



Security Valuation

Under this chapter, we will learn how to calculate actual value of security (Fair value or intrinsic value) and compare it with market price, in order to take decision whether to purchase a security or not

Bond Valuation: Intrinsic value of bond = Present Value of all future cash flows from bond using required rate of return from this bond

- If Bond is redeemable = PV of Interest Payment received from Bond + PV of Redemption Amount

Example:

Face Value of redeemable bond = Rs 1,000, Coupon Rate = 8%, Required Rate of Return (Kd) = 10%
Years to Maturity (n) = 2 years

$$\text{Intrinsic value} = \frac{80}{(1.10)^1} + \frac{80}{(1.10)^2} + \frac{1000}{(1.10)^2} = 965.30$$

- Intrinsic Value in case of Irredeemable bond is calculated by calculating **PV of Perpetual Interest received from this bond** = $\frac{\text{Interest Amount}}{Kd}$

Face Value of the bond = 1,000, Coupon Rate = 8%, Required Rate of Return (Kd) = 10%

$$\text{Intrinsic value} = \frac{80}{10\%} = 800$$

- Intrinsic value in case of Zero Coupon Bond = PV of Redemption amount = $\frac{\text{Face Value}}{(1+r)^t}$

ZCB Face Value (F) = 1,000 and was issued at Rs 900

Time to Maturity (n) = 5 years

Required Rate of Return (r) = 8%

$$\text{Intrinsic value} = \frac{1000}{(1+0.08)^5} = 680.58$$

Note: Zero-Coupon Bond is type of bond that does not pay periodic interest (coupons). Instead, it is issued at deep discount to its face (par) value and redeemed at its full face value.

Important note for Exam: If question does not specify otherwise, Face value of bond is assumed as Rs 100 and bonds are redeemed at par (face value)

Below 2 Concepts are taken from ICAI April 20 MTP Question (My QB Question 40)

Concept of Beta of Bond: Bond's beta captures how much bond price is expected to move relative to bond market index.

So to calculate expected market price of bond, we multiply Intrinsic value of bond with beta
Expected Market price of Bond = Intrinsic value of Bond x Beta of Bond

Note: If different yield rates for different years are given in question, then future cash flows are discounted using these different yield rates

Consider bond paying ₹100 annually for 3 years and ₹1,000 at maturity. Given yield rates:

Yield rate of 1 year bond: 5%

Yield rate of 2 year bond: 6%

Yield rate of 3 year bond: 7%

$$\text{PV of Future cash flows: } \frac{100}{(1.05)^1} + \frac{100}{(1.06)^2} + \frac{1100}{(1.07)^3} = 1082.16$$

From above it can be seen that if investor invests in a bond for one year, rate of interest will be 5%. However if he decides to invest in a bond today directly for two years rate of interest will be 6%

Now Understanding concept of forward rates:

Forward rate is a rate at which investor becomes indifferent between short term investment or long term investment

Which means 1 year investment then again 1 year investment = Directly 2 year investment

$$1 \left(1 + \frac{5}{100}\right) \left(1 + \frac{R}{100}\right) = 1 \left(1 + \frac{6}{100}\right)^2$$

Therefore (R) Forward rate for second year = 7%

When in question forward rates of different years are given then discounting will be done as follows:

$$\frac{\text{1st Year Cash Flow}}{(1+F1)} + \frac{\text{2nd Year Cash Flow}}{(1+F1)(1+F2)} + \frac{\text{3rd Year Cash Flow}}{(1+F1)(1+F2)(1+F3)} \text{ and so on...}$$

F1= Forward rate for 1st year

F2= Forward rate for 2nd Year

F3= Forward rate for 3rd Year

ICAI MTP Question

ABC Ltd. issued 9%, bonds of ₹ 1,000/- having a maturity of 3 years. The present rate of interest is 12% for one year tenure. It is expected that Forward rate of interest for next year tenure is going to fall by 75 basis points and further by 50 basis points for every next year in further for same tenure. This bond has a beta value of 1.02 and is more popular in the market due to less credit risk.

Calculate (i) Intrinsic value of bond (ii) Expected price of bond in the market.

(i) Intrinsic value of Bond : PV of Interest + PV of Maturity Value of Bond

Forward rate of interests

1st Year	12%
2nd Year	11.25%
3rd Year	10.75%

$$\text{PV of Interest} = \frac{90}{(1+0.12)} + \frac{90}{(1+0.12)(1+0.1125)} + \frac{1090}{(1+0.12)(1+0.1125)(1+0.1075)} = 942.48$$

(ii) Expected Price = Intrinsic Value x Beta Value = ₹ 942.48 x 1.02 = ₹ 961.33

Concept of Bond Yield: Return an investor earns on a bond investment

There are different types of bond yield:

- **Current Yield**
- **Yield to Maturity**

Current Yield: Measures return based on the bond's market price instead of face value.

