NCPERS Trustee Education Seminar

FIXED INCOME 101

May 14, 2016
What is a bond or fixed income security

• A bond represents a loan to a government or business

• Fixed income securities are debt obligations promising a series of pre-specified payments at pre-determined points in time
What Does the Global Bond Market Look Like?

- U.S. makes up a little over a 1/3rd of the global bond market

- Global bond market as of June 30, 2014 was approximately $87.2T according to the Bank of International Settlements statistical annex.

Source: Barclays Capital, PNC
Types of Bonds

Government Bonds

• Governments and Instrumentalities issue debt obligations to investors

• Proceeds are used to finance the operation of the U.S. government

• Types of Government securities include:

  - U.S. Treasury Bills, Notes, Bonds, Inflation-Protected Securities (TIPs), Zero Coupons
  - U.S. Agency Obligations/Government Sponsored Entities (GSE’s)
    - Federal National Mortgage Association (FNMA/Fannie Mae)
    - Federal Home Loan Mortgage Association (Freddie Mac)
    - Federal Farm Credit Bank (FFCB)
    - Federal Home Loan Bank (FHLB)
    - Tennessee Value Authority (TVA)
    - Small Business Association (SBA)
  
  - Direct U.S. Backed Agency
    - Government National Mortgage Association (GNMA/Ginnie Mae)

  - Foreign Government Issuers
Types of Bonds

Corporate Bonds

• Corporations issue fully taxable debt obligations to investors

• Proceeds are used to refinance existing bonds, fund expansions, mergers and acquisitions, fund operations, fund research and development

• Types of Corporate debt securities include:
  - Secured Debt: backed by a specific pledged asset/collateral
  - Unsecured Debt: aka Debentures; backed by good faith and credit of borrower
  - Yankee bonds: foreign corporations issuing bonds in the U.S. in U.S. dollars
  - High Yield bonds: backed by good faith and credit of borrower but these companies have impaired financial conditions and are considered risky
Types of Bonds

Municipal Bonds

- State and local governments issue tax-free debt obligations to investors

- Proceeds are used to build schools, hospitals, sewer systems, highways, improve infrastructure, and many other projects for the public good.

- Types of municipal securities include.
  - General Obligation (G.O.’s): backed by full faith and credit and taxing power of entity
  - Revenue Bonds: backed by the revenue generated from the particular entity within the municipality issuing the bonds
### Types of Bonds

**Asset Backed Securities (ABS)**
- Created by pooling large number of loans or receivables into a single bond.
- These securities are collateralized or securitized by the loans or receivables of consumers and/or business loans.
- Types of Asset Backed Securities include:
  - Auto Loan/Leases
  - Credit Cards
  - Student Loans
  - Home Equity Loans
  - Equipment Leases

### Additional Security Types

**Mortgage Backed Securities (MBS)**
- Created by pooling large number of mortgage loans into a single bond.
- These securities are collateralized or securitized by the loans/mortgages.
- Types of Mortgage Backed Securities include:
  - Pass Throughs
  - Collateralized Mortgage Obligations (CMO’s)

**Commercial Mortgage Backed Securities (CMBS)**
- Created by pooling large number loans backed by commercial real estate into a single bond.
- These securities are collateralized or securitized by the loans.
- Commercial Loans include:
  - Hotels
  - Corporate Buildings
  - Retail space/Malls
  - Industrial complexes
Bond Basics

Bonds have a variety of characteristics which determine their value

Face Value/Par Amount: The amount of money the bond holder receives once the bond matures

Discount: A bond that is priced below par value

Premium: A bond that is priced above par value

Coupon: The amount the bondholders receives as interest at a pre-determined date

Maturity: Date in the future when the bond holder’s will receive their principal investment back

