Session 1 - Fixed Income Investing

Concepts of Fixed Income Investing

What is a bond?

bond *(noun)*; debt security or loan agreement, obligation or promise.

Fixed income securities are — contracts to repay principal with interest

Features of Bonds

Issuer name	This is the name of the entity issuing the bond.
Issuer type	This states the nature of the issuer: sovereign (a government), quasi-sovereign (local government, public sector entity), corporates, banks.
Subordination ranking	This specifies the order of debt repayment should the issuer default: senior debt (repaid first), subordinated debt (after senior ranking, before the shareholders).
Coupon rate	This may be fixed or variable (pegged to inflation, the 3-month interest rate, etc). Its frequency is variable (annual, half-yearly, quarterly).
Maturity	This is the bond's redemption date, the date on which the nominal invested will be repaid.
Issue Currency	It is the currency in which the bond is to be denominated
Yield to maturity	This is the rate of return on the bond.
Credit Rating	A rating is given to the issuer by a credit rating agency. It is the issuer who requests and pays for this service.
Price	It is the price at which the bond is currently selling in the secondary market. In most cases, you will find that the price is expressed as a percentage to the par value of the bond. For example, if the price quoted on a bond having a par value of Rs. 10,000 is say 98.50, it means that the bond is currently trading at 98.5% of the par value of the bond i.e. the bond is available in the secondary market for Rs. 9,850
Issue size	This is the total amount of the issue. For e.g.: a company may want to borrow Rs. 500 crore by issuing bonds having face value of Rs. 10,000 each. In this case, the company will issue 500,000 bonds (if the issue is at par) and the issue size would be Rs. 500 crore
Denomination	It is the value of one unit of the bond. In the example that we took just above, the denomination of the bonds is Rs. 10,000

About the Features

The issuing entity (issuer name) is the company issuing it. Apart from a company issuing it, issuer could be a Government, a municipal authority, etc.

Issuer type is categorization of the bond as per the nature of the issuer e.g. bonds issued by the Central Government is of a certain type, bonds issued by private sector companies is of one type, etc.

Subordination ranking means if the company goes into liquidation, what will be the hierarchy of payments. Senior debt is paid before sub-debt.

Issue price can be at par or premium or discount. For example, a bond with face value Rs 100, may be issued at Rs 100 (par), Rs 105 (premium) or say Rs 95 (discount).

Coupon

The interest payable on a bond is known as coupon.

Origin of the term:

The term coupon dates back to the time where bonds were printed certificates, accompanied by a sheet of coupons of which the bearer would detach one at each interest payment date and exchange it for cash at the bank.

The designation has remained, although bonds are no longer issued as physical certificates.

Coupon continued

Types of Coupon

Fixed coupons

By far the most frequent type. The coupon is a fixed percentage of the nominal of the bond, which applies throughout the life of the bond.

Floating Rate Coupons

Coupon rate is based on a benchmark interest rate index such as Libor, plus generally a margin.

Zero coupons

Zero-coupon bonds do not have any coupon detach during their lifetime but pay all of the interest at maturity. They are generally issued at a discount and redeemed at par.

Step-up coupons

Step-up coupons are coupons of which the rate changes with time, according to a schedule fixed at the bond's issuance. This type of coupon is not very frequent.

Par Value, Premium & Discount
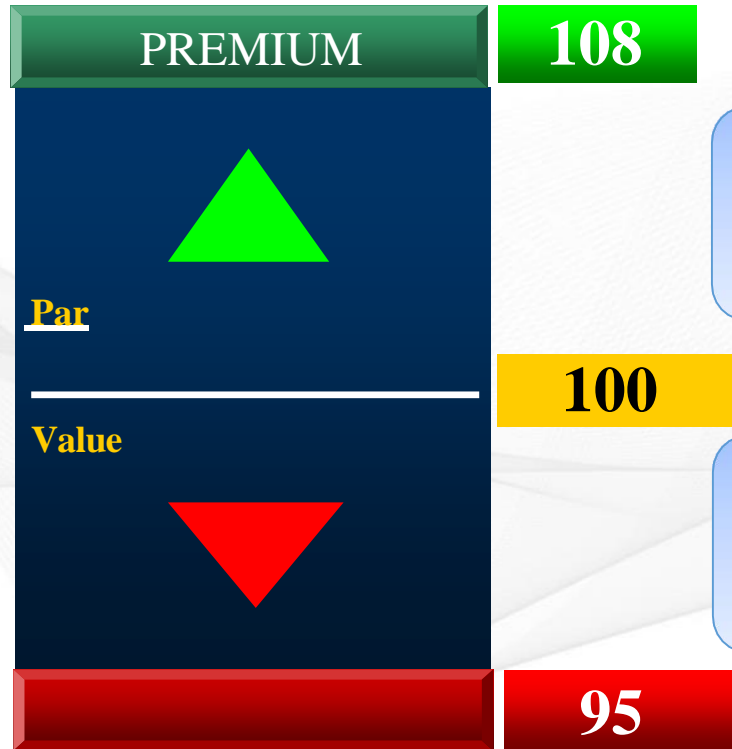
Bond - The Borrower

A disciplined company with stable earnings will find debt a useful and manageable source of financing

A company with unstable earnings will experience difficulty in managing their debt obligations

❑ Payouts are capped

❑ No shareholder dilution

❑ Interest payments are tax - deductible

❑ Interest payments have to be met always

❑ Debt holders could dictate terms

❑ The cost of debt piles up as debt is accumulated

Bond - The Lender

Built-in Contractual Provisions of Fixed Income protects the Lender in the event of default/bankruptcy

Safety Net for Lender

Flows take priority

- Debt (except G-Sec) typically takes precedence over equity. The seniority of multiple issues is determined by bond covenants.

