**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**

<table>
<thead>
<tr>
<th>Standard &amp; Poor’s Moody’s</th>
<th>Investment-Quality Bond Ratings</th>
<th>Low-Quality, Speculative, and/or “Junk” Bond Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Grade</td>
<td>Medium Grade</td>
</tr>
<tr>
<td>Aaa</td>
<td>AAA</td>
<td>AA</td>
</tr>
<tr>
<td>Aa</td>
<td>Aa</td>
<td>A</td>
</tr>
<tr>
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<tr>
<td>Baa</td>
<td>BBB</td>
<td>BBB</td>
</tr>
<tr>
<td>Ba; B</td>
<td>BB; B</td>
<td>CCC</td>
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<tr>
<td>Caa</td>
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<td>Ca</td>
<td>CC</td>
<td>C</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

**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– is 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

<table>
<thead>
<tr>
<th>Include in Watchlist</th>
<th>Bond Symbol</th>
<th>Issuer Name</th>
<th>Coupon</th>
<th>Maturity</th>
<th>Callable</th>
<th>Moody’s</th>
<th>S&amp;P</th>
<th>Fitch</th>
<th>Price</th>
<th>Yield</th>
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<tbody>
<tr>
<td></td>
<td>DE KE</td>
<td>JOHN DEERE CAPITAL CORPORATION</td>
<td>5.55</td>
<td>01/17/2012</td>
<td>No</td>
<td>A2</td>
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<td>103.574</td>
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<td>No</td>
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<td>105.532</td>
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<td>A</td>
<td>NR</td>
<td>102.114</td>
<td>4.018</td>
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<tr>
<td></td>
<td>DE IO</td>
<td>DEERE &amp; COMPANY</td>
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<td>A2</td>
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<td>112.718</td>
<td>4.487</td>
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Most Active Investment Grade Bonds

<table>
<thead>
<tr>
<th>Issuer Name</th>
<th>Symbol</th>
<th>Coupon</th>
<th>Maturity</th>
<th>Rating</th>
<th>High</th>
<th>Low</th>
<th>Last</th>
<th>Change</th>
<th>Yield%</th>
</tr>
</thead>
<tbody>
<tr>
<td>J P MORGAN CHASE &amp; CO</td>
<td>JPM.JPT</td>
<td>6.000%</td>
<td>Jan 2013</td>
<td>Aa2/AA-/AA-</td>
<td>104.361</td>
<td>102.730</td>
<td>103.501</td>
<td>-0.023</td>
<td>5.526</td>
</tr>
<tr>
<td>SPRINT MEXTEL CORP</td>
<td>S.HM</td>
<td>6.000%</td>
<td>Dec 2016</td>
<td>Baa3/BB+/SB+</td>
<td>84.500</td>
<td>83.500</td>
<td>84.000</td>
<td>0.000</td>
<td>8.690</td>
</tr>
<tr>
<td>ISTAR FNL INC</td>
<td>ISF.IZ</td>
<td>5.950%</td>
<td>Oct 2013</td>
<td>Baa2/BBB/BBB+</td>
<td>89.375</td>
<td>87.750</td>
<td>86.875</td>
<td>-1.625</td>
<td>8.556</td>
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<tr>
<td>WELLS FARO &amp; CO NEW</td>
<td>WFC.ODT</td>
<td>5.625%</td>
<td>Dec 2017</td>
<td>Aa1/AA+/AA-</td>
<td>103.700</td>
<td>102.517</td>
<td>102.562</td>
<td>0.294</td>
<td>5.260</td>
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<tr>
<td>NUCOR CORP</td>
<td>NUG.EE</td>
<td>6.400%</td>
<td>Dec 2037</td>
<td>A1/A+/NR</td>
<td>101.680</td>
<td>100.819</td>
<td>100.819</td>
<td>-0.360</td>
<td>6.338</td>
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<tr>
<td>UNITED TECHNOLOGIES CORP</td>
<td>UTX.GU</td>
<td>6.350%</td>
<td>Mar 2011</td>
<td>A2/A/A+</td>
<td>106.957</td>
<td>105.647</td>
<td>106.889</td>
<td>0.229</td>
<td>3.730</td>
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<tr>
<td>AT&amp;T INC</td>
<td>T.KG</td>
<td>5.500%</td>
<td>Feb 2013</td>
<td>A2/A/A</td>
<td>102.550</td>
<td>99.500</td>
<td>96.064</td>
<td>0.029</td>
<td>5.517</td>
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<td>AT&amp;T INC</td>
<td>T.KIK</td>
<td>4.950%</td>
<td>Jan 2013</td>
<td>A2/A/A</td>
<td>103.433</td>
<td>101.170</td>
<td>101.706</td>
<td>0.294</td>
<td>4.538</td>
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</table>
**Treasury Notes** – 2-, 5-, and 10-year  
**Treasury Bonds** – Over 10 years – Currently only 30 years

