

FINANCIAL MANAGEMENT II

WEEK 3: TIME VALUE OF
MONEY- PART II



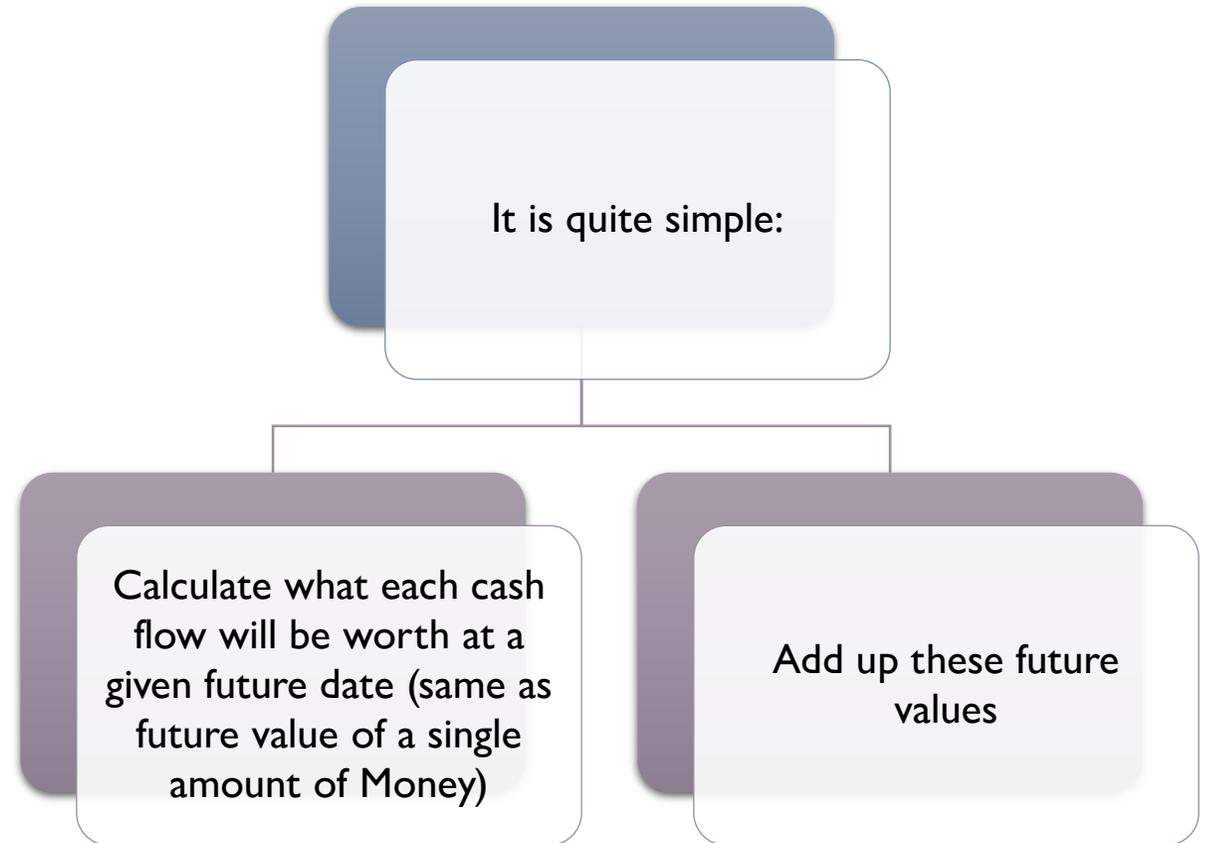
FUTURE AND PRESENT VALUES OF MULTIPLE CASH FLOWS

To date, we mainly focused on future or present values of single amount of Money.

This class aims to teach how future and present values of multiple cash flow is measured.

Cash Flow (CF) is the increase or decrease in the amount of money a business, institution, or individual has (Corporate Finance Institute). Inflows are positive cash flows, while outflows are negative cash flows.

HOW CAN WE FIND FUTURE VALUE OF MULTIPLE CASH FLOW?



