

APPLIED FINANCE

Lecture 9





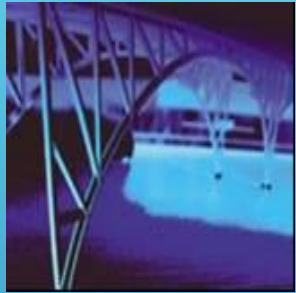
AFTER STUDYING CHAPTER 3, YOU SHOULD BE ABLE TO:

1. Understand what is meant by "the time value of money."
2. Understand the relationship between present and future value.
3. Describe how the interest rate can be used to adjust the value of cash flows – both forward and backward – to a single point in time.
4. Calculate both the future and present value of: (a) an amount invested today; (b) a stream of equal cash flows (an annuity); and (c) a stream of mixed cash flows.
5. Distinguish between an “ordinary annuity” and an “annuity due.”
6. Use interest factor tables and understand how they provide a shortcut to calculating present and future values.
7. Use interest factor tables to find an unknown interest rate or growth rate when the number of time periods and future and present values are known.
8. Build an “amortization schedule” for an installment-style loan.



THE TIME VALUE OF MONEY

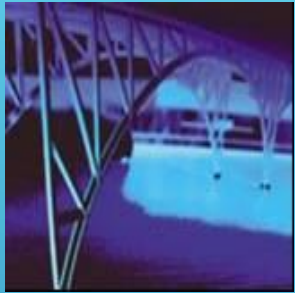
- ▶ The Interest Rate
 - ▶ Simple Interest
 - ▶ Compound Interest
 - ▶ Amortizing a Loan
 - ▶ Compounding More Than Once per Year
- 



Which would you prefer -- \$10,000 today or \$10,000 in 5 years?

Obviously, \$10,000 today.

THE INTEREST RATE You already recognize that there is
TIME VALUE TO MONEY!!

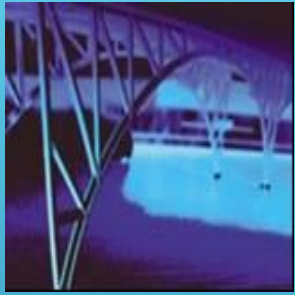


Why is **TIME** such an important element in your decision?

TIME allows you the *opportunity* to postpone consumption and earn

WHY TIME?

INTEREST.



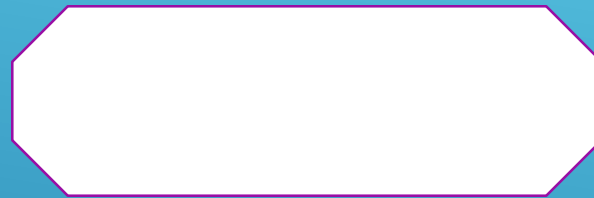
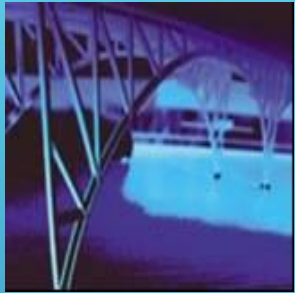
TYPES OF INTEREST

◆ Simple Interest

Interest paid (earned) on only the original amount, or principal, borrowed (lent).

▶ Compound Interest

Interest paid (earned) on any previous interest earned, as well as on the principal borrowed (lent).



Formula

$$SI = P_0(i)(n)$$

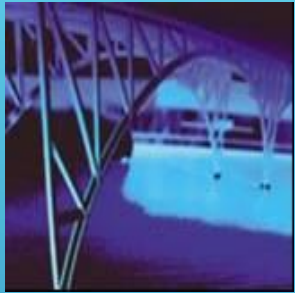
SI: Simple Interest

P_0 : Deposit today ($t=0$)

i : Interest Rate per Period

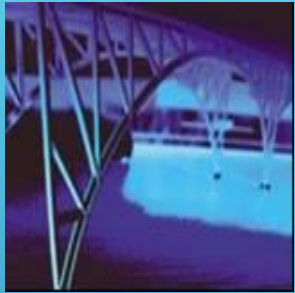
n : Number of Time Periods

SIMPLE INTEREST FORMULA



- ▶ Assume that you deposit **\$1,000** in an account earning **7%** simple interest for **2** years. *What is the accumulated interest at the end of the 2nd year?*

