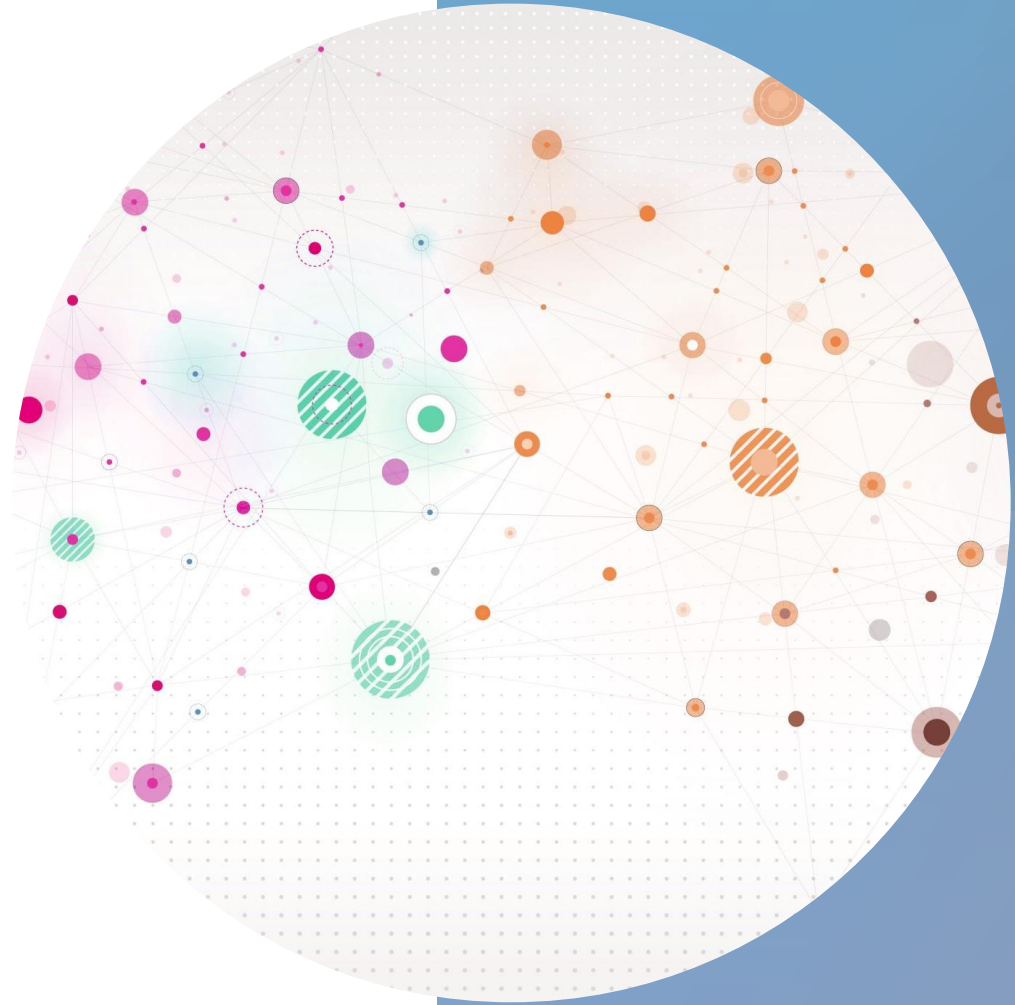# FINANCIAL MANAGEMENT II

WEEK 2: TIME VALUE OF MONEY: PART I

THE CONCEPT OF TIME VALUE OF MONEY

- The principle that underlies modern finance: an amount of money is worth more today than the same amount in the future.

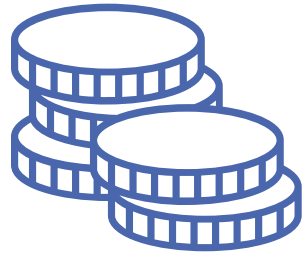- This principle is stated as time value of Money.
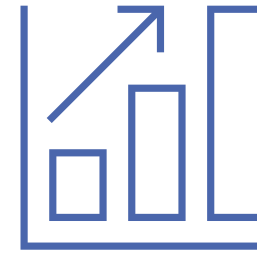
INTEREST RATE

An interest rate is the fee charged by a lender to a borrower for the use of assets.

