“Time Value of Money, a must for every decision in Finance”

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Time Value of Money, is in the heart of every decision in Finance including Equity Research and Business Valuations

How to find time value of money?

- **Compounding:**
  1. Future value of a single cash flow
  2. Future value of a multiple cash flow
  3. Future value of an annuity.
  4. Sinking Fund Factor (SFF)

- **Discounting**
  1. Present value of a single cash flow
  2. Present value of a multiple cash flow
  3. Present value of an annuity.
  4. Capital Recovery Factor (CRF)

What is Annuity?

Fixed:
Amount
Period
Interval
Interest

What is Perpetuity?

Annuity without Fixed period

Effective And Nominal Rate Of Interest

- **NOMINAL INTEREST RATE:** Rate specified on an annual basis on a loan agreement or security
- **EFFECTIVE INTEREST RATE**: The actual rate of interest paid when compounding is done more than once a year.
- Effective interest rate > Nominal Interest rate
- Relationship between effective and nominal interest rate

$$r = \left(1 + \frac{k}{m}\right)^{m} - 1$$

- where, r is the effective rate of interest

k is the nominal rate of interest

m is the frequency of compounding per year.

- **Example:** On a particular saving scheme, a bank is offering an interest rate of 9% compounded quarterly. What is the effective rate of interest being offered by the bank?

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- **Example:** On a particular saving scheme, a bank is offering an interest rate of 9% compounded quarterly. What is the effective rate of interest being offered by the bank?
- **Solution:**

The effective rate of interest can be computed as:

$$r = \left(1+\frac{k}{m}\right)^m - 1$$

$$= \left(1+\frac{0.09}{4}\right)^4 - 1 = 9.31\% \text{ p.a. compounded quarterly.}$$

Is Effective Interest Rate same as IRR ?

“Compounding”

Compounding is to find future value of present cashflow.

Future Value Investment Factor (FVIF)

$$FV_n = A\,(1+k)^n$$

- **Example:** Let us find the value of Rs 1,000 (which we have invested now), at the end of 3 years given that the rate of interest earned by it is 4%.

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- **Solution:** Future value = Present value $(1+k)^n$

Future value = 1000 $(1+0.04)^3$ = Rs 1,124.86.

What if compounding is on monthly / quarterly or half yearly basis?

- In such case, FVIF would be computed as:

$FV_n = A\ (1+(k/m))^{n*m}$

- Where m is frequency of compounding in a year.
- So in case of half yearly compounding, m will be = 2 and
- In case of monthly compounding, m will be = 12
- And n is number of years for which compounding is to be done.

Future Value Of Multiple Cash Flows

- The future value of multiple cashflows can be computed as follows:

$$FV_n = A_1 (1+k)^n + A_2 (1+k)^{n-1} + A_3(1+k)^{n-2}$$

- **Example:** Ram invests Rs 1500 at the beginning of the first year (or in other words at the end of 0^{th} year); Rs. 2,000 at the beginning of the second year and Rs 5,000 at the beginning of third year at a rate of interest 5% per annum. What will be the accumulated value of all these cash outflows at the end of the third year?

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- **Solution:**

The accumulated value which Ram will get at the end of three years will be:

$= 1,500\ (1+.05)^3 + 2,000\ (1+0.05)^2 + 5,000\ (1+0.05)^1$

$= 1,500\ (1.158) + 2,000\ (1.1025) + 5,000\ (1.05) = 1737 + 2205 + 5250 =$ Rs 9,192.

Future Value Investment Factor of An Annuity (FVIFA)

$FVIFA_n = A(1+k)^n + A(1+k)^{n-1} + \ldots\ldots$

Where, $FVIFA = [(1+k)^n - 1]/k$

What is an Annuity?

Future Value Investment Factor of An Annuity (FVIFA)

$$\text{FVIFA} = \frac{(1+k)^n - 1}{k}$$

- **Example:** What will be the accumulated value which Vishal will receive at the end of the third year if he invests Rs. 1500 at the beginning of first, second and third year @ the interest rate of 5%?

$$\text{FVIFA} = \frac{(1+k)^n - 1}{k}$$

- **Example:** What will be the accumulated value which Vishal will receive at the end of the third year if he invests Rs. 1500 at the beginning of first, second and third year@ the interest rate of 5%?