Formula of current yield: $\frac{\text{Interest Payment}}{\text{Current Market Price of Bond}} \times 100$

Yield to Maturity (YTM): Measures return based on future cash inflows including redemption amount from particular bond

YTM = Rate at which Present value of (Future cash flows from bonds i.e. Interest and Redemption amount) equals to current market price of bond

So Basically we can say that if we discount the future cash flows from bond using YTM of Bond, we will get the current market price of Bond

Note: If Question asks us to calculate Interest on similar type of Bond, then we need to calculate YTM of our bond (**My QB Question 70**)

Below concept and formula was tested in ICAI RTP (My QB Question 69)

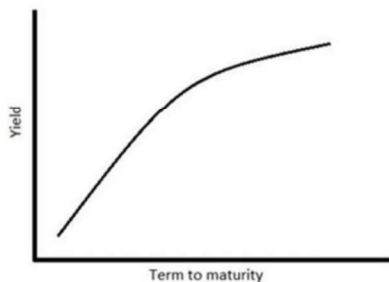
Note: If question asks us to calculate **Spread of Yield**, then formula will be =
= YTM of our Bond - YTM of similar Bond

Types of Yield curve:

Normal Yield Curve

- Occurs when long-term bonds have higher yields than short-term bonds.
- This happens in normal market situation where investors demand higher returns for longer commitments.

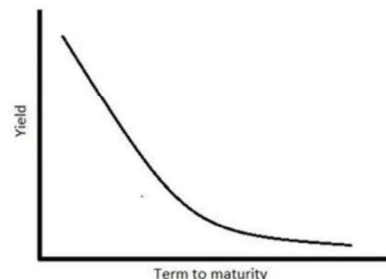
Normal Yield Curve



Inverted Yield Curve

- Occurs when short-term bonds have higher yields than long-term bonds.
- Indicates recession or economic slowdown, as investors expect lower interest rates future.

Inverted Yield Curve



Concept of Realized Yield:

- Realized yield refers to actual return earned on an investment, considering all cash flows received and any capital gains or losses upon selling investment before maturity.
- Unlike yield to maturity (YTM), which assumes that the investor holds the security until it matures, realized yield is based on actual holding periods and reinvestment rates.

Formula for realized yield: **Initial Investment** $\left(1 + \frac{\text{Realized Yield}}{100}\right)^n = \text{Total Cash flows received}$

where:

- Total Cash Inflows = Interest/Dividends received + Selling Price of the security
- Holding Period = Duration for which the investment was held

In question, initial investment, total cash flows received, holding period will be given: By putting these figures in above formula, we will derive realized yield

Example of Realized Yield

An investor buys 5-year bond with coupon rate of 6% (paid annually) and a face value of 1,000 at 950. The investor sells the bond after 2 years for 980.

Initial investment is 950

Total Cash flows received during 2 year holding period is $60 + 60 + 980 = 1100$

Realized yield will be: $950\left(1 + \frac{\text{Realized Yield}}{100}\right)^2 = 1100$

Therefore Realized yield will be 7.5%

Concept of Bond's Duration (Macaulay's Duration): It is weighted average time in years to measure how long, on average; it takes for an investor to get back all money they invested in a bond considering reinvestment of intermediate coupon payments

Which means no matter what the interest rate in market is, if we discount cash flows received at end of bond duration period using initial YTM rate*, we will get initial investment amount

OR

We can say if u sell the bond before maturity at end of bond duration period then our realized yield in this case will be equal to initial YTM (Note: To earn initial YTM of 14% investor has to hold bond till maturity, but Let us assume that interest rate in market changes, in that case also, investor can maintain his initial YTM of 14% if he sells bond at end of bond duration period i.e. 4 years)

***Discounting using initial YTM is because, investor initially expected 14% return p.a. from this bond at the time of initial investment**

Note: Cash flows received during bond duration are calculated considering reinvestment of intermediate coupon payment and selling of bond at end of bond duration period

Note: If we have to make a choice between 2 bonds, then Bond having lower duration will be chosen in comparison to bond having higher duration

Let us understand this with an example

Bond Details:

Face Value: Rs 1,000, Coupon Rate: 12%, Maturity: 5 years, YTM: 14%, CMP= 931.34

Steps to calculate bond's Duration:

1. Create a cash flow table of Bond and discount them by using YTM of bond

Years	Cash Flows	PV by 14% YTM
1	120	105.26
2	120	92.34
3	120	81.00
4	120	71.05
5	1120	581.69
		931.34

2. Calculate weight of Present value cash flows: $\frac{\text{Present Value of respective year}}{\text{Sum total of all PV cash flows}}$ And then multiply the weights by respective years

Years (a)	Cash Flows (b)	Present value (c)	Weights (d)	E = d x a
1	120	105.26	0.1130	0.113
2	120	92.34	0.0991	0.198
3	120	81.00	0.0870	0.261
4	120	71.05	0.0763	0.305
5	1120	581.69	0.6246	3.123
		931.34	1.0000	4.000