Collateral

- Assets of the issuing company could be sold to satisfy debt obligations in case of default (based on the bond covenants)

Contingency

- Failure to pay coupon / bullet payments allow debt holders to take control of the firm.

Bond - The Investor

Bonds provide several benefits to the investors

Portfolio Diversification

Fixed income securities can diversify the asset -class risk of a portfolio, as they are structured differently from equity

Regular Consistent Income

Fixed income securities provide a regular stream of coupon payments that can supplement earnings for many investors

Portfolio De-Risking

Fixed income coupon returns are guaranteed, they can reduce the risk on a portfolio containing volatile equity holdings.

YTM

Yield to Maturity (YTM), or yield for short, is the annualized return that you will earn if you invest in a fixed income security today and hold it till maturity.

It's not a simple rate of return but takes into account the effect of compounding i.e. it is the CAGR.

When comparing alternative investments, yield is one of the points taken into consideration.
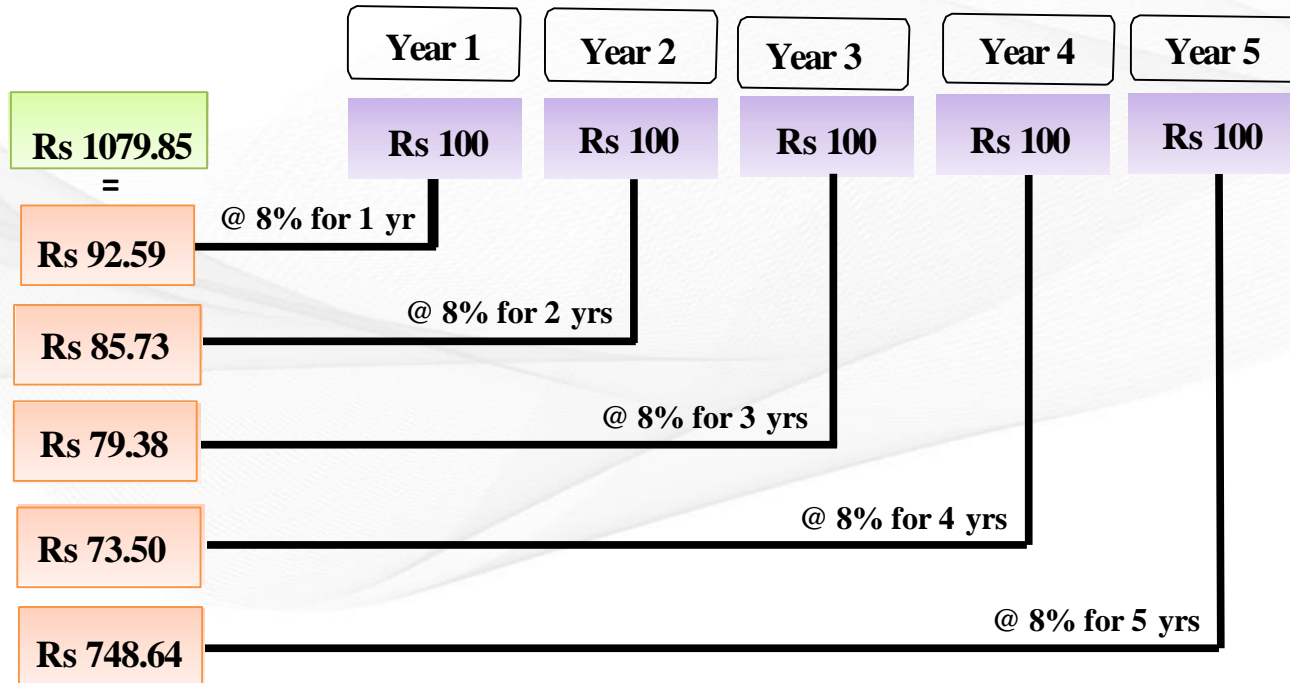
So, yield is the return that you will earn if:

- You invest in the security today,
- Hold that security till maturity, and
- Could reinvest all intermittent cash flows (such as coupons) at the same yield rate.
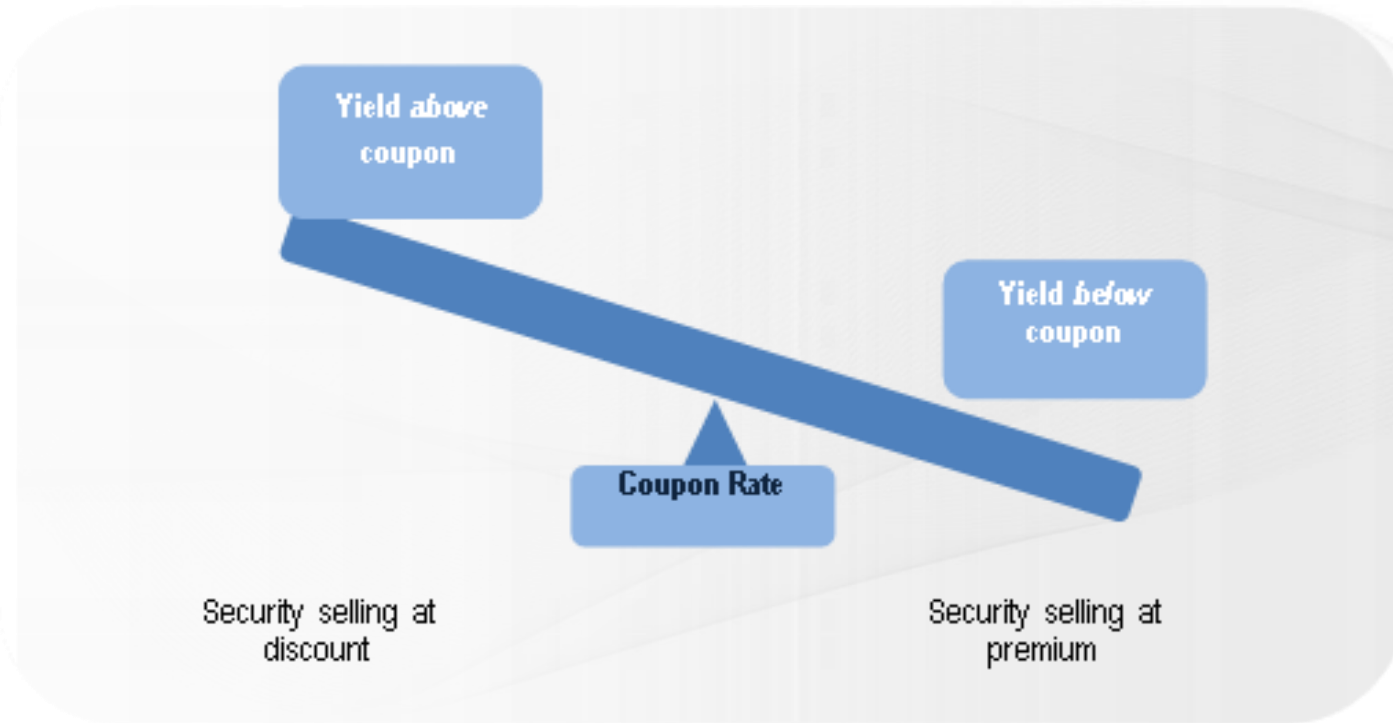
YTM – Discounted Cash Flows

Coupon: 10%   **Par: Rs 1000**   **Term: 5 years**

Inverse Movement of Price and Yield

Yield above coupon

Yield below coupon

Coupon Rate

Security selling at discount

Security selling at premium

Why is it inverse?

Let us say, there is a bond with face value Rs 100, coupon rate 8%. Market price also is Rs 100. Then my yield on the bond is 8%, as the market price is same as face value.

Now lets say, the market price moves up to Rs 101. My coupon remains Rs 8 per year. I am paying a higher price to buy the same coupon as in first case. Hence my yield (effective return) goes down.

Lets say price goes down to Rs 99. My coupon remains Rs 8 per year. I am paying a lower price to buy the same coupon as in first case. Hence my yield (effective return) goes up.

YTM continued

Yield to Maturity (or simply yield) of a bond is the return you will get, in compound annualized terms, if you hold it till maturity.

YTM (or running yield) of a bond fund is the weighted average yield of all the instruments in the portfolio.

Yields moving up means prices coming down, which is (i) bad for your existing investments (ii) good for fresh investments.

Yields coming down means prices moving up, which is (i) good for your existing investments (ii) bad for fresh investments.

YTM continued

The reason we use yield and not the coupon rate when comparing alternative investment opportunities is simple: you may not buy the security in the secondary market at par value nor you may sell the security at par.

If you could buy and sell the security at par, your yield will be the coupon rate of that security.

The yield will differ from the coupon rate depending on whether the security is selling at a discount to par (cheap) or premium (costly).

A security selling at a discount will have a yield higher than its coupon rate while the one selling at premium will have a yield lower than its coupon.

YTM continued

There are two academic assumptions in the concept of YTM (yield to maturity):

•First, it assumes that you reinvest all cash flows at the same yield rate. This may not always be the case. You may not be able to reinvest the cash flows in the same security again for several reasons. The intermittent flows will be reinvested at the rates available at that point of time.

•Second, it assumes that you hold that security till its maturity. An investor may not always intend to do so, or unforeseen requirements may force him to liquidate his investment in the security. If you sell your investment before maturity, the sale price may be higher or lower than the par value which creates a capital gain or loss. This aspect of your return is completely ignored by the yield measure.

However, this concept is the closest to being perfect in the absence of an ideal parameter.

Redemption

All bonds come with a maturity date, with the exception of perpetual bonds.

Redemption of bonds may be at par or at premium.

Redemption may be on one day (bullet redemption) or spread over multiple dates (staggered redemption).

For zero coupon bonds, the difference between issue price and redemption value is conceptually the interest on the bond.

Time Value of Money (TVM)

Time value of money denotes that investors prefer to receive money today rather than the same amount of money in the future because of money's potential to grow in value over a period of time.

For example, money deposited in a bank earns a certain interest rate, and is therefore said to be compounding in value.