Bonds are priced as a point or as a percentage of Par Value

<table>
<thead>
<tr>
<th>Bond Price</th>
<th>Percentage of Par Value</th>
<th>Price in Dollars</th>
<th>Discount, Par, or Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>95 Points</td>
<td>95%</td>
<td>$950</td>
<td>Discount</td>
</tr>
<tr>
<td>100 Points</td>
<td>100%</td>
<td>$1,000</td>
<td>Par</td>
</tr>
<tr>
<td>105 Points</td>
<td>105%</td>
<td>$1,050</td>
<td>Premium</td>
</tr>
</tbody>
</table>
Bond Basics

Bonds have a variety of characteristics which determine their value

**Credit Quality:** Independent bond rating agencies determine the company’s credit risk

<table>
<thead>
<tr>
<th>Moody’s</th>
<th>S&amp;P</th>
<th>Grade</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaa</td>
<td>AAA</td>
<td>Investment</td>
<td>Best quality</td>
</tr>
<tr>
<td>Aa</td>
<td>AA</td>
<td>Investment</td>
<td>High quality</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
<td>Investment</td>
<td>High-Medium quality</td>
</tr>
<tr>
<td>Baa</td>
<td>BBB</td>
<td>Investment</td>
<td>Adequate capacity to pay</td>
</tr>
<tr>
<td>Ba</td>
<td>BB</td>
<td>Junk</td>
<td>Some speculation</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td>Junk</td>
<td>More vulnerable to adverse conditions</td>
</tr>
<tr>
<td>Caa</td>
<td>CCC</td>
<td>Junk</td>
<td>Currently highly vulnerable</td>
</tr>
<tr>
<td>Ca</td>
<td>CC</td>
<td>Junk</td>
<td>Currently highly vulnerable</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
<td>Junk</td>
<td>Currently highly vulnerable</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>Default</td>
<td>In default</td>
</tr>
</tbody>
</table>

High Yield Bonds
Yields, Yields, and Yields

All yields are not the same

Nominal Yield: Is the same yield as the bond’s coupon rate

Current Yield: The return an investor would expect if the bond is held for one year

\[
\text{Current Yield} = \frac{\text{Annual coupon rate}}{\text{current price}}
\]

Yield to Maturity (YTM): Anticipated return earned if the bond is held to maturity

\[
\text{Bond Price} = \frac{\text{CF}_1}{(1+\text{Yield})^1} + \frac{\text{CF}_2}{(1+\text{Yield})^2} + \ldots + \frac{\text{Last CF}}{(1+\text{Yield})^n}
\]

YTM takes into account the price you paid for the bond and the face value
Yields – Rule of Thumb

All yields are not the same

- **Yield to Maturity** will be the highest yield for bonds purchased at a discount to par.
- **Nominal Yield** will be the highest yield for bonds purchased at a premium to par.
- All 3 yields are the same for bonds purchased at par.

<table>
<thead>
<tr>
<th>Bond Purchased At...</th>
<th>Yield To Maturity</th>
<th>Nominal Yield</th>
<th>Current Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount</td>
<td>Highest Yield</td>
<td>Lowest Yield</td>
<td>Middle Yield</td>
</tr>
<tr>
<td>Par</td>
<td>All 3 Yields Equal</td>
<td>All 3 Yields Equal</td>
<td>All 3 Yields Equal</td>
</tr>
<tr>
<td>Premium</td>
<td>Lowest Yield</td>
<td>Highest Yield</td>
<td>Middle Yield</td>
</tr>
</tbody>
</table>
How Do Bonds Work