3. Sum total of Column E is duration of Bond i.e. 4 Years

Duration 4 years means it the weighted average time in which the investor get all the money he invested in a bond

Lets prove this: For this we need to calculate the cash flows received during these 4 years

Let us assume YTM in market is still 14%

Years (a)	Cash Flows in respective years (b)	Cash inflows reinvested till 4 th year end	
1	120	$120 \times (1.14)^3 =$	177.7853
2	120	$120 \times (1.14)^2 =$	155.952
3	120	$120 \times (1.14)^1 =$	136.8
4	120	$120 =$	120
4	Sale of Bond at end of 4 th year	$\frac{1120}{1.14}$	982.456
			1572.9933

So in the above example if we discount 1572.9933 received end of 4 years at Initial YTM rate (14%), we will get value of 931.34 i.e. our initial investment amount

So it can also be interpreted that our realized yield in this case will be equal to Initial YTM in bond duration period

$$\text{Realized yield will be} = 931.34 \left(1 + \frac{\text{Realized Yield}}{100}\right)^4 = 1575.1018$$

Therefore Realized yield will be 14%

Suppose after purchasing this bond, YTM in market changes to 10%.

Now even if YTM changed from 14% to 10%, present value of total cash flow received at end of 4 years will still be 931.34.

Lets prove this as well:

Years (a)	Cash Flows in respective years (b)	Cash inflows reinvested till 4 th year end	
1	120	$120 \times (1.1)^3 =$	159.72
2	120	$120 \times (1.1)^2 =$	145.2
3	120	$120 \times (1.1)^1 =$	132
4	120	$120 =$	120
4	Sale of Bond at end of 4 th year	$\frac{1120}{1.10}$	1018.1818
			1575.1018

So in the above example if we discount 1575.1018 received end of 4 years at 14% discount rate, we will get value of 931.34

So it can also be interpreted that our realized yield in this case will be equal to Initial YTM in bond duration period

$$\text{Realized yield will be} = 931.34 \left(1 + \frac{\text{Realized Yield}}{100}\right)^4 = 1575.1018$$

Therefore Realized yield will be 14%

So hence proved, bond duration is the period in which investor recovers all his initial investment amount irrespective of rate of interest in market

This happened because lower reinvestment income of coupons is offset by higher sale value of bond since 5th year value is discounted by lower rate of 10%

In the above case, interest rate changed to 10%, and by selling bond after 4 years our realized Yield was equal to initial YTM i.e 14%

But let us say, in above case we do not sell the bond at end of 4 years but hold it till maturity in that case u can see our realized yield got reduced and it will be 13.22% only

Let us calculate realized yield in this case

Years (a)	Cash Flows in respective years (b)	Cash inflows reinvested till maturity	On Maturity actual inflows
1	120	$120 \times (1.1)^4$	175.692
2	120	$120 \times (1.1)^3$	159.72
3	120	$120 \times (1.1)^2$	145.2
4	120	$120 \times (1.1)^1$	132
5	1120	1120	1120
			1732.612

$$\text{Realized yield will be} = 931.34 \left(1 + \frac{\text{Realized Yield}}{100}\right)^5 = 1732.612$$

Therefore Realized yield will be 13.22%

So the crux is if the YTM in the market changes, the bondholder can still maintain his initial YTM if he sells the bond at the end of bond duration period

Concept of Modified Duration or Volatility of Bond: which tells us percentage change in bond price for a 1% change in YTM of bond

$$\text{Formula to calculate volatility of Bond} = \frac{\text{Duration of Bond}}{(1 + YTM)}$$

For Eg: If volatility of bond as per above formula comes out to be 3, this means

- if YTM increases by 1%, Bond price will decrease by $1 \times 3 = 3\%$
- if YTM decreased by 1%, Bond price will increase by $1 \times 3 = 3\%$

Concept of Convexity of Bond:

- Duration assumes a linear price-yield relationship, but in reality, bond prices move in a curved (convex) manner when interest rates change.
- Convexity corrects duration errors, especially for large interest rate movements.
- Higher convexity means the bond price is less affected by interest rate changes, which benefits investors.

$$\text{Convexity of Bond in percentage (\%)} = C \times (\Delta Y)^2 \times 100, \text{ where } C = \frac{V_+ + V_- - 2V_0}{2V_0 (\Delta Y)^2}$$

ΔY = Change in Yield in decimals

V_0 = Initial price of Bond

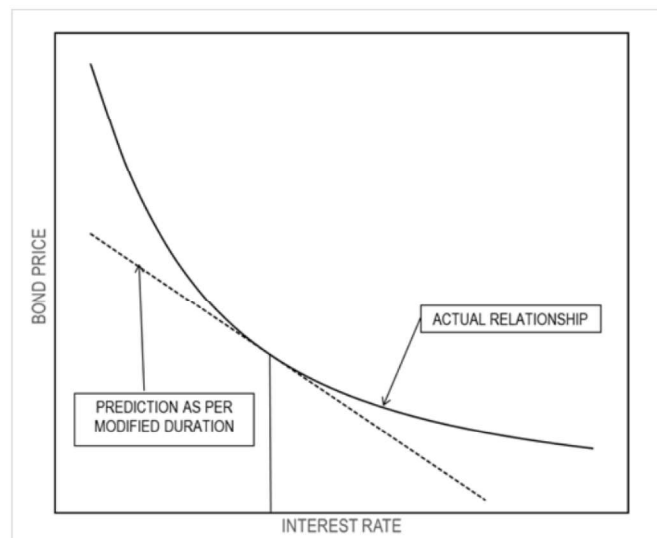
V_+ = Bond price if yield increases by ΔY