- **Solution:** The accumulated value which Ram will get at the end of three years = 1500 FVIFA (5%, 3)

$= 1500\ ((1+.05)^3-1)/.05 = 1500 \times 3.1525 = \text{Rs } 4{,}728.75.$

Sinking Fund Factor (SFF)

- Sinking fund factor = $\boxed{\dfrac{k}{(1+k)^{n}-1}}$

- **SFF is inverse of the FVIFA.**
- Therefore, SFF = 1/FVIFA
- **SFF tells you, how much should you invest periodically so as to get a fixed sum at the end of the Annuity.**

- **Example:** A Ltd. has to repay Rs. 55,000 worth debentures at the end of 5 years from now. How much should the firm deposit each year at an interest rate of 5% so that it grows to Rs 55, 000 at the end of the fifth year?

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- **Example:** A Ltd. has to repay Rs. 55,000 worth debentures at the end of 5 years from now. How much should the firm deposit each year at an interest rate of 5% so that it grows to Rs 55, 000 at the end of the fifth year?

- **Solution:** With the help of sinking fund factor, the amount to be deposited each year can be computed as:

A = $55000 \times \frac{0.05}{(1+0.05)^5 - 1}$

= 55000*0.1809

=Rs 9,954.

“Discounting”

Discounting is to find Present Value of future cashflow.

Present value of a single Cashflow

PV= $$\frac{A}{(1+k)^n}$$

- Where PVIF = $\frac{1}{(1+k)^n}$
- A is the amount of Cashflow
- PVIF – Present Value Investment Factor

- **Example:** Suppose a particular investment opportunity provides us Rs 2000 at the end of three years. What is the present value of this cash inflow that we will get at the end of three years with the interest rate being 5% ?

- PVIF = $\dfrac{1}{(1+k)^{n}}$

- **Example:** Suppose a particular investment opportunity provides us Rs 2000 at the end of three years. What is the present value of this cash inflow that we will get at the end of three years with the interest rate being 5% ?

- **Solution:** Present value = Future value x $\dfrac{1}{(1+k)^n}$

$$= 2000 \times \frac{1}{(1+0.05)^3}$$

= Rs 1,727.68.

What if cashflows are received monthly / Quarterly or half yearly basis?

- The present value of an amount expected at a frequency of monthly / quarterly or half yearly is calculated by dividing the K by “m” and multiplying n with m in the following formula.
- Where “m” stands for frequency of compounding.

$$\frac{A}{(1+k/m)^\wedge n * m}$$

Present Value Of Multiple Cashflows

$$PV = A_1/(1+k) + A_2/(1+k)^2 + \ldots\ldots\ldots + A_n/(1+k)^n$$

- **Example**: A person invested certain amount of money in a project. The project generates an inflow of Rs 1500 at the end of first year, Rs 2,000 at the end of second year and Rs 4,000 at the end of third year. What is the present value of these future cash inflows given that the rate of interest is 5%?

$$\mathbf{PV = A_1/(1+k) + A_2/(1+k)^2 + \ldots\ldots\ldots + A_n/(1+k)^n}$$

- **Example**: A person invested certain amount of money in a project. The project generates an inflow of Rs 1500 at the end of first year, Rs 2,000 at the end of second year and Rs 4,000 at the end of third year. What is the present value of these future cash inflows given that the rate of interest is 5%?

$$\mathbf{PV = A_1/(1+k) + A_2/(1+k)^2 + \ldots\ldots.. + A_n/(1+k)^n}$$

- **Solution:** Present value = 1500 PVIF (5%,1) + 2000 PVIF(5%,2) + 4000 PVIF(5%,3)

$= 1500 \times 1/(1+0.05)^1 + 2000 \times 1/(1+0.05)^2 + 4000 \times 1/(1+0.05)^3$

= 1428.57 + 1814.06 + 3455.35 = Rs 6,697.98.

Present Value Investment Factor Of An Annuity (PVIFA)

PV of a multiple Cashflow= $A/(1+k) + A/(1+k)^2 + \ldots\ldots + A/(1+k)^n$

PV of an Annuity = A x $\dfrac{(1+k)^n - 1}{k(1+k)^n}$

Where PVIFA = $\boxed{\dfrac{(1+k)^n - 1}{k(1+k)^n}}$

- **Example:** A person invested certain amount of money in a project. The project generates an inflow of Rs 2000 at the end of first, second and third year. What is the present value of this annuity of Rs 2000 if the rate of interest is 5%?

- PVIFA = $\boxed{\dfrac{(1+k)^{n}-1}{k(1+k)^{n}}}$

- **Example:** A person invested certain amount of money in a project. The project generates an inflow of Rs 2000 at the end of first, second and third year. What is the present value of this annuity of Rs 2000?

