1.5 SIMPLE AND COMPOUND INTEREST

The terms *interest, interest period,* and *interest rate* were introduced in Section 1.3 for calculating equivalent sums of money for one interest period in the past and one period in the future. However, for more than one interest period, the terms *simple interest* and *compound interest* become important.

Simple interest is calculated using the principal only, ignoring any interest accrued in preceding interest periods. The total simple interest over several periods is computed as

$$\text{Interest} = (\text{principal})(\text{number of periods})(\text{interest rate}) \qquad [1.3]$$

Simple interest

Final value = principal(1 + interest rate)$^{(n)}$

While Compound value = Principal$(1+i)^n$

n: number of periods

EXAMPLE 1.4

HP borrowed money to do rapid prototyping for a new ruggedized computer that targets desert oilfield conditions. The loan is $1 million for 3 years at 5% per year simple interest. How much money will HP repay at the end of 3 years? Tabulate the results in $1000 units.

Borrowed Money

TABLE 1.1 Simple Interest Computations (in $1000 units)

(1) End of Year	(2) Amount Borrowed	(3) Interest	(4) Amount Owed	(5) Amount Paid
0	$1000			
1	—	$50	$1050	$ 0
2	—	50	1100	0
3	—	50	1150	1150

First year = $1,000,000(1 + 0.05(1)) = $1,050,000

2nd year = $1,000,000(1 + 0.05(2)) = $1,100,000

3rd year = $1,000,000(1 + 0.05(3)) = $1,150,000

increase of $50,000 per year

Using Excel

Simple interest

Using excel to solve 1.4

D10 | =D5*(D5+D6)

$D_5 = \$1.00$ Million

$D_6 = 0.05(1)$

	B	C	D	E	F	G
1						
2						
3	Solved example 1.40					
4	case of simple interest					
5	Present value (principal)		1	Million		
6	Interest rate		0.05	%percent		
7	Terms(years)		3	years		
8	Period		balance			
9	start		1	Millions		
10	After -one year		1.05	Millions		
11	After -two years		1.1	Millions		
12	After -three years		1.15	Millions		

5%

written as (0.05)

$FV = 1,000,000$

$(FV)_1 = \$1(1+0.05(1))$

$FV_2 = \$1(1+(0.05(2))$

$FV_3 = \$1(1+(0.05)(3))$

=D5*(1+D6*2)

2 for 2 years

EXAMPLE 1.5 If HP borrows $1,000,000 from a different source at 5% per year compound interest, compute the total amount due after 3 years. Compare the results of this and the previous example.

Solution:

Case of Compound interest 5%:

End of First year $\Rightarrow$ amount accrued $= 1,000,000(1+0.05)^{n=1}$ # 1 year $= 1,050,000$

End of 2nd year $\Rightarrow$ amount accrued

$1,050,000(1.05) \Rightarrow \$1,102,500$

End of Third year $\Rightarrow$ amount accrued

$= 1,102,500(1.05) = \$1,157,625$

or

$= 1,000,000(1.05)^1(1.05)^1(1.05)^1 = 1,000,000(1.05)^3 = \$1,157,625$

Simple interest

5%

1,000,000

n = 30 year

$1,050,000

1 year

+ 0.05(1,000,000)

+ 50,000 → $1,100,000

2 nd

$1,150,000

3rd

Compound interest

5%

n = 3

1,000,000 →

$1,050,000

$1,102,500

$1,157,625

Comparsion between Calculations

Excel

Compound interest

FV

$FV = PV(1+0.05)^n$

FV: future value

Solved example 1.50

Case of compound interest

Present value	1	Million	5%	
Interest rate	5	%percent		
Terms(years)	3	years		
Compounding periods by year	3	Compounded yearly		

Compound interest yearly

Period	time	balance	
start	0	1	Millions
After -one year	1	1.05	Millions
After -two years	2	1.1025	Millions
After -three years	3	1.15763	Millions

Future value £1.16

Syntax **FV(rate, nper, , pv, [type])**

rate

FV(5%,3,,-1)

amount is in negative so as to get the future value amount in positive.

For our Example → nper, , -$1.000 → Present value