V_- = Bond price if yield decreases by ΔY

% Change in Bond price using convexity of bond =

If YTM increases:	If YTM decreases:
% Change in market price of bond using volatility of bond - Convexity of Bond calculated above	% Change in market price of bond using volatility of bond + Convexity of Bond calculated above

The convexity effect has been shown in the following diagram:



Concept of Bond Immunization:

- Bond Immunization is risk management strategy that protects bond portfolio from interest rate fluctuations. It ensures that changes in interest rates do not affect portfolio's ability to meet future obligation
- When rates rise, bond prices fall, and vice versa. Goal is to ensure that changes in interest rates do not affect portfolio's ability to meet future liabilities.
- This is done by matching duration of assets (bonds) with duration of liabilities (future payments).
- So under Bond immunization we match duration of bond portfolio with duration of future liabilities which Ensures that any loss in bond value due to interest rate increases is offset by increased reinvestment income.

Example: RG has a liability to pay Rs 665.5 after 3 years and RG has to invest such an amount in bonds today so that after 3 years invested amount amounts to 665.5 and RG can pay his liability. YTM is 10%. So RG has to invest Rs 500 today in a bond.

And in market there are two types of bonds available

4 Years Bond: Which has a duration of 2 years

5 Years Bond: Which has duration of 3 years and will pay following cash flows in 5 years:

Year 1	Year 2	Year 3	Year 4	Year 5
110	121	133.1	146.41	161.05

So in this particular case, to get an amount of 665.5 after 3 years, we will select a bond which has a duration of 3 years, since I explained earlier that if u sell the bond at end of bond duration period, your realized yield will be equal to initial YTM no matter what the interest rate in the market is OR in another terms PV of total amount received at end of bond duration period will be equal to initial investment made

So let us say we invested in 5 years bond which has a duration of 3 years. Let us check whether we get 655.5 at end of 3 years or not

Assuming YTM is market is 10% only

Years (a)	Cash Flows in respective years (b)	Cash inflows reinvested till 3 th year end	Actual inflows at end of 3 rd year
1	110	$110 \times (1.1)^2$	133.1
2	121	$121 \times (1.1)^1$	133.1
3	133.1 Sale of Bond at end of 3 rd year	$133.1 + \frac{146.41}{1.10} + \frac{161.05}{1.10^2}$	133.1 265.917
			665.217

Assuming YTM is market is 20%

Years (a)	Cash Flows in respective years (b)	Cash inflows reinvested till 3 th year end	Actual inflows at end of 3 rd year
1	110	$110 \times (1.2)^2$	158.4
2	121	$121 \times (1.2)^1$	145.2
3	133.1 Sale of Bond at end of 3 rd year	$133.1 + \frac{146.41}{1.20} + \frac{161.05}{1.20^2}$	133.1 233.85
			670

So we can see that even if YTM changes the amount to be received at end of 3rd year is almost close to 655.217 only

Bond Refunding Decision: Sometimes after issue of bonds by company, interest rate in market falls, due to which company may decide to refund old bond and issue new bonds with lower interest rate
For Eg: Company issued 10 year bonds which has coupon rate of 10%, after 4 years interest rate in market falls to 8%, so company may here decide to refund old 10% bonds and issue new 8% bonds

To decide whether to refund bonds or not, we will calculate the NPV of bond refunding decision as per below method. If NPV is positive we take bond refunding decision otherwise not to take decision

Format to solve Bond refunding question is: (Format Taken from MTP Nov 21) (My QB Ques 47)

NPV of Bond Refunding Decision =

PV of Annual Cash flow savings calculated as per Step 2 Below	xx
Note: Discounting rate to be used for calculating PV of Annual cash flow should be after tax cost of debt if given in question otherwise use after tax cost of new bonds	
Less: Initial Investment calculated as per Step 1 Below	(xx)
NPV of Bond Refunding Decisions	xx

Step 1: Calculate Initial Investment

1. [Call Premium - (Tax saving on Call Premium i.e. Call Premium x Tax Rate)]	xx
2. Floatation cost on issue of new bonds	Xx
3. Overlapping Interest on old bonds - Tax savings on Overlapping Interest	xx
4. Tax savings on writing off of unamortized discount on old bonds	(xx)
5. Tax savings on writing off of unamortized floatation cost on old bonds	(xx)
TOTAL	xx