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Coupon</th>
<th>Bid</th>
<th>Asked</th>
<th>Chg</th>
<th>Yield</th>
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<tbody>
<tr>
<td>8/31/2017</td>
<td>1.875</td>
<td>102.8828</td>
<td>102.9141</td>
<td>−0.0363</td>
<td>1.019</td>
</tr>
<tr>
<td>5/15/2018</td>
<td>3.875</td>
<td>110.3125</td>
<td>110.3750</td>
<td>−0.3125</td>
<td>1.317</td>
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<tr>
<td>2/28/2019</td>
<td>1.375</td>
<td>98.6953</td>
<td>98.7109</td>
<td>−0.3516</td>
<td>1.646</td>
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<tr>
<td>2/28/2020</td>
<td>1.250</td>
<td>95.7734</td>
<td>95.8203</td>
<td>−0.3750</td>
<td>1.996</td>
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<td>8/15/2021</td>
<td>8.125</td>
<td>140.1328</td>
<td>140.1797</td>
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<td>2.231</td>
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<td>11/15/2022</td>
<td>1.625</td>
<td>92.1563</td>
<td>92.2031</td>
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<td>2.635</td>
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<td>8/15/2023</td>
<td>2.500</td>
<td>98.0703</td>
<td>98.1388</td>
<td>−0.4453</td>
<td>2.726</td>
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<td>2/15/2024</td>
<td>2.750</td>
<td>99.6094</td>
<td>99.6719</td>
<td>−0.4844</td>
<td>2.788</td>
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<tr>
<td>2/15/2026</td>
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<td>130.2813</td>
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<td>138.7500</td>
<td>138.8281</td>
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<td>2.989</td>
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<td>2/15/2027</td>
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<td>137.9219</td>
<td>138.0000</td>
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<td>3.048</td>
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<td>135.6875</td>
<td>135.7656</td>
<td>−0.7422</td>
<td>3.100</td>
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<td>8/15/2028</td>
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<td>126.2891</td>
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<td>3.204</td>
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<td>123.3828</td>
<td>123.4609</td>
<td>−0.7031</td>
<td>3.230</td>
</tr>
</tbody>
</table>

**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)

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

$\text{Equivalent taxable yield} = \frac{.08}{1.31} = .1159 \text{ or } 11.59\%$

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

9% taxable, 7% muni

$\text{Critical tax rate} = 1 - (.07/.09) = .2222 \text{ or } 22.22\%$

*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)

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 and 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:

<table>
<thead>
<tr>
<th></th>
<th>Bond 1</th>
<th>Bond 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Par</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Coupon rate</td>
<td>3%</td>
<td>12%</td>
</tr>
<tr>
<td>Maturity</td>
<td>25 years</td>
<td>25 years</td>
</tr>
<tr>
<td>YTM</td>
<td>8%</td>
<td>8%</td>
</tr>
</tbody>
</table>

What is the price of each bond?

- **Bond 1**
  - $1,000 FV
  - 15 PMT
  - 50 N
  - 4 I/Y
  - CPT PV
  - $462.95

- **Bond 2**
  - $1,000 FV
  - 60 PMT
  - 50 N
  - 4 I/Y
  - CPT PV
  - $1,429.64

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

- **Bond 1**
  - $1,000 FV
  - 15 PMT
  - 50 N
  - 3 I/Y
  - CPT PV
  - $614.05
  - %Δ = 32.64%

- **Bond 2**
  - $1,000 FV
  - 60 PMT
  - 50 N
  - 3 I/Y
  - CPT PV
  - $1,771.89
  - %Δ = 23.94%

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

- **Bond 1**
  - $1,000 FV
  - 15 PMT
  - 50 N
  - 5 I/Y
  - CPT PV
  - $361.04
  - %Δ = 22.01%

- **Bond 2**
  - $1,000 FV
  - 60 PMT
  - 50 N
  - 5 I/Y
  - CPT PV
  - $1,182.56
  - %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:

<table>
<thead>
<tr>
<th>Par = $1,000</th>
<th>Par = $1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupon rate = 8.5%</td>
<td>Coupon rate = 8.5%</td>
</tr>
<tr>
<td>Maturity = 20 years</td>
<td>Maturity = 20 years</td>
</tr>
<tr>
<td>YTM = 3%</td>
<td>YTM = 13%</td>
</tr>
</tbody>
</table>

What is the price of each bond?