Main determinant of time value of money

SIMPLE INTEREST AND COMPOUNDING INTEREST

Simple Interest: Interest earned only on the principal; no interest is earned on interest.

Compounding Interest: Interest earned both on the principal and interest. The interest earned in a period becomes the part of the principal in the following periods.

Principal: The original investment, the amount of money invested or borrowed initially

SIMPLE INTEREST: CALCULATION

- Simple interest is calculated as following formula:

- $SI = Pxrxn$

Where;

o SI: Simple Interest

o P: Principal (Original investment)

o r: interest rate

o n: number of periods in year

- To calculate the total amount of money in the end of period, we use following formula

- $A = Px(1 + rxn)$

EXAMPLE-1

- John deposited $10,000 in his account. After 2 years, with a simple interest rate of 6% per annum, what is the total value of John's investment at the end of this period?

COMPOUNDING INTEREST: FUTURE AND PRESENT VALUE

Before discussing compounding interest, we should understand the concepts of future value and present value.

Future value: The amount by which a cash flow or series of cash flows increases over a specified period when compounded at a certain interest rate. (Brigham and Houston, 2007).

Present Value: The value today of a future cash flow or series of cash flows (Brigham and Houston, 2007).

COMPOUNDING INTEREST: CALCULATION

- To find future value, we use;

- $FV_n = PVx(1 + r)^n$ equation

Where;

- FV_n is future value of investment or cash flow n period later

- PV is present value

- r is the given interest rate in a period

- n is the number of period in which interest is earned

- To find present value, we derive future value equation:

- $PV = \dfrac{FV_n}{(1+r)^n}$

- r is called as the discount factor which is defined as the interest rate used to compute present values of future cash flows (Brealey, Myers, and Marcus, 2014).
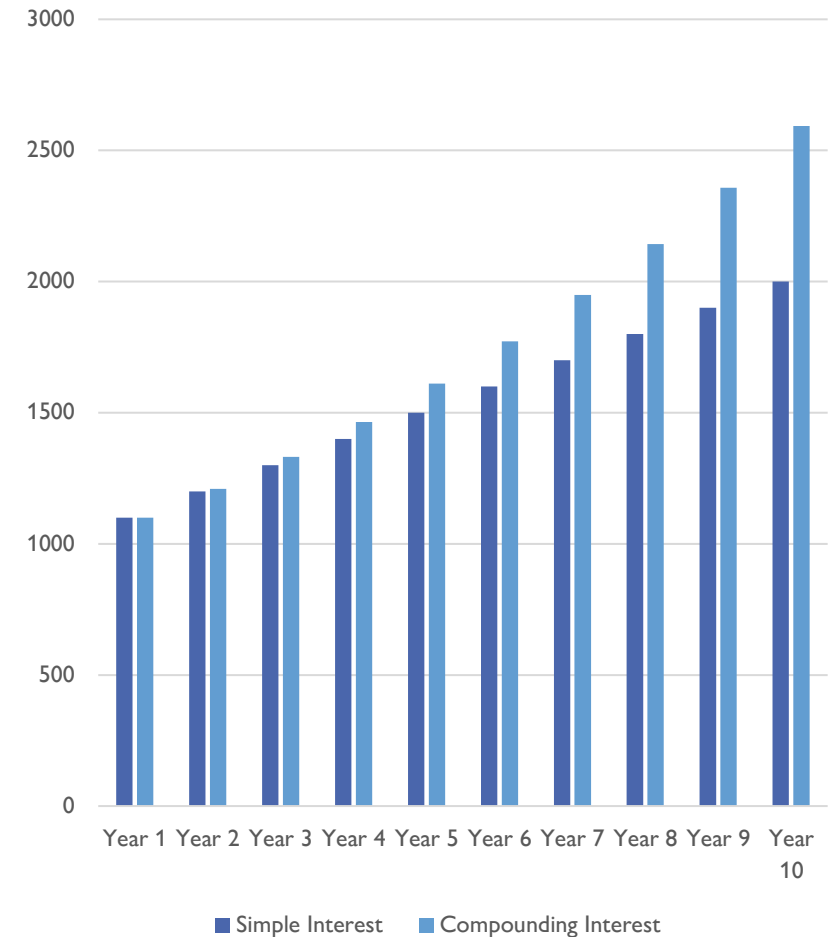
EXAMPLE-2