SIMPLE INTEREST EXAMPLE = $P_0 i n$ = $\$1,000 (.07) (2)$
= \$140

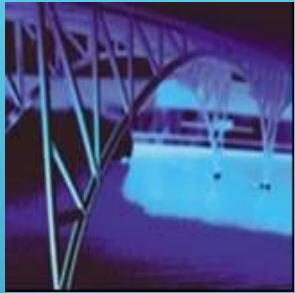


- ▶ What is the **Future Value (FV)** of the deposit?

$$\begin{aligned} FV &= P_0 + SI && = \$1,000 \\ + \$140 &&& = \$1,140 \end{aligned}$$

- ▶ **Future Value** is the value at some future time of a present amount of money, or a series of payments, evaluated at a given interest rate.

SIMPLE INTEREST (FV)



- ▶ What is the **Present Value (PV)** of the previous problem?

*The **Present Value** is simply the **\$1,000** you originally deposited. That is the value today!*

- ▶ **Present Value** is the current value of a future amount of money, or a series of payments, evaluated at a given interest rate.

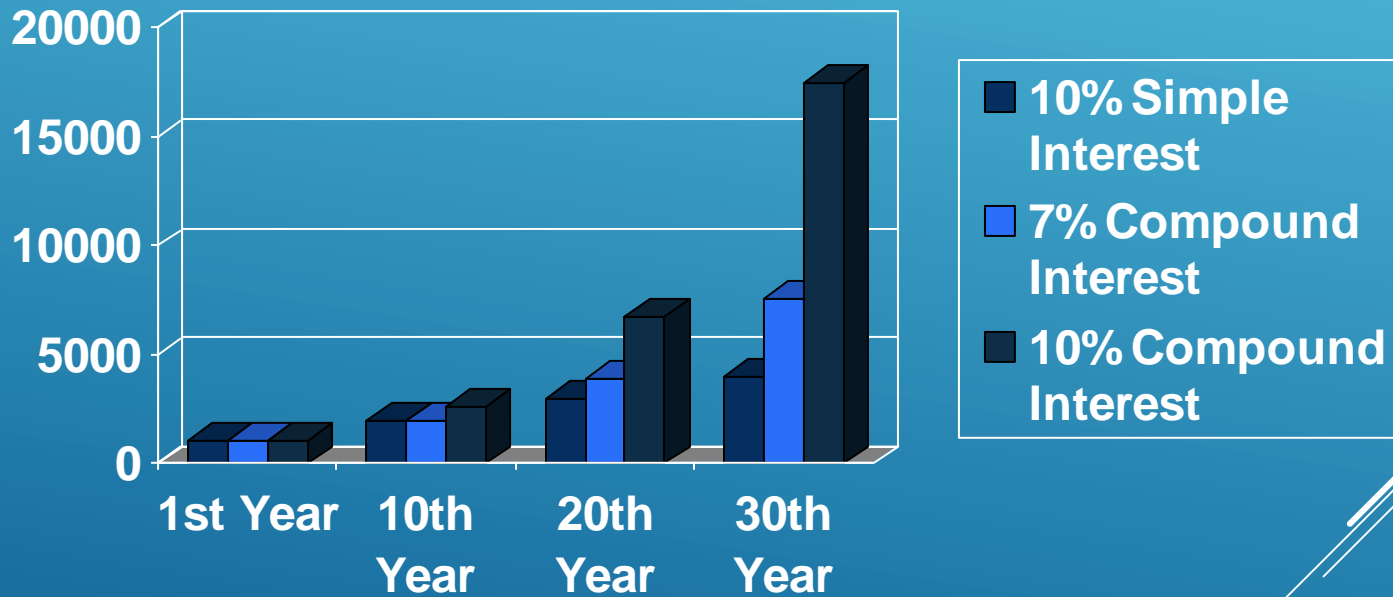
SIMPLE INTEREST (PV)



WHY COMPOUND INTEREST?

