

TIME VALUE OF MONEY

Introduction to the Time Value of Money

The Time Value of Money (TVM) is one of the most fundamental principles in finance, economics, investing, and decision-making. It states a simple but powerful truth:

Money available today has more value than the same amount of money available in the future.

This concept lies at the heart of nearly every financial decision—whether it's investing, borrowing, saving, valuing a business, comparing loan options, or planning for retirement. The idea is built on the fact that today's money can be invested or put to productive use, enabling it to grow over time. Moreover, future money carries risks, uncertainty, and loss of purchasing power due to inflation.

TVM is often expressed in terms of Present Value (PV) and Future Value (FV)—two sides of the same coin. PV tells us what future money is worth today, while FV tells us what today's money will be worth in the future. Together, they help individuals and businesses make informed financial decisions.

Why Today's Money Is Worth More Than Future Money

There are several reasons why “a dollar today is worth more than a dollar tomorrow.”

Each reason illustrates a different aspect of the time value of money:

1. Earning Potential

Money held today can be invested to earn interest or returns.

If ₹100 today grows at 10% per year, then in one year:

₹100 today → ₹110 in one year

Future money cannot take advantage of today's earning opportunity.

2. Inflation

Inflation reduces the purchasing power of money over time.

If inflation is 5%, then what costs ₹100 today will cost ₹105 next year?

So ₹100 next year buys less than ₹100 today.

Thus: **Purchasing power today > purchasing power in the future**

3. Uncertainty and Risk

Money promised in the future may not be received due to:

- Default risk
- Economic instability
- Market volatility
- Personal risk (unexpected health or job events)

Receiving money today eliminates this uncertainty

4. Preference for Liquidity

People generally prefer having money now rather than later, as immediate funds provide:

- Flexibility
- Choice
- Ability to handle emergencies
- Investment opportunities

This preference also contributes to why present money is more valuable.

A Basic Example of Time Value of Money

Consider the classic scenario:

Someone offers you ₹1,000 today or ₹1,100 after one year.

Which option should you choose?

It depends entirely on the return you can earn.

Case 1: You can earn MORE than 10%

If you can invest ₹1,000 today at 12%:

$$\text{Future value} = ₹1,000 \times (1 + 0.12) = ₹1,120$$

Since ₹1,120 > ₹1,100, taking ₹1,000 today is better.

Case 2: You can earn LESS than 10%

Suppose you can only earn 6% return:

$$\text{Future value} = ₹1,000 \times (1 + 0.06) = ₹1,060$$

Now ₹1,060 < ₹1,100

so taking ₹1,100 after a year is better—assuming you trust the payer.

Case 3: You can earn EXACTLY 10%

$$₹1,000 \times (1.10) = ₹1,100$$

both choices are equal.

This example demonstrates that the choice depends on the expected rate of return, also called the **discount rate** or **opportunity cost of capital**.

Time Value of Money and Purchasing Power

Purchasing power is the amount of goods or services money can buy. Over time, inflation slowly erodes this purchasing power. This makes the time value of money even more important.

An Example of Inflation's Impact

If you received a **₹100 petrol voucher in 1990**, you could buy far more petrol than you could with the same ₹100 voucher today.

- Petrol prices rise
- Food prices rise
- Cost of living increases

So even if the amount of money is the same, the **value is lower**.

Inflation vs Nominal Returns vs Real Returns

Understanding these terms is essential:

- **Nominal Return** = return without adjusting for inflation
- **Real Return** = return adjusted for inflation

Real return = Nominal return – Inflation

Example:

- Investment return = 10%
- Inflation = 15%

Real return = 10% - 15% = -5%

Even though you're "earning" 10%, your purchasing power is decreasing.

This is why investors focus on **real returns**, not nominal returns.

The Core Time Value of Money Formulas

1. Future Value (FV) Formula

$$FV = PV \times (1 + i/n)^{(n \times t)}$$

Where:

- **FV** = Future Value
- **PV** = Present Value
- **i** = annual interest rate
- **n** = number of compounding periods per year
- **t** = number of years

Simple Example

You have ₹5,000 today.

You earn 5% annual return for 2 years.

Compounded once a year:

$$FV = 5,000 \times (1 + 0.05)^2 = 5,000 \times 1.1025 = \mathbf{₹5,512.50}$$

Present Value (PV) Formula

$$PV = FV / (1 + i/n)^{(n \times t)}$$

Present value tells you how much future money is worth **today**.

Example: What is ₹1,100 one year from now worth today?

If expected return = 5%:

$$PV = 1,100 / 1.05$$

$$PV = \mathbf{₹1,047.62}$$

This means:

₹1,047 today = ₹1,100 after one year at 5% return

So unless you receive at least ₹1,048 today, the future payment is better.

Understanding Compounding and Its Importance

Compounding is one of the most powerful concepts in finance.

It means earning interest on both:

- Your principal
- Previously earned interest

Impact of More Frequent Compounding

- Annual compounding
- Semi-annual
- Quarterly
- Monthly
- Daily
- Continuously

More compounding periods result in higher future value.
 Example with ₹10,000 at 10% for 1 year:

Frequency	Formula	Future Value
Annual	$10,000 \times 1.10$	11,000
Semi-annual	$10,000 \times (1.05)^2$	11,025
Quarterly	$(1.025)^4$	11,038
Monthly	$(1.00833)^{12}$	11,047
Daily	$(1.000273)^{365}$	11,052

More compounding = more money.

