Fixed Income Securities Analysis and Strategies

Session

Topics to be Covered

- Introducing concepts for computation of Fixed Income Securities Valuation
- Fixed Income Securities Valuation in Practice
- Computation and Conceptual logics of various types of Yield in Fixed Income Securities investing
- Application of concepts with regards to Financial Planning
- Appreciating Why Fixed Income Securities is important to be in any portfolio

Introduction to Fixed Income Securities

Introduction

- Fixed-income security (a.k.a. bonds or debt securities).
- Its a contractual obligation of the issuer to pay the promised payments (interest & principal amount) at a specified future date to the investor.
- Bond is like a loan (borrowing) where:
  - The issuer of a bond is the borrower.
  - The holder of a bond is the investor (lender).
  - The borrowing is for a fixed term (maturity period).
  - The issuer agrees to (generally) pay a regular amount of pre-defined interest (coupon) and repayment of original principal to the investor.
- Bonds provide the borrower with external funds to finance long-term investments or to finance an expenditure.
- Governments, companies, and other types of issuer can borrow money from investors.

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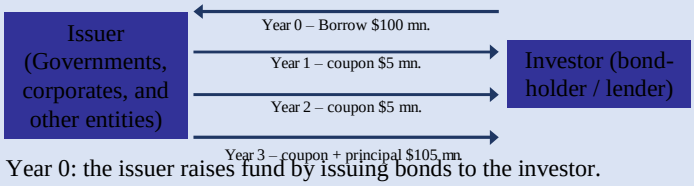
Introduction to Fixed Income Securities

A plain vanilla bond

- E.g. a plain vanilla bond - a 3 years 5% annual coupon paying bond.



- Year 0: the issuer raises fund by issuing bonds to the investor.
- Year 1 & 2: the issuer is obliged to pay periodic interest payment (based on the pre-defined coupon rate.
- Year 3: the bond is redeemed i.e. issuer repays the original investment amount to the investor.

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IntroductiontoFixedIncomeSecurities

Bonds v/s Common shares

- Bonds and stocks are both financial securities.
- The major difference is that stockholders are owners, whereas bondholders are a creditor i.e. they are lenders.
- Hence, bond provides a first right on the company's earnings/assets, i.e. a first right to recover their money if the company goes bankrupt.
- Also, bonds usually have a defined term (maturity), after which the bond is redeemed, whereas stocks are perpetual.
- Bond holders face much lower risk as compared to stockholders but such lower risk also means limited return (i.e. predefined cash flows).

Pros:
- Claim to earnings & assets
- Lower risk
- Pre-defined cash flows

Cons:
- No ownership rights
- Limited return potenti
- Limited maturity

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Introduction to Fixed Income Securities

Basic features of a bond

Issuer – it is an entity which issue a bond to raise funding from investors

- Supranational organization e.g. World bank or European investment bank.
- Sovereign (national) government e.g. government of Spain or China.
- Non-sovereign (local) governments e.g. state of Maharashtra in India.
- Government sponsored agencies e.g. postal service agency in a country.
- Companies (corporate issuer) e.g. Microsoft or Tata motors.

Maturity date – date when the issuer is obligated to redeem the bond

- Money market bonds – maturity in one year or less, e.g. commercial paper and certificate of deposit.
- Capital market bonds – maturity longer than one year.
- Perpetual bonds – have no stated maturity date, e.g. consols issued by UK government have no stated maturity.

Tenor (term to maturity) – the remaining time until the bond's maturity

- ≤ 1 year - Money market securities e.g. commercial paper, certificate of deposit.
- > 1 year - Capital market securities e.g. corporate bonds.

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Introduction to Fixed Income Securities

Basic features of a bond

Par value – the amount that the issuer agrees to repay at maturity

- A.k.a. Principal amount, Face value, Nominal value, redemption or maturity value.
- Bonds are quoted as a % of their par value, e.g. quote of 97 for a $1000 par reflects bond price of $970 (97% x $1000).

Coupon rate – a nominal interest rate which the issuer agrees to pay

- Zero coupon bond – pays no interest but are issued at discount E.g. An issuer issues a bond at $93 and redeems it at par value i.e. $100 after 3 years.
- Fixed rate bond – coupon rate remains fixed during the life of the bond.
- Floating rate notes (floaters) – coupon rate includes two components, a reference rate plus a spread, e.g. bond pays interest equals to LIBOR + 75 bps.

Currency denomination – bonds can be issued in any currency

- Single currency bonds (local or foreign currency).
- Dual currency bonds.
- Currency option bonds = a single-currency bond + a foreign currency option.

Coupon frequency – reflects the periodicity i.e. how frequent the interest is paid

- Interest paid annually, six-monthly, quarterly or monthly.