Future Value of a Single \$1,000 Deposit

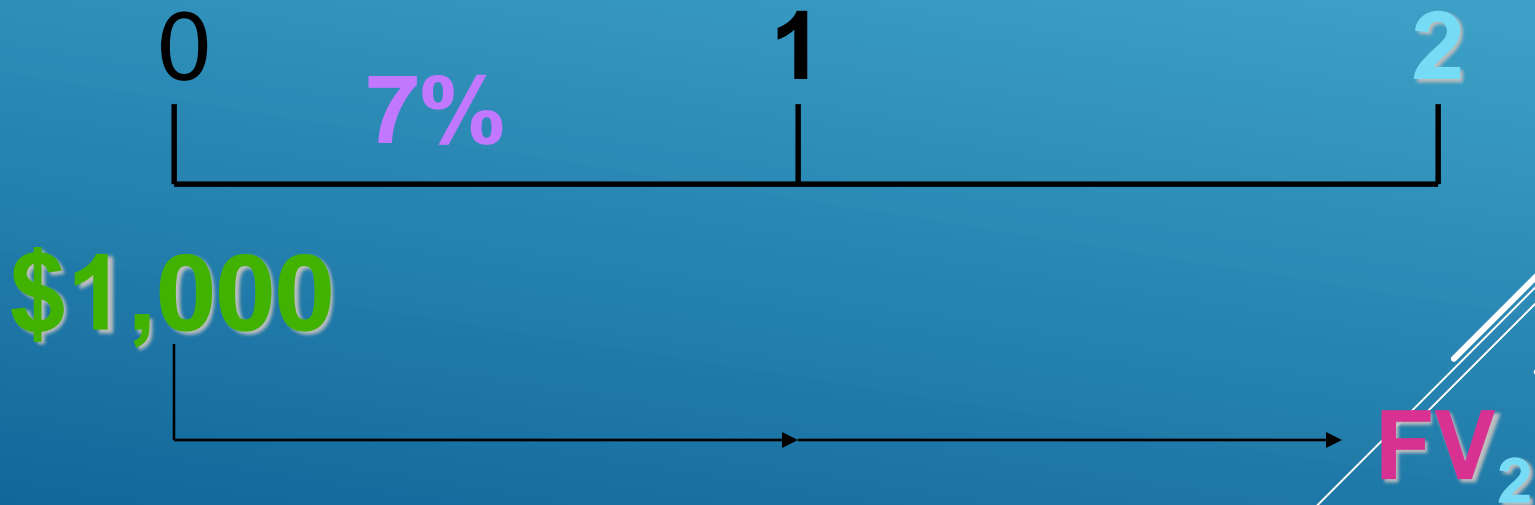
Future Value (U.S. Dollars)





FUTURE VALUE SINGLE DEPOSIT (GRAPHIC)

Assume that you deposit **\$1,000** at a compound interest rate of **7%** for **2 years**.





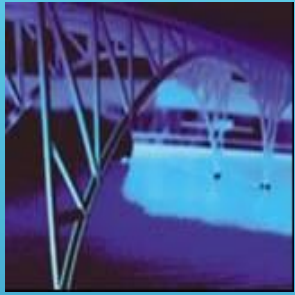
FUTURE VALUE SINGLE DEPOSIT (FORMULA)

$$\begin{aligned}FV_1 &= P_0 (1+i)^1 = \$1,000 (1.07) \\ &= \$1,070\end{aligned}$$

Compound Interest

You earned \$70 interest on your \$1,000 deposit over the first year.

This is the same amount of interest you would earn under simple interest.



Future Value Single Deposit (Formula)

$$FV_1 = P_0 (1+i)^1 = \$1,000 (1.07) = \$1,070$$

$$\begin{aligned} FV_2 &= FV_1 (1+i)^1 \\ &= P_0 (1+i)(1+i) = \$1,000 (1.07)(1.07) \\ &= P_0 (1+i)^2 = \$1,000 (1.07)^2 \\ &= \$1,144.90 \end{aligned}$$

You earned an *EXTRA* **\$4.90** in Year 2 with compound over simple interest.



GENERAL FUTURE VALUE FORMULA

$$FV_1 = P_0(1+i)^1$$

$$FV_2 = P_0(1+i)^2$$

etc.

General **Future Value** Formula:

$$FV_n = P_0 (1+i)^n$$

or $FV_n = P_0 (FVIF_{i,n})$ -- See *Table I*