- PVIFA = $\boxed{\dfrac{(1+k)^{n}-1}{k(1+k)^{n}}}$

- **Solution:** Present Value = 2000 x $\dfrac{(1+0.05)^{3}-1}{0.05(1+0.05)^{3}}$

= 2000 x 2.7232

= Rs 5,446.40.

Capital Recovery Factor (CRF)

- Capital Recovery Factor = $$\frac{k(1+k)^{n}}{(1+k)^{n}-1}$$
- **The Capital Recovery Factor is the inverse of PVIFA**
- **Therefore,** CRF = 1/PVIFA
- **CRF tells, as to how much amount to repay periodically at the given rate of Interest, for a fixed period, so as to repay the Loan full by expiry of the repayment rpeiod**

- **Example:** Ananya borrowed a loan of Rs 14,000 at a rate of 9% for a period of three years. Prepare a loan amortization schedule using the given data.

$$\text{CRF} = \boxed{\frac{k(1+k)^n}{(1+k)^n - 1}}$$

- **Example:** Ananya borrowed a loan of Rs 14,000 at a rate of 9% for a period of three years. Prepare a loan amortization schedule using the given data.

- **Solution:**

The annual installment for a loan of Rs. 14,000 at a rate of 9% can be computed using the capital recovery factor.

$$\text{CRF} = \boxed{\frac{k(1+k)^{n}}{(1+k)^{n}-1}}$$

$$\text{Annual installment} = 14{,}000 \times \frac{.09(1.09)^3}{(1.09)^3 - 1}$$

= 14,000 x 0.3951 = Rs. 5531

Loan Amortization Schedule

End of Year	Annual installment	Interest Payment	Principal repayment	Outstanding Balance
1	5531	1260	4271	9729
2	5531	876	4655	5074
3	5531	457	5074	0

Sinking Fund Factor V. Capital Recovery Factor

- Sinking Fund Factor helps to compute the amount that has to be invested at the end of every year for a period of "n" years at k% rate of interest, in order to accumulate a given amount at the end of the period.

- Capital Recovery Factor helps in computing:

  (1) Loan installment to liquidate a loan

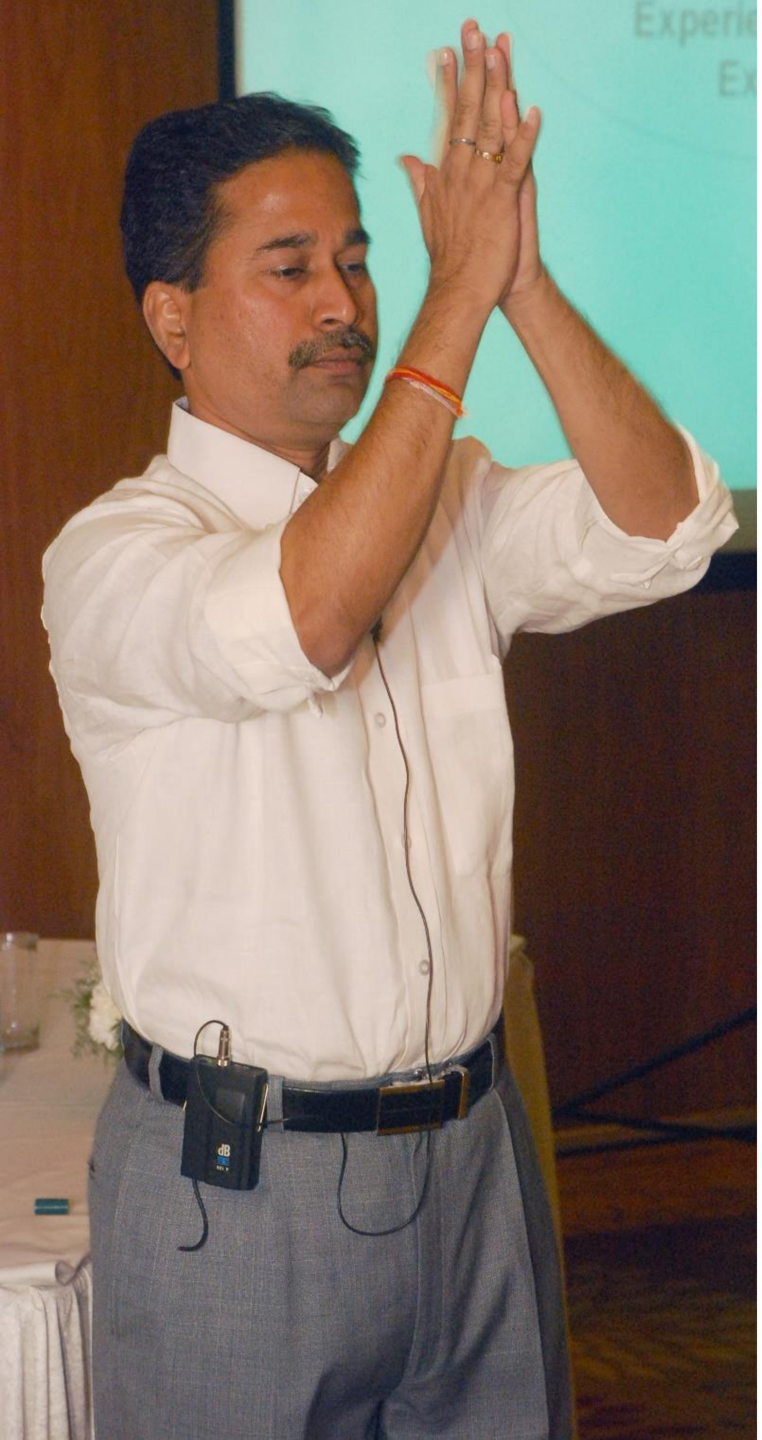
  (2) Amount that can be withdrawn periodically when a particular amount is invested now.

