Y	6.5 I/Y
CPT PV	CPT PV
$1,822.69	$681.73

Suppose the YTM increases by 1% for each bond. What is the price of each bond now?

1,000 FV	1,000 FV
42.50 PMT	42.50 PMT
40 N	40 N
2 I/Y	7 I/Y
CPT PV	CPT PV
$1,615.50	$633.38
%Δ = –11.37%	%Δ = –7.09%

Notice, the bond with a higher initial YTM lost a lower percentage that the bond with a lower initial YTM.

Finding the YTM

Suppose we see a 7.5 percent coupon bond with 10 years to maturity selling for $934. Is the YTM above or below 7.5 percent? What is the YTM of the bond?

Zero coupon bonds

Suppose we have the following bond:

Par = $1,000
Coupon rate = 0%
Maturity = 15 years
YTM = 9%

What is the price of the bond?

Buying bonds

Settlement
- Treasury – next day
- Corporate – 3 days

Accrued interest

Day count conventions:
1) Actual/Actual (in period)
2) Actual/365
3) Actual/365 (366 in leap year)
4) Actual/360
5) 30/360
6) 30E/360

Market	Coupon payments	Day count	Ex-dividend Trading
U.S. Government	Semiannual	Actual/Actual (in period)	N
U.S. Corporate	Semiannual	30/360	N
U.S. Government Agency	Annual	30/360	N
	Semiannual		N
	Quarterly		N
U.S. Municipal	Semiannual	30/360	N
U.K. Government	Semiannual	Actual/365	N
Australian Government	Semiannual	Actual/Actual (in period)	Y
New Zealand Government	Semiannual	Actual/Actual (in period)	Y
Canadian Government	Semiannual	Actual/Actual (in period)	N
German Government	Annual	30E/360	Y
Swiss Government	Annual	30E/360	N
Dutch Government	Annual	30E/360	Y
Eurobond	Annual	30E/360	N
Italian Government	Annual	30E/360	N
French Government	Annual	Actual/Actual (in period)	N
Danish Government	Annual	30E/360	Y
Swedish Government	Annual	30E/360	Y
Spanish Government	Semiannual	Actual/Actual (in period)	N
Belgian Government	Annual	30E/360	N
Irish Government	Annual	Actual/365	Y
Austrian Government	Annual	30E/365	Y
Norwegian Government	Annual	Actual/365	Y

Notation:

Settlement: D1/M1/Y1
Maturity: D2/M2/Y2

30/360

If D1 = 31, change to 30
If D2 = 31 and D1 = 30 or 31, change D2 to 30, otherwise leave D2 at 31
# of days

$$(Y2 - Y1)\times 360 + (M2 - M1)\times 30 + (D2 - D1)$$

May 1 to May 30 = 29 days
May 1 to May 31 = 30 days

30E/360 – Assumes a 30-day month

If D1 = 31, change to 30
If D2 = 31 Change to 30
# of days

$$(Y2 - Y1)\times 360 + (M2 - M1)\times 30 + (D2 - D1)$$

May 1 to May 30 = 29 days
May 1 to May 31 = 29 days

Actual/Actual

U.S. Treasury bond settles July 17, next coupon Sept. 1

July 17 to July 31	14 days
August	31 days
September	1 day
Total	46 days

If this was Federal agency, corporate, or muni: 30/360

July 17 to July 31	13 days
August	30 days
September	1 day
Total	44 days

$(Y2 - Y1)\times 360 + (9 - 7)\times 30 + (1 - 17) = 44$ days

Accrued Interest and Bond Pricing

1) Determine the number of days until the next interest payment.
2) Compute the ratio:

$$w = \frac{\text{\# of days between settlement and next coupon payments}}{\text{\# of days in coupon period}}$$

3) Find the present value.

10% coupon corporate bond maturing March 1, 2014, settles July 17, 2008, YTM = 6.5%
44 days until Sept. 1 (next coupon)

Period	Coupon	Present value
0.2444444	$5	$4.9611
1.2444444	$5	$4.8049
2.2444444	$5	$4.6537
3.2444444	$5	$4.5072
4.2444444	$5	$4.3653
5.2444444	$5	$4.2279
6.2444444	$5	$4.0948
7.2444444	$5	$3.9659
8.2444444	$5	$3.8411
9.2444444	$5	$3.7202
10.2444444	$5	$3.6031
11.2444444	$105	$73.2830
		$120.0281

$$\text{Accrued interest} = C\left(\frac{\text{\# of days since last coupon}}{\text{\# of days in period}}\right)$$