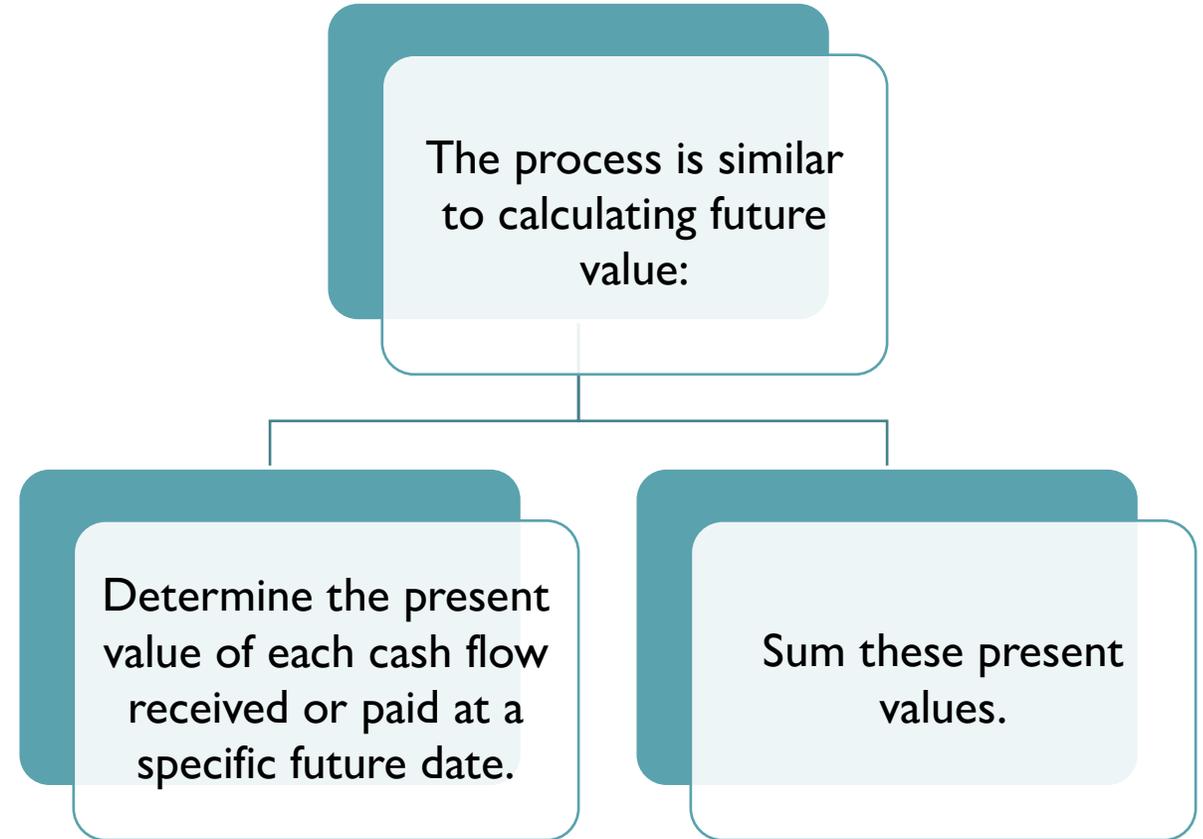
EXAMPLE - 1

Imagine you've just graduated and started your first job on March, 2025. After taking care of your monthly expenses, you manage to put some money aside in your savings account at the bank each month. Since your expenses can change from month to month, the amount you save does too. In the first six months, you couldn't save anything because your expenses were higher than expected. But in the next six months, you were able to save a bit more. Here's how much you saved each month:

- September, 2025: 10,000 TL
- October, 2025: 12,000 TL
- November, 2025: 8,000 TL
- December, 2025: 6,000 TL
- January, 2026: 13,000 TL
- February, 2026: 9,000 TL

The bank is offering an annual interest rate of 36%. In March 2026, you decide to withdraw your savings to finance a tour abroad which was one of your dreams. What is the maximum price of the tour that you can afford with your savings?

HOW CAN WE FIND PRESENT VALUE OF MULTIPLE CASH FLOW?



