

# Finance

## Key Definitions

- **Principal:** The principle is the amount of money you initially invest.
- **Interest:** The profit from this investment is interest. Interest is only the amount made from the principle and does not include the principle.
- **Interest Rate:** The interest rate is the percent of the principle that will be earned over a given period of time.
- **Term:** The term is the length of time your money is invested for during which you will accrue interest.
- **Present Value:** Present value is a term used when you know the future value of an investment, but do not know the principle. This tells you how much you need to invest if you want to have a certain amount after a given amount of time.
- **Compounding Period:** The compounding period is the amount of time that interest is calculated over. Compound interest can be calculated quarterly, monthly, yearly, etc.
- **Annual Yield:** The annual yield is the equivalent simple interest rate that matches the future value of a given compound interest over the course of a year.
- **Annuity:** An annuity is a series of equal, regularly-timed payments that get put into an account with compound interest. An ordinary annuity has the payment due at the end of the regular time period (Ex: the end of the month). An annuity due has the payment due at the beginning of the regular time period (Ex: the beginning of the month)
- **Amortized Loan:** An amortized loan is a loan where the principle and interest of the loan are paid off in regular equal payments over a period of time.

## Key Formulas

- **Simple Interest:**  $I = Prt$   
**Example:** For a \$100,000 principle, what is the interest accumulated over 4 years with an interest rate of 3%?  

$$I = 100,000 \cdot .03 \cdot 4 = 12,000$$
The accumulated interest is \$12,000.
- **Future Value:**  $FV = P(1 + rt)$   
**Example:** What is the future value of the above principle at the same rate, over a period of 9 months?  

$$FV = 100,000(1 + .03 \cdot .75) = 100,000(1.0225) = 102,250$$
The future value of the investment is \$102,250. Notice how "9 months" is expressed in terms of years. Unless otherwise noted, simple interest is usually expressed in years.
- **Compound Interest:**  $FV = P(1 + i)^n$

**Example:** Calculate the future value of an investment of 50,000 that receives compound interest at a rate of 4% per year, compounded quarterly, after 8 years.

$$FV = 50,000(1 + .01)^{32} = 50,000(1.37494) = 68,747$$

The future value of the investment is \$68,747. Notice that compound interest means you divide the yearly rate by how often it is compounded to get  $i$ . Also notice that the number of periods,  $n$ , is in the same measure of time as the compounding.

- **Ordinary Annuity:**  $FV(\text{ord}) = pymt \frac{(1+i)^n - 1}{i}$

**Example:** Find the present value of an ordinary annuity that has a \$100 monthly payment for 20 years where the account receives 6% interest. Round to the nearest cent.

First, substitute  $P(1 + i)^n$  for  $FV(\text{ord})$  as they represent the same amount and solve for  $P$ .

$$P(1 + .005)^{240} = 100 \cdot \frac{(1 + .005)^{240} - 1}{.005}$$

$$P = \frac{100 \cdot \frac{(1 + .005)^{240} - 1}{.005}}{(1 + .005)^{240}} = \frac{100 \cdot \frac{2.3102}{.005}}{3.3102} = \frac{46,204}{3.3102} = 13,958.069$$

The present value of the annuity is \$13,958.07. Notice how the formula was rearranged to isolate the variable. Also, notice the order in which operations were done.

- **Annuity Due:**  $FV(\text{due}) = pymt \frac{(1+i)^n - 1}{i} (1 + i)$

**Example:** Find the future value of an annuity due for the information from the last example.

$$FV(\text{due}) = 100 \cdot \frac{(1 + .005)^{240} - 1}{.005} \cdot (1 + .005) = 100 \cdot \frac{2.3102}{.005} \cdot 1.005 = 46,435.02$$

The future value of the annuity due is \$46,435.02.

- **Simple Interest Amortized Loan:**  $pymt \frac{(1+i)^n - 1}{i} = P(1 + i)^n$

**Example:** Find the monthly payment of a simple interest amortized loan of \$20,000 over the course of 6 months at an interest rate of 12%. Round to the nearest cent.

$$pymt \frac{(1 + .1)^6 - 1}{.1} = 20,000(1 + .1)^6$$

$$pymt = 20,000(1 + .1)^6 \cdot \frac{.1}{(1 + .1)^6 - 1} = 20,000(1 + .1)^6 \cdot \frac{.1}{.7716}$$

$$= 20,000 \cdot 1.7716 \cdot .1296 = 4,591.9872$$

The monthly payment for this loan would be \$4,591.99. Be aware that you may be asked to create an amortization schedule. To do so, follow the instructions in the chapter.

## Helpful Tips

- **Rearranging Formulas:** Sometimes the information you are given will require you to rearrange one of the formulas you have been given to solve for a different variable. In order to do this correctly, reverse the order of operations below and use the reverse operation of what you are trying to move on BOTH sides of the equation. The original side will cancel out and you can proceed to moving the next step over.
- **Computing Information Piece-by-Piece:** If your calculator does not allow you to compute all information at once, or you prefer to do it one operation at a time by hand, be sure to follow the order of operations and work from the inside out. The order of operations is PEMDAS (Parentheses, Exponents, Multiplication, Division, Addition, and Subtraction).
- **Rounding Numbers:** Due to the number of computations and the size of the numbers being used, it is easy to get final answers that are close, but incorrect because you rounded too early. To avoid this, take into account how many decimal places your homework asks for and do not round sooner than double that amount of places until it is time to put in your final answer. Because of this, it can be safer to input the entire equation before calculating the answer (this can be done with relative ease using a T.I. 84 or Microsoft Excel).
- **Choosing a Calculator:** It is important to choose a calculator that is able to “store” a significant number of digits for the same reason it is important to not round too early. Some online calculators or inexpensive models do not calculate to enough decimal places to produce an accurate answer that will be accepted by WebAssign. To avoid frustration, it is important to get at least a T.I. 30x (a basic scientific calculator). A T.I. 83 or 84 is also a quality calculator that will allow you to do more steps at once but is also more expensive. Microsoft Excel can be an exceptionally useful tool when used properly.
- **Using Excel:** In order to get a correct answer in Excel, follow the same steps provided in your textbook for computing all steps at once. The only difference is that you start with an equals sign in the function bar at the top and all given information must follow that. Be sure to use all indicated parentheses. The asterisk stands for multiplication, the backslash stands for division, and the carrot raises the preceding numbers to the following power.

## Symbol Guide

Finance Symbols		
Term	Symbol	Use
Interest	$I$	$I = Prt$
Principle	$P$	See Above
Interest Rate	$r$	See Above
Term	$t$	See Above
Future Value	$FV$	$FV = P(1 + i)^n$
Period Interest Rate	$i$	See Above
Number of Periods	$n$	See Above
Payment Size	$pymt$	$FV(\text{ord}) = pymt \frac{(1 + i)^n - 1}{i}$