FV = PV x [1 + (i / n)] (n x t)

Assume a sum of Rs 10,000 is invested for one year at 10% interest. The future value of that money is:

FV = Rs 10,000 x (1 + (10% / 1) ^ (1 x 1) = Rs 11,000

The formula can also be rearranged to find the value of the future sum in present day terms. For example, the value is Rs 5,000 one year from today, compounded at 7% interest:

PV = Rs 5,000 / (1 + (7% / 1) ^ (1 x 1) = Rs 4,673

Time Value of Money continued

Effect of Compounding Periods on Future Value

The number of compounding periods can have a drastic effect on the TVM calculations. Taking the Rs 10,000 example earlier, if the number of compounding periods is increased to quarterly, monthly or daily, the ending future value calculations are:

Quarterly Compounding: FV = Rs 10,000 x (1 + (10% / 4) ^ (4 x 1) = Rs 11,038

Monthly Compounding: FV = Rs 10,000 x (1 + (10% / 12) ^ (12 x 1) = Rs 11,047

Daily Compounding: FV = Rs 10,000 x (1 + (10% / 365) ^ (365 x 1) = Rs 11,052

This shows TVM depends not only on interest rate and time horizon, but also on how many times the compounding calculations are computed each year.

Holding Period Returns (HPR)

It is the total return on an investment over the period for which it is held.

It is an important piece of information as it takes into account the amount that you invested, the amount that you got when you exited the investment as well as the cash flows that you may have earned when holding the investment (in terms of interest, dividend, etc).

HPR =   (P1 – P0 + Di) / Po

Where:

P1 is the amount that you got when you exited the investment. Po is the

amount that you spent to buy the investment

Di is the distributions (interest, dividend, etc) that you may have earned during the period that you

held the investment.

Maturity - Duration

Maturity of a bond is same as "English' maturity. In case of bonds with staggered maturity, the term from issue to last maturity is referred to as 'door to door' maturity.

Maturity of a fund is the weighted average maturity of all the instruments in the portfolio.

Duration is different from "English" duration. In simple terms, 'modified duration'(a technical term) shows the relationship between yield and price movement.

If the modified duration of a bond is 5, if the yield comes down by 1%, price will move up by approx Rs 5. If the price was Rs 100 earlier, it would become Rs 105.

Coupon Flows and Maturity Flow

120	
100	
80	
60	108
40	
20	
0	8 8 8 8 8 8

Cash Flow 1   Cash Flow 2   Cash Flow 3   Cash Flow 4   Cash Flow 5   Cash Flow 6   Cash Flow 7

Maturity - Duration continued

It is used to measure the 'sensitivity' of a bond or bond fund to yield movements. Conceptually, modified duration is a multiplier on yield movement – the impact it has on your returns.

As in the previous example, if the maturity of a bond fund is 9 years and modified duration is 5, if yield comes down by 1%, you will gain 5% over and above the accruals.

Word of caution: if yield moves up by 1%, you lose 5% from the accruals. It works both ways.

Long bond funds have a longer maturity and duration. The fund gains more when interest rates come down, and vice versa. Long bond funds should be sold only when interest rates are expected to come down, the client is on the same page and has risk appetite and adequate horizon.
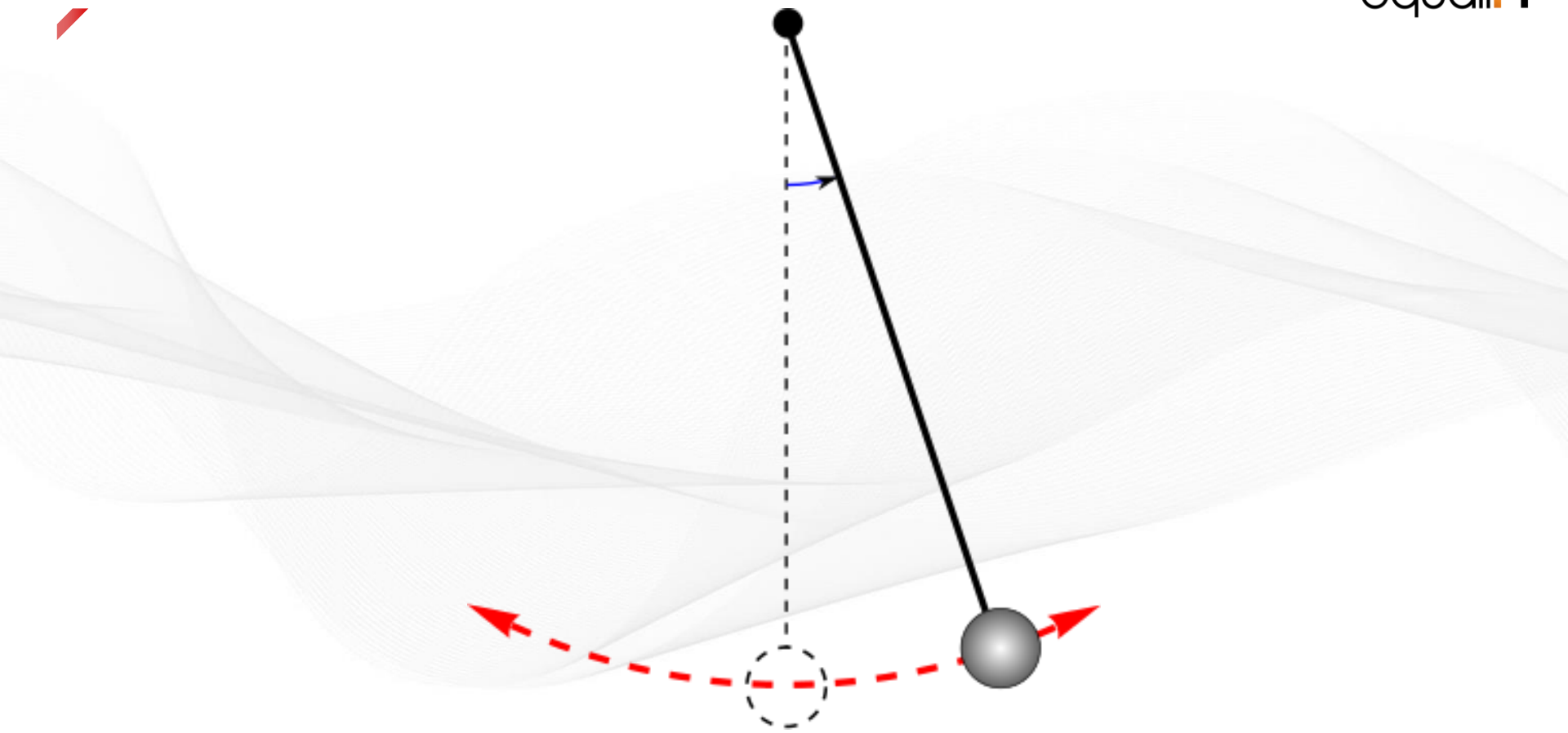
Break if required