Discounting: The Reverse of Compounding

Discounting is the process of converting future money into today's value.

If compounding pushes money forward, discounting brings it backward.

Discounting helps businesses and investors evaluate:

- Projects
- Bonds
- Loans
- Pensions
- Real estate investments

For example, if you will receive ₹10,000 five years from now and discount rate is 8%:

$$PV = 10,000 / (1.08)^5 = ₹6,805.83$$

So ₹10,000 in the future is worth **₹6,805 today**.

The Real Meaning of Discount Rate

The discount rate represents:

- Expected return
- Opportunity cost
- Risk level
- Minimum acceptable rate of return
- Inflation expectation

Higher discount rate = lower present value.

Example

Future value=₹1,000

Time = 3 years

Discount Rate	PV Value
5%	₹863
10%	₹751
15%	₹658

More risk or higher return expectations reduce the value of future money.

TVM in Everyday Life

1. Saving for retirement

TVM helps calculate future retirement corpus.

2. Loans and mortgages

EMI calculations depend entirely on PV/FV formulas.

3. Leasing vs buying decisions

Businesses compare present value of leasing expenses vs buying assets.

4. Insurance policies

Premium calculations use discounting of expected payouts.

5. Education planning

Parents discount the future cost of tuition to find how much to invest today.

6. Capital budgeting

TVM guides decisions on factory expansions, machinery purchases, new projects, etc.

TVM in Business Decisions

Companies regularly use discounted cash flow methods (DCF) to determine whether a project will create value.

1. Capital Expenditure (CAPEX) Decisions

Such as:

- New equipment
- Factory expansion
- Technology upgrades

Companies compare:

Present value of expected cash inflows with

- Present value of cost

If benefits > cost → Accept the project.

2. New Product Development

Future sales and profits are discounted to today to calculate viability.

3. Leasing vs Purchasing Assets

PV of lease payments vs PV of ownership cost determines the best option.

4. Credit Terms

Offering 30-day or 60-day credit impacts cash flow and must be evaluated using TVM.

Net Present Value (NPV)

Net Present Value is the most widely used TVM-based tool in corporate finance.

NPV = Present Value of Cash Inflows – Present Value of Cash Outflows

A project creates value if :

NPV > 0

Example of NPV (Simplified)

Imagine a project giving:

- Year 1: ₹5,000
- Year 2: ₹7,000
- Year 3: ₹9,000

Initial investment = ₹15,000

Discount rate = 10%

$$\begin{aligned} PV &= 5,000/1.10 + 7,000/1.10^2 + 9,000/1.10^3 \\ &= 4,545 + 5,785 + 6,757 \\ &= 17,087 \end{aligned}$$

$$NPV = 17,087 - 15,000$$

NPV = **+2,087 (ACCEPT PROJECT)**

Graphical Illustration: Present Value vs Future Value

Imagine a bar chart:

- Top bars show future cash flows (FV) in increasing bars
- Bottom bars show present value (PV), lower due to discounting

This visually shows:

- Future money is worth less today
- PV decreases as discount rate increases
- Longer time periods reduce PV further.

Real-World Examples of TVM

Example 1: Lottery Winnings

A lottery offers:

- ₹50 million now, or
- ₹80 million spread over 20 years

Using TVM, most financial advisors choose the lump sum, invest it, and grow it.

Example 2: Selling a Property

A buyer offers:

- ₹20 lakh today OR
- ₹25 lakh after 5 years

Using discounting, seller evaluates which is better depending on expected return.

Example 3: Salary Choices

Employees compare:

- Higher salary now

vs

- Higher salary increments in future

TVM helps evaluate which has more lifetime value.

Example 4: Comparing Loan Offers

Loan 1: 10% interest, monthly compounding

Loan 2: 10% interest, annual compounding

Due to compounding, Loan 1 is costlier.

Example 5: Investment Growth

Invest ₹1,00,000 at 12% for 30 years:

$$FV = 1,00,000 \times (1.12)^{30} = \text{₹29.95 lakh}$$

TVM highlights the magic of compounding.

Advantages of Understanding TVM

Smarter financial decisions

Better loan and investment comparisons.

Accurate assessment of business projects
Higher long-term wealth creation
Proper retirement and goal planning
Helps avoid financial mistakes

Conclusion

The Time Value of Money is the backbone of nearly every financial decision. It highlights that money available today has more potential than future money because of investment opportunities, inflation, risk, and liquidity preferences.

By mastering concepts such as:

- Present Value
- Future Value
- Discounting
- Compounding
- Real vs Nominal returns
- NPV

Individuals and businesses can make optimal decisions that maximize financial benefits. Whether you're comparing investment opportunities, calculating retirement savings, analysing business projects, or evaluating loans, TVM offers a mathematically sound foundation for decision-making.

In a world where financial choices shape our futures, understanding the Time Value of Money isn't just helpful—it's essential.