Step 2: Annual Cash Flow savings = Annual cost on old bonds (A) - Annual cost on new bonds (B)

Calculate Annual cost on old bonds (A)

1. Interest cost on old bonds - Tax savings on interest on old bonds	xx
2. Tax savings on amortization of discount on issue of old bonds	(xx)
3. Tax savings on amortization of floatation cost on issue of old bonds	(xx)
TOTAL	xx

Calculate Annual cost on New bonds (B)

1. Interest cost on new bonds - Tax savings on interest on new bonds	xx
2. Tax savings on amortization of discount on issue of new bonds	(xx)
3. Tax savings on amortization of floatation cost on issue of new bonds	(xx)
TOTAL	xx

Concept of Convertible Bonds: Sometimes company issues bond with an option with bondholder to convert the bond into specified number of shares after specified period of time

When to Convert? If bond's value in stock form is higher than keeping it as bond, conversion makes sense.

Some Formulas to be used for Question solving purposes:

These formulas are taken from ICAI material Example (My QB Question 24)

1. Conversion Value: Total value of shares you get if you convert the bond. Also called as stock value of bond	Formula = Number of shares per bond × Market Price per Share
2. Conversion Premium	Formula = Market price of convertible bond - Conversion value of convertible bond If conversion premium is to be calculated in % terms: Formula = $\frac{\text{Market Price of Bond} - \text{Conversion Value}}{\text{Conversion Value}} \times 100$ If conversion premium is to be calculated per share: Formula = $\frac{\text{Conversion Premium}}{\text{Number of shares per Bond}}$
3. Straight Value of Bond: Bond's value if conversion option not available (calculated using normal bond valuation).	Formula: Present Value of Future Cash Flows from Bond
4. Downside Risk Percentage: Percentage risk if stock price drops and conversion becomes unattractive.	Formula: $\frac{\text{Market price of bond} - \text{Straight value of Bond}}{\text{Market Price of Bond}} \times 100$
5. Premium over straight value: How much more investors are willing to pay over bond's normal value.	Formula: $\frac{\text{Market price of bond} - \text{Straight value of Bond}}{\text{Straight Value of Bond}} \times 100$
6. Market Conversion Price OR (Conversion Parity Price): Price at which shares must trade for conversion to be fair.	Formula = $\frac{\text{Market Price of Bond}}{\text{Number of shares per Bond}}$
Below 2 Formulas are taken from SFM Assignment released by ICAI in year 2021	
7. Favourable Income Differential per Share:	Formula = $\frac{\text{Coupon Interest from Bond} - (\text{Number of shares per bond} \times \text{Dividend per share})}{\text{Number of shares per bond}}$
8. Premium Payback Period:	Formula = $\frac{\text{Conversion Premium per Share}}{\text{Favorable Income Differential per Share}}$

Money Market Instruments: short-term financial securities that provide liquidity and low-risk investment options. These instruments are issued by governments, banks, and corporations to manage short-term funding needs. Examples: Treasury Bills, Commercial Papers, Certificate of deposit etc

These instruments are issued at discount and redeemed at face value.

There are 2 types of yield in Money market instruments:

Discount Yield : Percentage of discount at which market market instrument is issued

$$\text{Formula} = \frac{\text{Face Value} - \text{Purchase price}}{\text{Face Value}} \times 100 \times \frac{12/365}{\text{Number of months/ days}}$$

Investment Yield/ Bond Equivalent Yield/Nominal Interest: return an investor earns from a money market instrument. It shows how much profit you make compared to your investment.

$$\text{Formula} = \frac{\text{Face Value} - \text{Purchase price}}{\text{Purchase Price}} \times 100 \times \frac{12/365}{\text{Number of months/ days}}$$

Face Value = The amount received at maturity.

Purchase Price = The price paid to buy the instrument.

Eg: Suppose you buy Treasury Bill for ₹9,800, and after 91 days, government repays you ₹10,000.

$$\text{Investment yield} = \frac{10000 - 9800}{9800} \times 100 \times \frac{365}{91} = 8.19\% p. a.$$

Below concept taken from MTP of ICAI (My QB Question 86)

Concept of Effective Annual Return (EAR) / Effective Annual Interest (EAI)

EAR adjusts return to reflect the impact of compounding over full year

$$\text{Formula of EAR} = \left(1 + Y \times \frac{\text{Number of Days/ Months}}{365/12} \right)^{\frac{365/12}{\text{Number of Days/ Months}}} - 1$$

Let us understand above formula with an example:

1. Let's say we invest for 91 days with Investment yield of 5%.

$$\text{Periodic return for 91 days} = 1 + \frac{Y \times n}{365} = 1 + \frac{0.05 \times 91}{365} = 1.01247\%$$

This means in 91 days, the money grows by 1.247%.

2. **Compounding the Return Over 1 Year:** $1.247 \frac{365}{61}$

The exponent $\frac{365}{91} = 4.01$ means this 91-day return could be earned 4.01 times in full year if reinvested.