EXAMPLE - 2

You want to attend a language school abroad this summer and have asked your family for financial support. Your parents offered you two options:

- Receive \$10,000 today,
- Receive \$3,350, \$3,400, and \$3,300 for the next three months, respectively.

Which option is better for you, considering an interest rate of 6%?

ANNUITIES

- If multiple cash flows are equal and periodic it is called as annuities. In other words, annuity is defined as a stream of equal periodic cash flows over a specified time period.

TYPES OF ANNUITIES

Ordinary Annuity

- Type of annuity in which cash flow occurs ***at the end*** of the period

Annuity Due

- Type of annuity in which cash flow occurs at ***the beginning*** of the period

ORDINARY ANNUITY VS. ANNUITY DUE

- Consider that you made an investment with two alternatives. Both alternatives are 5-year, \$100 annuities; annuity A is an ordinary annuity and annuity B is an annuity due. To better understand the difference between these annuities, their cash flows are listed in the table. Note that the amount of each annuity totals \$500. The two annuities differ only in the timing of their cash flows: The cash flows are received sooner with the annuity due than with the ordinary annuity. (Assume that interest rate is 8%)

	Ordinary Annuity	Annuity Due
Year 0	\$0	\$100
Year 1	\$100	\$100
Year 2	\$100	\$100
Year 3	\$100	\$100
Year 4	\$100	\$100
Year 5	\$100	\$0

FUTURE VALUE OF ANNUITY

- The future value of an **ordinary annuity** is calculated with the following equation:

- $$FV_n = CFx \frac{(1+r)^n - 1}{r}$$

- If annuity is an **annuity due**, the following equation is used:

- $$FV_n = CFx \frac{(1+r)^n - 1}{r} x(1 + r)$$

- Where;

1. FV_n is future value of annuity
2. CF is annuity
3. r is interest rate of period
4. n is the number of periods

PRESENT VALUE OF ANNUITY

- The present value of an **ordinary annuity** is calculated with following equation:
- $PV_n = CFx \frac{(1+r)^n - 1}{rx(1+r)^n}$
- If annuity is an **annuity due**, the following equation is used:
- $PV_n = CFx \frac{(1+r)^n - 1}{rx(1+r)^n} x(1+r)$
- Where;
 1. PV_n is present value of annuity
 2. CF is annuity
 3. r is interest rate of period
 4. n is the number of periods

EXAMPLE - 3

- Your friend has told an interest in purchasing a car valued at \$50,000 one year later. To achieve this goal, she intends to save a portion and an equal amount of her monthly income into a savings account, but she is uncertain about the appropriate amount to save each month. Upon conducting some research, you discovered that the bank offers an annual interest rate of 6%. She is looking for your guidance on how much should be saved monthly to meet the target amount for the car purchase.

EXAMPLE - 4

- An enterprise has purchased a machine on credit. They will pay 100,000 USD at the end of each year for five years. Given a discount rate of 10%, what is the present value of the machine? What if the payments are made at the beginning of the year what will be the present value of the machine?

LOAN AMORTIZATION AND ITS SCHEDULE

- Loan amortization is defined as the determination of the equal periodic loan payments necessary to provide a lender with a specified interest return and to repay the loan principal over a specified period (Gitman and Zutter, 2012).
- Loan Amortization Schedule: A schedule of equal payments to repay a loan. It shows the allocation of each loan payment to interest and principal (Gitman and Zutter, 2012).
- To find periodic loan payments, we use present value of annuity formula.

EXAMPLE - 5

You borrow \$10,000 at 24 percent and agree to make equal monthly end-of-month payments over 6 months.

- Calculate monthly payments
- Constitute loan amortization schedule

PERPETUITIES

- Perpetuity is a special form of annuity
- If an annuity with an infinite life, providing continual annual cash flow it is called as perpetuity. In other words, perpetuity is a stream of equal cash flow at fixed intervals expected to continue forever.
- The present value of perpetuity is calculated as following formula:
- $$PV = \frac{CF}{r}$$
- A famous example of perpetuity is 'consol' which is British government bond paying interest rate forever.

EXAMPLE - 6

- What's the present value of a perpetuity that pays \$100 per year, beginning one year from now, if interest rate is 4 percent?

SOURCES

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