Computation of Duration

Now let's understand the concept of duration. A fixed income security such as a bond usually provides a stream of cash flows until it matures.

These cash flows consist of coupon payments and principal repayment.

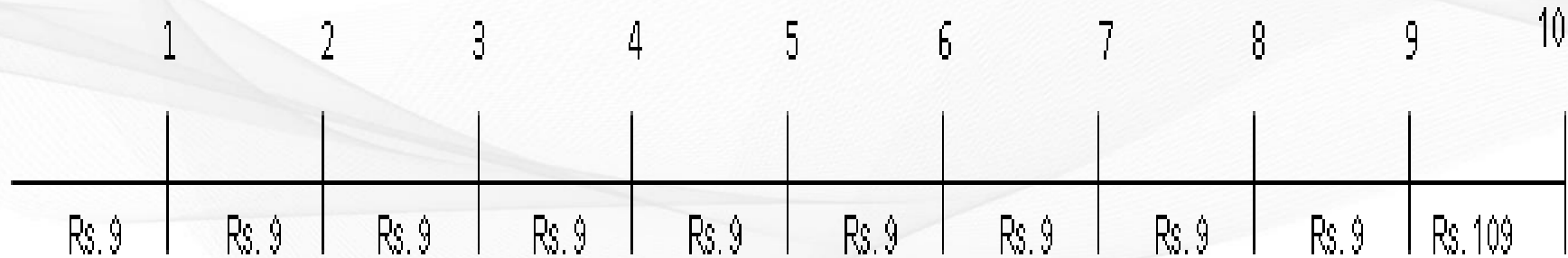Duration is the weighted average of the time until each of these cash flows is received. The weights used to calculate the duration is the proportion of the present value of the cash flows on the respective dates.

Illustration:

Settlement Date: April 1, 2017
- Maturity Date: April 1, 2027
- Coupon Rate: 9%
- Price: Rs. 95
- Redemption Value: Rs. 100 Present
- Yield to Maturity: 9.80% Coupon
- payment: Annual

Computation of Duration continued

1	2	3	4	5	6	7	8	9	10
Rs. 9	Rs. 9	Rs. 9	Rs. 9	Rs. 9	Rs. 9	Rs. 9	Rs. 9	Rs. 9	Rs. 109

Cash Flows from the bond

Computation of Duration continued

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Rs. 8.20 Rs. 7.47 Rs. 6.80 Rs.6.19 Rs. 5.64 Rs. 5.14 Rs. 4.68 Rs. 4.26 Rs. 3.88 Rs. 42.80

Present Value of
Cash Flows
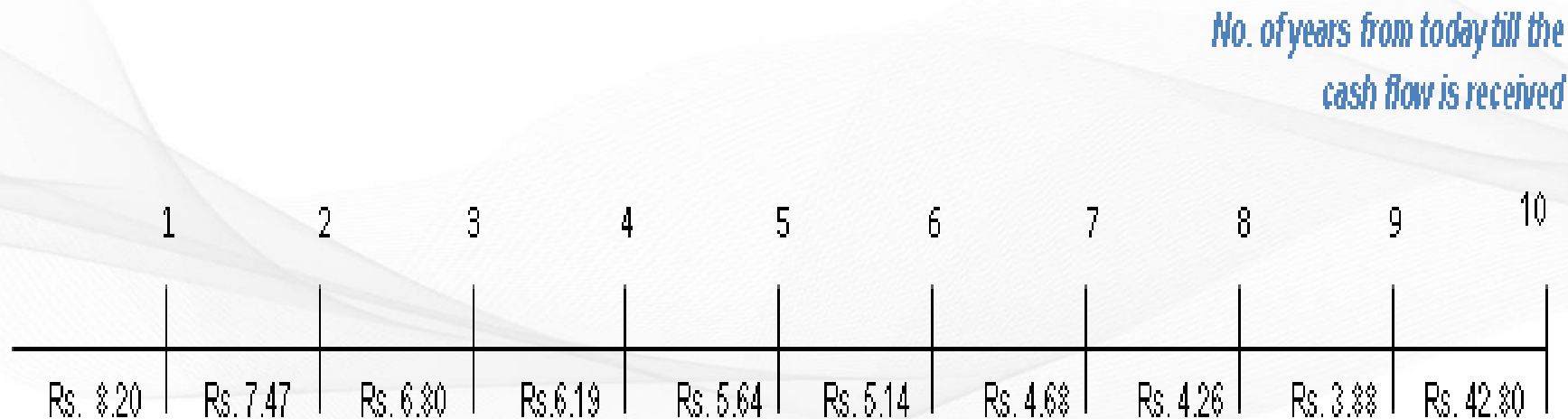
Total Present Value (Value of Bond) = **Rs. 95.04**