Raising 1.01247 to this power ensures the interest builds on itself over the year.

3. **Final Calculation:** $(1.01247)^{4.01} = 1.0513$

This means after a year, ₹1 would grow to ₹1.0513 if reinvested every 91 days.

Subtracting 1 gives the Effective Annual Return (EAR) = 5.13%.

Why is This Important?

- **Without compounding:** The return would simply be 5%
- **With compounding:** The return increases to 5.13%

This concept is taken from old course SFM Questions (My QB Question 58)

Concept of Cost of Funds in case of Commercial Papers (CP):

When company issues Commercial Paper (CP) to raise money, it does not receive full face value of the CP. Instead, it receives a lower amount due to discounting and issuance expenses. The cost of funds helps company determine actual cost of raising money through CP.

Formula to calculate cost of Funds =

$$\frac{(Interest\ Expense + Issue\ Expenses)(1 - Tax\ Rate)}{Net\ Proceeds\ received\ by\ company} \times \frac{365/12}{Number\ of\ days/Months} \times 100$$

Net Proceeds received by company =

Issue price - Issue Expenses - Minimum Bank Balance requirement

Note:

Many CP issuances require company to maintain minimum balance in bank account as condition of issue. This portion of the money is not available for business operations and effectively reduces actual funds available from the CP issue. Since company can't use it, it should not be counted as part of the net amount received in the cost calculation.

Repurchase Agreement (Repo) Transaction in Money Market

Repurchase Agreement (Repo) is short-term borrowing arrangement used by banks in money market. In this, one bank sells Government of India (GOI) bonds to another bank to raise funds. At same time, selling bank agrees to buy back bonds after certain period by paying interest (repo rate) on borrowed money.

How Does a Repo Transaction Work? (Below Steps derived from ICAI module Example)

Step 1: Initial Funds Raised also called as Start Proceeds or First Leg

- Bank raises money by selling GOI bonds. Amount it receives is called Start Proceeds, which is calculated as: **GOI Bond Sales Amount = Number of GOI Bonds Sold × Dirty Price**
- But since banks sometimes need to keep an initial margin, the actual amount received is:
Start Proceeds = GOI Bond Sales Amount - Initial Margin

Key Terms:

- Dirty Price** = Clean Price + Accrued Interest
- Clean Price** = Market price of the bond when the last interest was paid.
- Accrued Interest** = Unpaid interest earned by the bond till date.

$$Accrued\ Interest = \frac{Face\ Value \times Coupon\ Rate \times Accrued\ Interest\ Days}{365}$$

Step 2: Amount to be Paid at Repurchase also called as Second Leg

When bank repurchases GOI bonds at agreed time, it has to return borrowed money along with interest at Repo Rate.

Repurchase Amount = Start Proceeds + Repo Interest

$$Repo\ Interest = \frac{Start\ Proceeds \times Repo\ Rate \times Days\ of\ Repo\ transaction}{365}$$

ICAI Example

Bank A enter into a Repo for 14 days with Bank B in 10% Government of India Bonds 2028 @ 5.65% for ₹ 8 crore. Assuming that clean price (price that does not have accrued interest) be ₹ 99.42 and initial Margin be 2% and days of accrued interest be 262 days. You are required to determine:

- Dirty Price
- Repayment at maturity. (Consider 360 days in a year)

(i) **Dirty Price** = Clean Price + Interest Accrued

$$= 99.42 + \frac{100 \times 10\% \times 262}{360} = 106.70$$

(ii) **First Leg (Start Proceed)**

$$= \text{Nominal Value} \times \frac{\text{Dirty Price}}{100} \times \frac{100 - \text{Initial Margin}}{100}$$

$$= ₹ 8,00,00,000 \times \frac{106.70}{100} \times \frac{100 - 2}{100} = ₹ 8,36,52,800$$

Second Leg (Repayment at Maturity) = Start Proceed + Repo Interest

$$= ₹ 8,36,52,800 + (83652800 \times 5.65\% \times 262/360) = ₹ 8,38,36,604$$

Valuation of Equity shares:

Under this we will calculate Intrinsic value/ Fair value of Equity share and compare it with current market price to make a decision whether to buy or sell the share

- If Intrinsic value of Equity share calculated above < Current Market price, Equity share is over priced and we should sell the share
- If Intrinsic value of Equity share calculated above > Current Market price, Equity share is under priced and we should buy the share
- If Intrinsic value of Equity share calculated above = Current Market price, Equity share is fairly priced and we should buy the share

1. Where dividend will be received perpetually with constant growth assumption (Gordon Growth Model)

Cost of Equity formula we have studied: $K_e = \frac{D_1}{P_0} \times 100 + g$

$$\text{Intrinsic value of share (P}_0\text{)} = \frac{D_1}{K_e - g}$$

D ₁	= Expected dividend to be paid next year = D ₀ (1 + g)
K _e	= Cost of equity for issuer/ Rate of return for investor
G	= Growth Rate = Retention ratio (b) × Return on equity (r)
D ₀	= Dividend pays/paid by the company/ Dividend is given in income statement

