International Management Studies

Class 10

November 13, 2025

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I. Time Value of Money

Meaning of Time Value of Money (TVM)

The **Time Value of Money (TVM)** is the financial concept that **money available today is worth more than the same amount of money in the future** because of its potential earning capacity. In other words, a dollar today can be invested to earn interest, returns, or profits, making it worth more than a dollar received in the future.

Mathematically, this is expressed through:

$$PV = \frac{FV}{(1+r)^n}$$

where

- **PV** = Present Value
- **FV** = Future Value
- **r** = interest rate (or discount rate)
- **n** = number of periods

Importance of Knowing the Concept

1. **Investment Decision-Making**

   Investors use TVM to evaluate whether an investment today will generate sufficient returns in the future. It helps compare investment options that have different time horizons.

2. **Loan and Mortgage Planning**

   Banks and individuals apply TVM when calculating loan repayments, interest costs, and amortization schedules.

3. **Capital Budgeting**

   Firms use TVM in tools such as **Net Present Value (NPV)** and **Internal Rate of Return (IRR)** to decide whether to proceed with long-term projects.

4. **Retirement and Savings Planning**

   Financial planners use TVM to estimate how much money should be saved today to reach a specific financial goal in the future.

5. **Pricing and Valuation**

   It is critical in valuing **bonds, stocks, leases, and annuities**, which depend on the discounted value of future cash flows.

Applications in the Business World

1. **Corporate Finance:**
   - Determining the **value of future cash flows** from a project.
   - Assessing mergers and acquisitions based on the **discounted cash flow (DCF)** model.
2. **Banking and Lending:**
   - Calculating **loan payments**, **interest rates**, and **present value of annuities**.
   - Structuring repayment schedules that balance principal and interest.
3. **Investment Analysis:**
   - Estimating **bond prices** using the present value of future coupon payments and face value.
   - Evaluating **stock valuation** based on expected dividends.
4. **Insurance and Pension Funds:**
   - Estimating future obligations or benefits and discounting them to present value.
5. **Real Estate and Leasing:**
   - Calculating the present value of future rent payments to decide whether to **lease or buy** an asset.

II. How to calculate the future value

🧮 1. Investment Growth in a Bank Deposit

Case:

A company deposits **₩100 million** in a fixed savings account that earns **4% annual interest** for **5 years**.

Calculation:

$$FV = PV(1+r)^n = 100,000,000(1+0.04)^5 = ₩121,665,290$$

Interpretation:

After 5 years, the initial ₩100 million grows to about **₩121.7 million** — showing how the value of money increases over time with compound interest.

💼 2. Retirement Savings Planning

Case:

An employee invests **₩500,000 each month** in a pension fund earning **6% annual interest (0.5% per month)** for **20 years**.

Calculation (Future Value of an Annuity):

$$FV = P \times \frac{(1+r)^n - 1}{r}$$

$$= 500,000 \times \frac{(1.005)^{240} - 1}{0.005} = ₩23,155,000,000$$

Interpretation:

Consistent monthly savings can accumulate to a large amount because of **compound growth** — a key motivation for long-term retirement planning.

🏢 3. Corporate Project Investment

Case:

A firm invests **$10 million** in new machinery expected to yield **8% annual returns** for **7 years**.

Calculation:

$$FV = 10,000,000(1 + 0.08)^7 = \$17,143,589$$

Interpretation:

At the end of 7 years, the project's returns are equivalent to **$17.14 million**. The management uses FV to compare this with the cost of capital and decide if the investment is worthwhile.

💰 4. Bond Interest Accumulation

Case:

An investor buys a **zero-coupon bond** for **$800**, which will mature in **10 years** at a **face value of $1,200**.

Calculation:

To verify the yield or to find FV:

$$FV = PV(1 + r)^n$$

$$1,200 = 800(1 + r)^{10} \Rightarrow r = (1.5)^{1/10} - 1 = 4.14\%$$

Interpretation:

The FV ($1,200) shows the **redeemable amount** the investor will receive, and the calculation helps determine the bond's **implied yield**.

🏠 5. Real Estate Investment

Case:

A real estate investor buys a property for **₩200 million**, expecting it to appreciate **5% annually** for **10 years**.

Calculation:

$$FV = 200,000,000(1.05)^{10} = ₩325,779,000$$

Interpretation:

After 10 years, the property value is projected to rise to about **₩326 million** — a 63% gain, excluding rental income.

III. How to calculate the present value

💼 1. Corporate Investment Decision (Capital Budgeting)

Case:

A company expects a project to generate **₩120 million** in 3 years. The required rate of return (discount rate) is **8%**.

Calculation:

$$PV = \frac{FV}{(1+r)^n} = \frac{120,000,000}{(1.08)^3} = ₩95,254,000$$

Interpretation:

If the project's current cost is less than **₩95.25 million**, it's financially viable. Firms use this in **Net Present Value (NPV)** analysis to decide whether to invest.

🏦 2. Loan Repayment Valuation

Case:

A bank is evaluating the value of a **₩50 million** loan to be repaid after **5 years** at **6%** interest.

Calculation:

$$PV = \frac{50,000,000}{(1.06)^5} = ₩37,363,000$$

Interpretation:

The present value shows how much the loan repayment is *worth today*. The bank uses this to determine whether the interest rate adequately compensates for the time and risk.

📈 3. Bond Pricing

Case:

An investor wants to know the **current price (PV)** of a bond that pays **₩5 million** per year in coupons for 5 years and **₩100 million** at maturity. Market interest rate = **4%**.

Calculation:

$$PV = \sum_{t=1}^{5} \frac{5,000,000}{(1.04)^t} + \frac{100,000,000}{(1.04)^5} = ₩117,665,000$$

Interpretation:

If the bond's market price is below ₩117.7 million, it is undervalued; if above, it's overpriced. This is how **bond investors** assess fair value.

👴 4. Retirement Planning (Pension Valuation)

Case:

An employee expects to receive **₩3 million per month** for **20 years** after retirement. The discount rate is **5% per year (0.416% per month)**.

Calculation (PV of an Annuity):

$$PV = PMT \times \frac{1 - (1 + r)^{-n}}{r}$$

$$= 3,000,000 \times \frac{1 - (1.00416)^{-240}}{0.00416} = ₩446,700,000$$

Interpretation:

The company or pension fund must have about **₩446.7 million today** to finance this pension promise — a key concept in **actuarial finance**.

🏠 5. Real Estate Valuation

Case:

A building is expected to generate **₩30 million annual rent** for 10 years. The investor's required rate of return is **7%**.

Calculation:

$$PV = 30,000,000 \times \frac{1 - (1.07)^{-10}}{0.07} = ₩210,000,000$$

Interpretation:

The investor should pay no more than ₩210 million for the property to meet their expected return. This method is used widely in **real estate appraisal** and **lease evaluation**.

Q&A