Introduction of CA Pramod Jain

1. Worked for 20 years as Finance Head, Legal Head & Company Secretary in India from June 1984 to August 2004.
2. During this period, gained rich corporate experience of supervising, managing and handling all aspects of business, relating to management of Finance, Accounts, Assurance, Compliances, Legal, Commercial, joint ventures, corporate restructuring, fund raising locally and globally as well as through IPO.
3. In August 2004, changed track to pursue my passion of teaching and training initially as Freelancer and then as Head of Training in Finance for a Fortune 500 company namely **ArcelorMittal**.
4. During this period, delivered training programs across the globe in more than 50 locations including in **USA, Canada, Brazil, Luxembourg, Dubai, France, Costa Rica, Germany, South Africa, Singapore, Malaysia and Russia** on a wide range of topics relating to Finance and Business Valuations.
5. Currently, practicing as a **Chartered Accountant, Business Valuation Professional, Independent Director and Insolvency Professional**.
6. **As a practicing Chartered Accountant** have helping Business Owners, MSMEs, Entrepreneurs & Start ups in managing their Businesses and Finances efficiently.
7. **As Valuation Professional**, have done business valuations for many corporates across the country.
8. **As an Insolvency Professional** have done two Voluntary Liquidations and have helped many clients with advisory services with regard to Insolvency & Bankruptcy Code 2016.
9. Have been on the Board of Suratwwala Business Group Limited, as an **Independent Director** and the **Chairman of Audit Committee**, a BSE listed company.

Introduction of CA Pramod Jain

10. **As a global corporate trainer**, have coached and trained thousands of corporate executives all over the world including from Fortune 500 company**.**
11. Is a Member on the Advisory Council of Lexicon Centre of Excellence for MSMEs.
12. Possess 16 qualifications including CA, CS, CMA, PGDFA, CFA, MBA and LL.B.
13. Have authored two Books, **"Finance for Value Creation" & "You Are A Born Winner".**
14. **As a passionate cyclist**, has cycled more than 18000 KM in last 7 years including 1) Pune –Goa, 2) Pune - Konkan 3) Pune - Shirdi 5) four countries in Europe and 6) Pune - Pandharpur covering 225 KM in a day.
15. **As a passionate Marathoner** has run more 5000 KMs in last six years that includes more than 100 half-marathons and a distance of 1501 KMs in year 2021 alone.
16. Regularly play Tennis, Squash and Golf.
17. Regular practitioner of Yoga, Pranayama & Meditation; have also delivered Yoga sessions globally, benefiting thousands of participants from this ancient knowledge of India.
18. Was **President of Rotary Club of Poona North** in 2007-08.
19. Received GSE Scholarship of Rotary Foundation and traveled to UK, Nigeria and Italy as a Rotary Scholar.
20. His YouTube Channel has more than 1000 videos on diverse topics relating to **Finance and Life Management. Click to view :** https://www.youtube.com/channel/UCvZDIzA75gE56nnb1XwvrNA



“Thank You”

Opportunities always come with Responsibilities.

Let Us, Make The Difference

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