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

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

1,000 FV 42.50 PMT 40 N 2 I/Y CPT PV $1,615.50
1,000 FV 42.50 PMT 40 N 7 I/Y CPT PV $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

<table>
<thead>
<tr>
<th>Market</th>
<th>Coupon payments</th>
<th>Day count</th>
<th>Ex-dividend Trading</th>
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<tbody>
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<td>Actual/Actual (in period)</td>
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<tr>
<td>U.S. Corporate</td>
<td>Semiannual</td>
<td>30/360</td>
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<td>Semiannual</td>
<td>30/360</td>
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<td>Quarterly</td>
<td>N</td>
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<tr>
<td>U.S. Municipal</td>
<td>Semiannual</td>
<td>30/360</td>
<td>N</td>
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<td>U.K. Government</td>
<td>Semiannual</td>
<td>Actual/365</td>
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<td>Australian Government</td>
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<tr>
<td>New Zealand Government</td>
<td>Semiannual</td>
<td>Actual/Actual (in period)</td>
<td>Y</td>
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<tr>
<td>Canadian Government</td>
<td>Semiannual</td>
<td>Actual/Actual (in period)</td>
<td>N</td>
</tr>
<tr>
<td>German Government</td>
<td>Annual</td>
<td>30E/360</td>
<td>Y</td>
</tr>
<tr>
<td>Swiss Government</td>
<td>Annual</td>
<td>30E/360</td>
<td>N</td>
</tr>
<tr>
<td>Dutch Government</td>
<td>Annual</td>
<td>30E/360</td>
<td>Y</td>
</tr>
<tr>
<td>Eurobond</td>
<td>Annual</td>
<td>30E/360</td>
<td>N</td>
</tr>
<tr>
<td>Italian Government</td>
<td>Annual</td>
<td>30E/360</td>
<td>N</td>
</tr>
<tr>
<td>French Government</td>
<td>Annual</td>
<td>Actual/Actual (in period)</td>
<td>N</td>
</tr>
<tr>
<td>Danish Government</td>
<td>Annual</td>
<td>30E/360</td>
<td>Y</td>
</tr>
<tr>
<td>Swedish Government</td>
<td>Annual</td>
<td>30E/360</td>
<td>Y</td>
</tr>
<tr>
<td>Spanish Government</td>
<td>Semiannual</td>
<td>Actual/Actual (in period)</td>
<td>N</td>
</tr>
<tr>
<td>Belgian Government</td>
<td>Annual</td>
<td>30E/360</td>
<td>N</td>
</tr>
<tr>
<td>Irish Government</td>
<td>Annual</td>
<td>Actual/365</td>
<td>Y</td>
</tr>
<tr>
<td>Austrian Government</td>
<td>Annual</td>
<td>30E/365</td>
<td>Y</td>
</tr>
<tr>
<td>Norwegian Government</td>
<td>Annual</td>
<td>Actual/365</td>
<td>Y</td>
</tr>
</tbody>
</table>
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
\[(Y2 - Y1)\times360 + (M2 - M1)\times30 + (D2 - D1)\]

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
\[(Y2 - Y1)\times360 + (M2 - M1)\times30 + (D2 - D1)\]

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

<table>
<thead>
<tr>
<th>Month</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 17 to 31</td>
<td>14</td>
</tr>
<tr>
<td>August</td>
<td>31</td>
</tr>
<tr>
<td>September</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Month</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 17 to 31</td>
<td>13</td>
</tr>
<tr>
<td>August</td>
<td>30</td>
</tr>
<tr>
<td>September</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
</tr>
</tbody>
</table>

\[(Y2 - Y1)\times360 + (9 - 7)\times30 + (1 - 17) = 44\] 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)

<table>
<thead>
<tr>
<th>Period</th>
<th>Coupon</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2444444</td>
<td>$5</td>
<td>$4.9611</td>
</tr>
<tr>
<td>1.2444444</td>
<td>$5</td>
<td>$4.8049</td>
</tr>
<tr>
<td>2.2444444</td>
<td>$5</td>
<td>$4.6537</td>
</tr>
<tr>
<td>3.2444444</td>
<td>$5</td>
<td>$4.5072</td>
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<tr>
<td>4.2444444</td>
<td>$5</td>
<td>$4.3653</td>
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<td>$5</td>
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<td>9.2444444</td>
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<td>$5</td>
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<td>11.2444444</td>
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<td>$73.2830</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$120.0281</td>
</tr>
</tbody>
</table>

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