Example: Suppose company is expected to pay dividend of ₹5 next year (D₁=5), and dividends are expected to grow at a constant rate of 6% per year (g=6% or 0.06). The required rate of return on the stock is 12% (K_e =12% or 0.12).

$$\text{Intrinsic value} = \frac{5}{0.12 - 0.06} = 83.33$$

2. Where dividends will be received perpetually with VARIABLE growth assumption,
then value of equity share = PV of Dividend + PV of Future Market Price

In this case, if question has given P_0 and asks us to calculate cost of equity K_e , then K_e will be the rate at which PV of inflows from share will be equal to P_0 . Here K_e will be calculated by Trial and error method. (Refer Q6 of my QB for example of Trail and Error method)

Example: A company currently pays a dividend of ₹10 per share, expected to grow as follows:

First 3 years: Variable growth rates: 10%, 8%, and 6%

After 3 years: Constant growth at 4% per year and Required rate of return (r): 10%

Step 1: Calculate Dividend for first 3 years and then calculated their present value

	Dividend Amount	Present Value of Dividend
Year 1	$10 (1 + 0.10) = 11$	$\frac{11}{1.10} = 10$
Year 2	$11 (1 + 0.08) = 11.88$	$\frac{11.88}{(1.10)^2} = 9.82$
Year 3	$11.88 (1 + 0.06) = 12.59$	$\frac{11.88}{(1.10)^3} = 9.46$
		29.28

Step 2: Calculate share price at end of 3 years by using Gordon growth model

$$= \frac{D_1}{K_e - g} = \frac{12.59 (1 + 0.04)}{0.10 - 0.04} = 218.33$$

This share price is of 3rd year's end, we have to discount it and calculate its present value as of today

$$\text{Present value} = \frac{218.33}{(1.10)^3} = 164.04$$

Step 3: Add PV of Dividend and PV of Future Market Price

$$= \text{Rs } 29.28 + \text{Rs } 164.04 = \text{Rs } 193.32$$

3. Where share purchased will be sold after a specified period, Intrinsic value of share =
PV of Dividend expected to be received till it is sold + PV of sale price of share

In this case, if question has given P_0 and asks us to calculate cost of equity K_e , then K_e will be the rate at which PV of inflows from share will be equal to P_0 . Here K_e will be calculated by Trial and error method

Example: Suppose you purchase a share today and plan to sell it after 3 years. The share is expected to pay annual dividends of ₹5 per year for the next 3 years. At the end of 3 years, you expect to sell the share for ₹120. The required rate of return (discount rate) is 10% per annum.

$$\text{Intrinsic Value of Share} = \frac{5}{1.10} + \frac{5}{(1.10)^2} + \frac{130}{(1.10)^3} = 102.62$$

This concept and formula are taken from ICAI Example (My QB Question 8)

Note: When question asks us to calculate Expected Rate of Return/ Cost of equity using CAPM method then $K_e = R_f + b(R_m - R_f)$

Where

R_f = Risk free rate of return

B = Beta of security

R_m = Market rate of return

$R_m - R_f$ = Market risk Premium

$b(R_m - R_f)$ = Security risk Premium

This concepts and formulas are taken from ICAI Example (My QB Question 10)

Valuation of Equity share on basis of Free cash flow to Equity (FCFE) approach: $P_o = \frac{FCFE(1+g)}{K_e - g}$

EPS	xx
Less: [(CE per Share + Dep per share - Change in WC per Share) * % of investment financed by equity holders]	(xx)
Free Cash Flow to Equity	xx

This concepts and formulas are taken from ICAI Example (My QB Question 4)

Valuation of Equity shares on PE Multiple approach: $PE \text{ Multiple} = \frac{MPS}{EPS}$

PE Ratio can also be calculated by $= \frac{1}{ROE}$, since $ROE = \frac{EPS}{MPS}$

Valuation of Equity share based on Earnings growth model: $P_o = \frac{EPS(1+g)}{ROE - g}$

This concepts and formulas are taken from ICAI Example (My QB Question 7)

Valuation of Equity share based on Accounting based model:

$P_o = \frac{\text{Actual Yield on Equity share in \%} \times \text{Paid up value of Equity share}}{\text{Expected Yield on Equity share in \%}}$

Where,

Actual Yield on Equity share in % = $\frac{\text{Yield on Equity shares}}{\text{Equity share capital}} \times 100$

Expected Yield on Equity share in % =

Normal return on ES of companies similarly placed in market +/- Risk Premium of our company

Valuation of Equity share based on Walters model: $P_o = \frac{DPS + (EPS - DPS) \frac{ROE}{K_e}}{k_e}$

Concept of Right Issue Valuation:

A right issue allows existing shareholders to buy additional shares at a discounted price.