Computation of Duration continued

Year	Present Value Amount (Rs.)	Present Value Contribution (%)
1	8.20	8.62%
2	7.47	7.85%
3	6.80	7.15%
4	6.19	6.52%
5	5.64	5.93%
6	5.14	5.40%
7	4.68	4.92%
8	4.26	4.48%
9	3.88	4.08%
10	42.80	45.03%
Total	**95.04**	**100%**

Computation of Duration continued

(1)	(2)	(3)	-(2) x (3)
Cash Flow (Rs.)	No. of years until receipt of the cash flow (in years)	Present Value Contribution (%)	Weighted average
9	1	8.62%	-0.09
9	2	7.85%	-0.16
9	3	7.15%	-0.21
9	4	6.52%	-0.26
9	5	5.93%	-0.30
9	6	5.40%	-0.32
9	7	4.92%	-0.34
9	8	4.48%	-0.36
9	9	4.08%	-0.37
109	10	45.03%	-4.50
		100%	**-6.91**

Computation of Duration continued

What we calculated in the previous slide, 6.91, is Macaulay Duration, named after Frederick Macaulay who developed this concept.

There is one more concept of duration called as 'Modified Duration'. It has more practical relevance as it measures the price sensitivity of a fixed income security to changes in interest rates. Modified duration can be calculated from the Macaulay Duration as below:
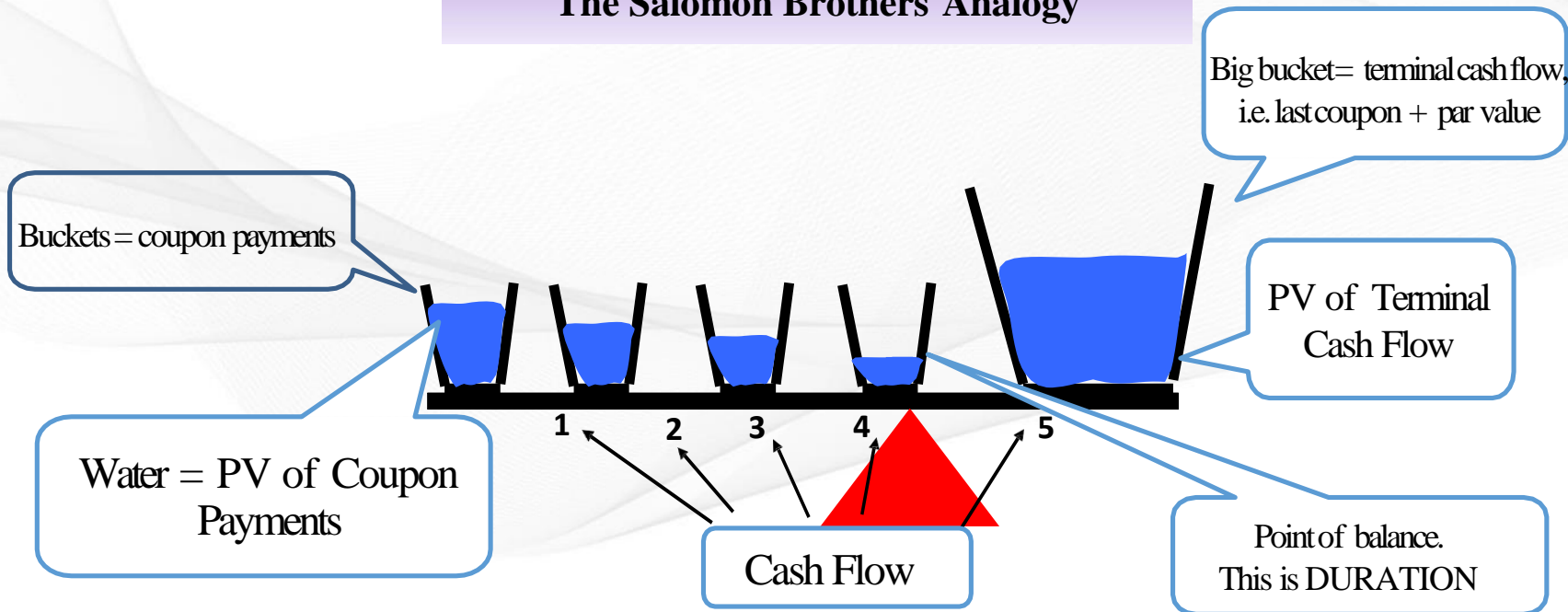
Modified Duration $\quad = \quad \dfrac{\rule{3cm}{0.4pt}}{}$ $\quad\quad \dfrac{-6.91}{(1 + 9.80\%)}$

The modified duration in our case works out to **-6.30.** This is slightly lower than the duration of 6.91 that we calculated earlier.

Duration

Duration can also be defined as the weighted average times interest and principal are received

The Salomon Brothers Analogy

Big bucket= terminal cash flow, i.e. last coupon + par value

Buckets = coupon payments

PV of Terminal Cash Flow

Water = PV of Coupon Payments

1   2   3   4   5

Cash Flow

Point of balance.
This is DURATION

Portfolio Duration

Portfolio managers often change the duration of their securities to manage changing Interest Rates

Interest Rate	Portfolio Manager Action
⬆	Lower Duration
⬇	Higher Duration

Convexity

Convexity as a measure is used to understand the limitations of duration.