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Duration

- Zero-Coupon Bond – Duration is equal to its time to maturity.

- Vanilla Bond - Duration will always be less than its time to maturity.

Duration

- Duration is a measurement of how long, in years, it takes for the price of a bond to be repaid by its internal cash flows.
- Bonds with higher durations carry more risk and have higher price volatility than bonds with lower durations.
- The Duration of a Zero-coupon bond is the same as its time to maturity and that for a Vanilla bond, duration is always less than its time to maturity.

Duration

- When the yield to maturity rises, the duration of the coupon bond falls.
- The higher the coupon rate on the bond, the shorter the duration of the bond.
- When the maturity of a bond lengthens, the duration rises as well.
- The duration of a portfolio of securities is the weighted-average of the durations of the individual securities, with the weights equaling the proportion of the portfolio invested in each.

Macaulay's Duration

- A bond's basic duration is the Macaulay duration (created by Frederick Macaulay in 1938)
- It is calculated by adding the results of multiplying the PVs of each cash flow by the time it is received and dividing by the total price of the security.
- Put differently, Duration is a weighted average term to maturity where the weights are relative size of the contemporaneous cash flow.

Duration (Cont'd..)

- The formula for Macaulay duration is as follows:

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^{n} \frac{t * C}{(1+i)^t} + \frac{n * M}{(1+i)^n}}{P}$$

n = number of cash flows ; t = time to maturity C = cash flow ; i = required yield
M = maturity (par) value ; P = bond price

Duration

- Bond price = $C * \frac{\left[1 - \left[\frac{1}{(1+i)^n}\right]\right]}{i} + \frac{M}{(1+i)^n}$
- So the Macaulay duration ca be rewritten as:

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^{n} \frac{t * C}{(1+i)^t} + \frac{n * M}{(1+i)^n}}{C * \left[\frac{1 - \left[\frac{1}{(1+i)^n}\right]}{i}\right] + \frac{M}{(1+i)^n}}$$

Duration

- Example 1: Ramu holds a six-year bond with a par value of Rs.1,000 and coupon rate of 6%.
- For simplicity, let's assume that the coupon is paid annually and that current market interest rates are 5%.
- What is the Macaulay duration of the bond?

Duration

- Macaulay's Duration
- =

60*[{1-1.05)^6}/.05] +
1000/1.05^6

- Use Duration function in Excel

Duration and Bond Price Volatility

- Large Interest Rate changes and Duration:
- Duration accurately measures the price sensitivity of financial securities only for small changes in interest rates of the order of one or a few basis points.
- For large changes in interest rates, Duration becomes a less accurate predictor of the changes in prices.

Duration and Bond Price Volatility

- Further, duration model predicts symmetric effects for rate increases or decreases whereas in actuality, the capital loss effect of large rate increases tends to be smaller than the capital gain effect of large rate decreases.

- This is the result of a bond's price – interest rate relationship exhibiting a property called convexity and not linearity as assumed by the duration model

Duration and Bond Price Volatility

- This is because the sensitivity of the bond's price to a change in interest rates depends on the level from which interest rates changes.

- In particular, the higher the level of interest rates, the smaller a bond's price sensitivity to interest changes.

Case for Illustration

- Suppose that the insurance company chooses to fund its obligation with Rs 10,000 of 8% annual coupon bonds, selling at par value (Rs 1,000), with 6 years to maturity.
- As long as the market interest rate stays at 8%, the company has fully funded the obligation.

Payment Number	Years Remaining until Obligation	Accumulated Value of Invested Payment			
A. Rates remain at 8%					
1	4	$800 \times (1.08)^4$	_	1,088.39	
2	3	$800 \times (1.08)^3$	_	1,007.77	
3	2	$800 \times (1.08)^2$	_	933.12	
4	1	$800 \times (1.08)^1$	_	864.00	
5	0	$800 \times (1.08)^0$	_	800.00	
Sale of bond	0	10,800/1.08	_	10,000.00	
				14,693.28	

- However, if interest rates change, two offsetting influences will affect the ability of the fund to grow to the targeted value of Rs 14,693.28.
- If interest rates rise, the fund will suffer a capital loss, impairing its ability to satisfy the obligation.
- However, at a higher interest rate, reinvested coupons will grow at a faster rate, offsetting the capital loss.
- In other words, fixed-income investors face two offsetting types of interest rate risk: REPRICING risk and REINVESTMENT rate risk.

Solution

- If the portfolio duration is chosen appropriately, these two effects will cancel out exactly.
- When the portfolio duration is set equal to the investor's horizon date, the accumulated value of the investment fund at the horizon date will be unaffected by interest rate fluctuations.
- For a horizon equal to the portfolio's duration, Re-Pricing risk and Reinvestment risk exactly cancel out.

Thank You