Bond prices move in an inverse direction to interest rates

If interest rates rise:
- Prices Fall
- Yields Rise

If interest rates fall:
- Prices Rise
- Yields Fall

Why ???
Why The Inverse Relationship to Interest Rates

Bond prices move in an inverse direction to interest rates

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Rates @ 10%</td>
<td>General Rates @ 9%</td>
<td>General Rates @ 11%</td>
</tr>
<tr>
<td>Initial Investment: $1,000 face value (FV)</td>
<td>Initial Investment: $1,000 (FV)</td>
<td>Initial Investment: $1,000 (FV)</td>
</tr>
<tr>
<td>Coupon: 10%</td>
<td>Coupon: 10%</td>
<td>Coupon: 10%</td>
</tr>
<tr>
<td>Income = Coupon * (FV)</td>
<td>Income = Coupon * (FV)</td>
<td>Income = Coupon * (FV)</td>
</tr>
<tr>
<td>$100 = 10% * $1,000</td>
<td>$100 = 10% * $1,000</td>
<td>$100 = 10% * $1,000</td>
</tr>
<tr>
<td>Price = $100 Income/10% = $1,000</td>
<td>Price = $100 Income/9% = $1,111</td>
<td>Price = $100 Income/11% = $909</td>
</tr>
</tbody>
</table>

The Bond’s price reflects the value of income that it generates from the annual coupon payment
Measuring Interest Rate Sensitivity

Maturity, coupon, and level of interest rates affect bond price sensitivity

DURATION – a measure of the interest rate risk of a security by taking into account all the cash flows from the security including coupon payments and repayment of face value, accounting for time. Just like Maturity, it’s expressed in terms of Years.

\[ \sum \frac{(\text{Coupons}) \, \text{Face Value}}{\Delta} \]
Measuring Interest Rate Sensitivity

Duration estimates interest rate risk of a security

The following equation describes how duration estimates a bond’s price change:

\[ \Delta P = -D \times \Delta IR \]

(D) Duration = 5 Years
(IR) Interest Rates Increase 2%
(P) Price = ?

\[ P? = -5 \times 2\% \]
\[ P? = -10\% \]

Price Would Decline by 10%
Duration – Rule of Thumb

Duration and interest rate sensitivity

- Longer maturity bonds have a higher level of interest rate sensitivity/duration
- Higher coupon bonds have a lower level of interest rate sensitivity/duration
Yield Curve

The yield curve is used to price other securities

- The curve is derived from plotting the current interest rates being paid on various U.S. Treasuries starting with the shortest maturity to the longest maturity
Bond Investing Risks

Risks associated with fixed income securities

• Interest Rate Risk – As mentioned earlier, the longer the duration, the greater potential price fluctuation

• Purchasing Power Risk – Inflation erodes the value of fixed income assets

• Liquidity Risk – Certain bonds are difficult to buy/sell causing negative price impact

• Reinvestment Risk – The rate that investors re-invest coupon payments – greater risk for longer dated bonds

• Credit/Default – Greatest when economy is weakening and companies lack financial strength
Active investment strategies

- Bond Pickers – focuses and attention is primarily on selecting individual securities that are deemed to be undervalued versus other securities (bottom-up management)

- Duration & Yield Curve Management – focus is on attempting to predict/time changes in interest rates

- Sector Rotation – focus is on attempting to predict/time changes in the valuation between sectors (ie. Agencies vs. Asset Backed Securities)
Bond Investing Strategies

Passive investment strategies

• Buy & Hold or a YTM portfolio

• Indexed – mirror the allocation and performance of a particular bond market

• Enhanced Index – use quantitative methods to attempt to slightly beat a particular index

• Dedicated– structured to provide income/cash flow which matches a pre-determined liability or cash flow need

• Immunized– structured to limit the impact of interest rate changes
Fixed Income Benchmarks/Indexes

Popular bond market benchmarks

• Broad Market Indexes
  - Barclays Capital Aggregate Bond Index
  - Barclays Capital Intermediate Government/Credit Index
  - Barclays Capital U.S. Universal Index
  - Citigroup Non-US Dollar World Government Index
  - Barclays Capital Global Aggregate Index

• Narrow Market Indexes
  - Merrill Lynch 1-3 Yr Government/Credit Index
  - Barclays Capital U.S. Aggregate 1-3 Yr Index
  - Barclays Intermediate Government/Credit Index
  - Merrill Lynch 1-10 Yr Government/Credit Index
  - Barclays Intermediate Aggregate Index
  - Merrill Lynch Mortgage Master Index
  - Barclays Capital High Yield Index
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