If duration is a measure of sensitivity of bond prices to changes in yields, convexity is the measure of sensitivity of duration itself to changes in yields.

Convexity continued
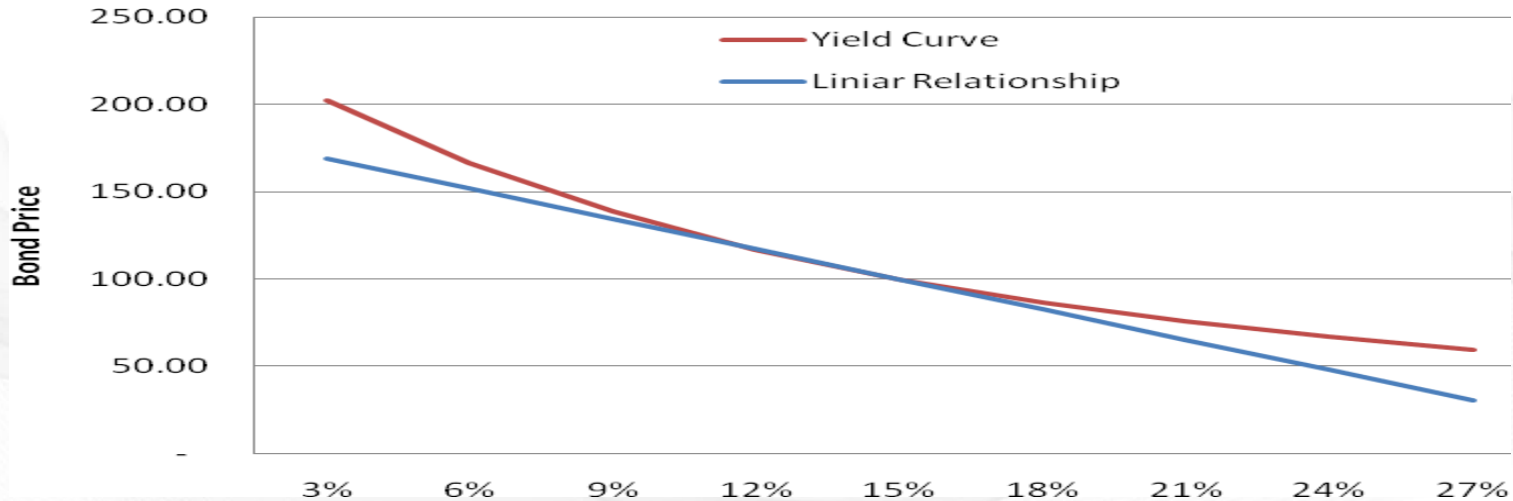
Duration assumes a linear relationship between yields and prices.

If duration were constant whatever be the current interest rates, the yield curve would have been a straight line (blue line in our chart above).

Convexity results in a curvature in the yield curve.

Convexity continued

Computation of convexity is very complex and it is highly unlikely that it is even as widely reported as durations and yields. For this reason we have skipped the mathematical calculation process of convexity. The key take away for you from this concept is that:

The concept of duration has theoretical limitations.

In a market with rising yields, duration will overestimate your loss. Taking 15% as the starting point, if the yields rose to 18%, the bond price will drop to Rs. 86.52. The duration measure indicates that price will drop to Rs.82.69. The disparity increases for larger changes in yields.

• In a market with falling yields, duration will underestimate your gains. If the yields were to fall to 9%, the price will actually rise to Rs. 138.51 while the price as indicated by duration would be Rs.134.62. Again the disparity is higher for larger changes in yields.

PVBP

Price Value of a Basis Point (PVBP) measures the change in price for one basis point (bps) change in yields and the change in price is measured in value terms rather than percentage terms. One basis point refers to 0.01%.

Modified duration measures the percentage change in price for a change in the yield levels.

PVBP as a concept is sometimes easier to apply than modified durations. This is because the change is measured in value terms which make it quicker to find out the price change.

Calculation of PVBP 9.15% GOVT.STOCK 2024

Date	Weighted Average Price (In Rs.)	Yield (%)	Change in Price (In Rs.)	Change in Yield (%)	PVBP (In Rs.)
15-Feb-12	106.85	8.25%	-0.01	-0.0152%	0.006579
14-Feb-12	106.86	8.27%	0.14	-0.0166%	-0.08434
13-Feb-12	106.72	8.28%	0.25	-0.0312%	-0.08013
10-Feb-12	106.47	8.31%	0.38	-0.0477%	-0.07966
09-Feb-12	106.09	8.36%	-0.11	0.0139%	-0.07914
08-Feb-12	106.2	8.35%	-0.38	0.0462%	-0.08225
07-Feb-12	106.58	8.30%	-0.19	0.0242%	-0.07851
06-Feb-12	106.77	8.28%	-0.31	0.0371%	-0.08356
03-Feb-12	107.08	8.24%	-0.02	0.0022%	-0.09091
02-Feb-12	107.1	8.24%	0.05	-0.0063%	-0.07937
01-Feb-12	107.05	8.24%			
					-0.07313