- What is the future value of $1000 in 5 years at 5% interest rate?

EXAMPLE-3

- What is the present value of $1000 to be received after 5 years, with a discount factor of 5%?

THE POWER OF COMPOUNDING

- Consider investing $1,000 at an interest rate of 10%. In the first scenario, the interest is calculated using a simple interest method, while in the second scenario, it is compounded over time.

- The graph illustrates the distinctions between simple interest and compound interest, emphasizing the potential benefits of compounding in investment growth.

EXAMPLE-4

- Robin deposited $10,000 into her savings account at 12% interest. What will she have at the end of 2 years if the investment is compounded annually?

EXAMPLE-5

- In two years, you will graduate, and you plan to buy yourself a gaming PC as a graduation gift. Let's assume that the price of the computer you want to purchase in two years will be $3,000. To achieve this goal, how much money do you need to deposit into your savings account today? Assume that interest rate is 6% and compounded annually.)

COMPOUNDING MORE FREQUENTLY THAN ANNUALLY

- The future value formula can be rewritten for use when compounding takes place more frequently:

- $FV_n = PV x \left(1 + \dfrac{r}{m}\right)^{mxn}$

- Where;

- m is the number of times per year interest is compounded

EXAMPLE-6

Robin deposited $10,000 into her savings account at 12% interest. What will she have at the end of 2 years if the investment is;

- Compounded semiannually
- Compounded quarterly
- Compounded monthly

EXAMPLE-7

- In two years, you will graduate, and you plan to buy yourself a gaming PC as a graduation gift. Let's assume that the price of the computer you want to purchase in two years will be $3,000. To achieve this goal, how much money do you need to deposit into your savings account today? Assume that interest rate is 6% and your saving is compounded;

a) Semi-annually

b) Quarterly

c) Monthly

CONTINUOUS COMPOUNDING

- Compounding of interest an infinite number of times per year at intervals of microseconds. The equation of future value converges to;

- $FV_n = PV x e^{rxn}$

- e is a constant term and approximately equals to 2.7183

EXAMPLE-8

- Robin deposited $10,000 into her savings account at 12% interest. What will she have at the end of 2 years if the investment is compounded continuously?

OTHER INTEREST CONCEPTS

- Nominal Rate (Annual Percentage Rate): Contractual annual rate of interest charged by a lender or promised by a borrower.

- Effective Annual Rate: The annual rate of interest actually paid or earned.

- $EAR = (1 + \frac{r}{m})^{mxn}$

NOMINAL VS. REAL INTEREST

- $1 + Real\ Interest = \dfrac{1 + Nominal\ Interest}{1 + Inflation\ Rate}$

EXAMPLE-9

- Bank offers 52% annual interest for your saving account while CPI is 40%. Calculate real interest rate.

FINDING INTEREST RATE- EXAMPLE

- Suppose we know that a given bond has a cost of $100 and that it will return $150 after 10 years. What is the interest rate?

FINDING TIME PERIOD-EXAMPLE

- How long would it take $1,000 to double if it were invested in a bank that pays 8 percent per year?

SOURCES

- Brealey, R. A., Myers, S. C., & Marcus, A. J. (2014). Fundamentals of Corporate Finance. McGraw-Hill Education.

- Brigham, E. F., & Houston, J. F. (2019). Fundamentals of financial management. Cengage Learning.

- Gitman, L. J., & Zutter, C. J. (2012). Principles of Managerial Finance. 13e. Pearson