Formulas:

1. **Theoretical Ex-right Price** = This gives the expected price after the right issue.

$$= \frac{(\text{Existing MPS} \times \text{Existing Shares}) + (\text{Right Issue Price} \times \text{Right Shares})}{\text{Total Shares after right issue}}$$

2. **Value of Right per share: Estimated loss per share if a person renounces his right**

$$= \text{Current Market Price} - \text{Theoretical Ex right price per share}$$

3. **Value of Right: Total loss if a person renounces his right** = Total Number of original shares x Value of right per share

Consequence of exercising rights issue by shareholder: No profit/ loss to shareholder

- **Before Issue:** Original Shares x Existing Market Price
- **After Right Issue:** Total Shares (New + Old) x New Market Price **Less** Payment for new shares

Consequence of selling rights by shareholder: No profit/ loss to shareholder

- **Before Selling Rights:** Original Shares x Existing Market Price
- **After Selling Rights:** (Original Shares x New Market Price) + Sale Proceeds from Rights

Consequence of ignoring right issue by shareholder: Loss occurs as the market price falls post-issue.

- **Value Before Issue:** Original Shares x Existing Market Price
- **Value After Issue:** Original Shares x New Market Price

ICAI EXAMPLE

ABC Limited's shares are currently selling at ₹ 13 per share. There are 10,00,000 shares outstanding. The firm is planning to raise ₹ 20 lakhs to Finance a new project.

Required: What are the ex-right price of shares and the value of a right, if

- The firm offers one right share for every two shares held.
- The firm offers one right share for every four shares held.
- How does the shareholders' wealth (holding 100 shares) change from (i) to (ii)? How does right issue increases shareholders' wealth?

(i) Number of shares to be issued: 5,00,000 Subscription price = ₹ 20,00,000 / 5,00,000 = ₹ 4 Ex-right Price=(₹1,30,00,000 + ₹20,00,000)/15,00,000 = ₹10 Value of a Right = ₹ 10 - ₹ 4 = ₹ 6 Value of a Right Per Share Basis = (₹ 10 - ₹ 4)/2 = ₹3	(ii) Number of shares to be issued: 2,50,000 Subscription price ₹ 20,00,000 / 2,50,000 = ₹ 8 Ex-right Price = (₹1,30,00,000 + ₹20,00,000)/12,50,000 = ₹12 Value of a Right = ₹ 12 - ₹ 8 = ₹ 4 Value of Right Per Share Basis = (₹ 12 - ₹ 8)/4 = ₹1
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(iii) Calculation of effect of right issue on wealth of Shareholder's wealth who is holding 100 shares.

(a) When firm offers one share for two shares held.

Value of Shares after right issue (150 X ₹ 10)	₹ 1,500
Less: Amount paid to acquire right shares (50 X ₹ 4)	<u>₹ 200</u>
	<u>₹ 1,300</u>

(b) When firm offers one share for every four shares held.

Value of Shares after right issue (125 X ₹ 12)	₹ 1,500
Less: Amount paid to acquire right shares (25 X ₹ 8)	<u>₹ 200</u>
	<u>₹ 1,300</u>

(c) Wealth of Shareholders before Right Issue ₹ 1,300

Thus, there will be no change in the wealth of shareholders from (i) and (ii).

Decision whether to raise additional funds through Debt Financing or Equity Financing.

Above concept taken from Nov 19 ICAI Main Exam Question Paper (My QB Question 59)

- Decision whether to raise additional funds through Debt Financing or Equity Financing.
We will simply calculate the market price of share under both the alternatives and will select the alternative which yield more market price

How to reflect information of new project or expansion scheme in share Price

Above Concept taken from RTP Question (My QB Question 10)

Value of Equity share is here calculated as : Formula =
$$\frac{(\text{Total Assets} - \text{Total Liabilities})}{\text{Total number of shares}}$$

Expected share price of company (Format taken from RTP Question of ICAI)

1. The existing Market Value	-
2. Expected NPV from new investment	-
3. Proceeds of New Issue	-
4. Issue Cost of shares	-
5. Gain/ Loss on early redemption of bonds = Value of Bond Today - Redemption amount of bond	-
6. Penalty charges	-
7. Expected Total Market value (1+2+3+4+5+6)	TOTAL
8. Total number of shares (Existing + New)	-
Expected Share Price of Company (7 ÷ 8)	-

Concept of Stock Lending scheme (Concept and Format Taken from RTP May 22 Question)

Process of Stock Lending & Borrowing:

1. Lender (Investor) → Lends shares to Short Seller
2. Short Seller → Sells shares in the market
3. Later, Short Seller → Buys back shares & returns them to Lender

Lender's Earnings calculation:

Total Earnings per share = Dividend received per share + Lending Fees per Share
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Borrowers Profit/ Loss Calculation

Profit or Loss from Short Selling: (Share Price at Start - Share Price at End)	xx
Lending Fees per Share	xx
Bank Guarantee Charges = (Share Price at Start × Guarantee Cost % × Borrowing Duration/12)	xx
TOTAL Profit or Loss per share	xx