As is seen in the table above, the PVBP, or the Price Value of a basis point change in the yield on our benchmark bond is Rs. 0.07313 or 7.31 paisa. The figure above is negative as it reflects the inverse relationship between price and yield.
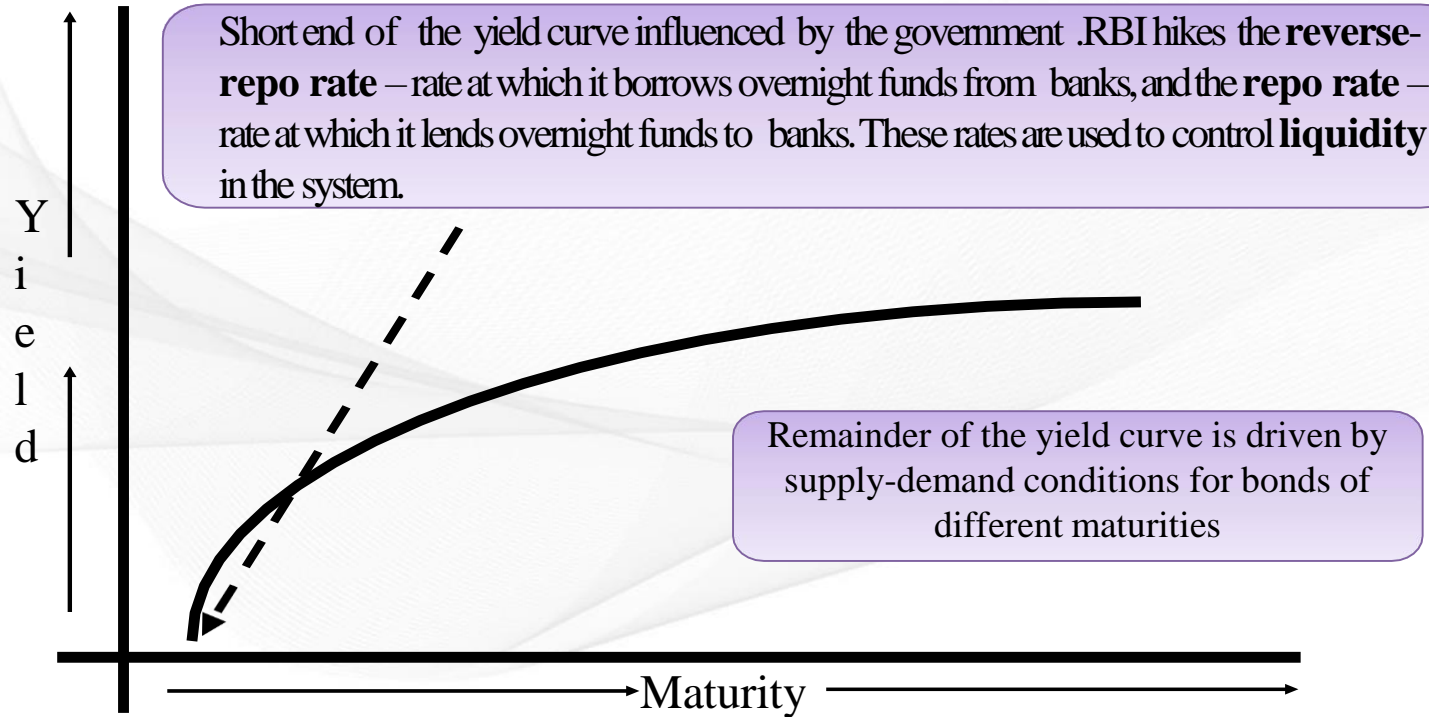
PV01 / DV01

The same concept as PVBP, expressed in dollar terms, is known as PV01 or DV01.

In other words, in the US market, this concept is called PV01 or DV01.

What determines the yield curve?

Short end of the yield curve influenced by the government .RBI hikes the **reverse-repo rate** – rate at which it borrows overnight funds from banks, and the **repo rate** – rate at which it lends overnight funds to banks. These rates are used to control **liquidity** in the system.

Remainder of the yield curve is driven by supply-demand conditions for bonds of different maturities

Yield

Maturity

The concept of yield spread

In a positive economic environment, the spread between Corporate and G-Sec contract, reflecting lower long- term default possibility in a lower interest rate environment.

High - yield

AAA Corporate

Gilts

Yield spreads are function of credit. Investment grade corporate have lower credit than G-sec, so other things being equal, G-sec will have lower yields than corporate at every maturity.

Maturity

High yield / Speculative grade bond market is not yet prevalent in India

Quiz

Bank A offers 8% interest on deposits. Bank B offers 8% interest with quarterly compounding. The effective interest rate in Bank B is (calculators not required, tick the nearest one).

A. 8%

B.   7.9%

C.   8.24%

D.   8.74%

Modified duration of a bond is

A.   Less than or equal to maturity of the bond

B.   Less than the bond

C.   More than the bond

D.   Anything i.e. less, equal to or more than the maturity of the bond

Quiz

Yield and price of a bond move

A.   In the same direction
B.   Inversely
C.   There is no correlation
D.   There is correlation, but random

A typical yield curve plots

A.   Yields across various maturities of a particular type of debt security
B.   Yields across various ratings of a particular type of debt security
C.   Yields across various types of debt securities of similar maturities
D.   Yields across various types of debt securities of similar credit rating

Quiz

The normal direction of a yield curve is?

A.   Upward sloping
B.   Downward sloping
C.   Flat
D.   No clear direction

Which of the following statements about Yield to Maturity (YTM) is NOT correct?

A.   YTM is an annualized value
B.   YTM takes into account the effect of compounding
C.   It assumes that the security would be held till maturity
D.   It assumes the intermittent cash flows are reinvested at the risk free rate

Thank You