7.2   Compound Interest

Present Value (P or PV):
- Principal that needs to be invested/borrowed <u>now</u> to achieve a future goal.
- PV can be calculated when the interest rate, compounding period and

length of term are known.

Present Value Formula: Use compound interest formula, rearranged for "P".

$$A = P (1 + i)^n$$

$$\frac{A}{(1 + i)^n} = P$$

$$A(1 + i)^{-n} = P$$

where
A = Amount at end of investment ($)
P = Present value/principal ($)
i = Interest rate per compound pd.
n = # of compound periods

Ex. 1 Julia wants to have $5000 in 2 years to use as a down-payment for a car. How much does she need to invest now at 6.3%/a compounded monthly?

Given
P = ?
A = 5000
$i = \dfrac{0.063}{12}$
$n = 2 \times 12$
$= 24$

$P = \dfrac{A}{(1+i)^n}$

$= \dfrac{5000}{\left(1 + \frac{0.063}{12}\right)^{24}}$

$\doteq 4409.53$

∴She will need to invest $4409.53

Ex. 2 David plans to put money into an RESP so that he has $9000 in 5 years. Which option is the best deal for David?

a) 7.2% compounded semi-annually

Givens
A = 9000
$i = \dfrac{0.072}{2}$
$n = 2 \times 5$
$= 10$

$P = \dfrac{A}{(1+i)^n}$

$= \dfrac{9000}{\left(1 + \frac{0.072}{2}\right)^{10}}$

$\doteq 6318.95$

b) 6.5% compounded bi-weekly

Givens
A = 9000
$i = \dfrac{0.065}{26}$
$n = 26 \times 5$
$= 130$

$P = \dfrac{9000}{\left(1 + \frac{0.065}{26}\right)^{130}}$

$\doteq 6505.38$

↑
"Put in" least amount

∴Option A is the best choice

1

The TVM Solver

A program on the graphing calculator used for financial calculations.

To find the TVM Solver program:

[APPS] , 1: Finance..., [ENTER] , 1: TVM Solver... [ENTER]

> N   = # of years
> I%   = interest rate/a as a percent
> PV   = present value (P)
> PMT   = the payment amount (put as "0" if there are no payments)
> FV   = future value (A)
> P/Y   = number of payments per year (put as "1" if there are no payments)
> C/Y   = number of compound periods per year
> PMT: = choose END

To determine a value:
- Move the cursor to the appropriate line and press [ALPHA] [ENTER]

Ex. 3 Harriet invested $4 000 in an investment fund that pays 6.5%/a compounded monthly. How much money is in the account after 8 years?

(handwritten: PV, C/Y=12, n=8)

N= 8

I%= 6.5   *interest rate/a as a percent*

PV= - 4000   *cash out neg-money going out of your pocket into the bank*

PMT= 0   *no regular payments-this is a one time investment*

FV= ■   *move cursor to here then press [ALPHA] [ENTER]*

P/Y= 1   *Put as a 1 as no payments*

C/Y= 12   *number of compound periods per year*

PMT: (END) BEGIN

(handwritten: = $6718.68)

Ex. 4 How much do you need to invest now at 8.2%/a compounded quarterly to have $20 000 in 5 years?

N= 5

I%= 8.2

PV= ▧ - 13328.15

PMT= 0

FV= 20 000

P/Y= 1

C/Y= 4

PMT: (END) BEGIN

(handwritten: ∴ You need to invest $13328.15)

Ex. 4 Graham deposits $4500 into an account paying 3.5%/a compounded monthly. How long will it take him to have $8000 to buy a motorcycle?

N= ☐   → 16.5
I%= 3.5
PV= -4500
PMT= 0
FV= 8000
P/Y= 1
C/Y= 12
PMT: (END) BEGIN

∴ It will take
16.5 yrs

Ex. 5 Jason invested $1200 in a fund that compounded interest semi-annually. At what rate did he invest at if he earned $500 interest in 6 years?

N= 6
I%= ☐   → 5.9
PV= -1200
PMT= 0
FV= 1200+500 = 1700
P/Y= 1
C/Y= 2
PMT: (END) BEGIN

∴ He will need
to invest at 5.9%

Ex. 6 Which investment will reach $10 000 faster?

A: $7500 invested at   OR   B: $8200 invested at
4.5%/a compounded monthly   4.2% compounded semi-annually

N= ☐ → 6.4
I%= 4.5
PV= -7500
PMT= 0
FV= 10000
P/Y= 1
C/Y= 12
PMT: (END) BEGIN

N= ☐ → 4.8
I%= 4.2
PV= -8200
PMT= 0
FV= 10000
P/Y= 1
C/Y= 2
PMT: (END) BEGIN

↑ 4.8 yrs!
This choice is faster

Ex. 7 Go back to examples 1 and 2 and use the TVM solver to check your answers.

Ex. 8 Brian is investing $6800 at an interest rate of 7% per annum, compounded quarterly, for 2 years. Then, he will invest the amount plus additional money at 6.5%/a, compounded semi-annually, for 3 years. At the end of the second investment, he wants to have $15 000. How much extra must he invest for the second investment?

N= 2 I%= 7 PV= -6800 PMT= 0 FV= ▨ →7812.40 P/Y= 1 C/Y= 4 PMT: (END) BEGIN	N= 3 I%= 6.5 PV= ▨ -12380.86 PMT= 0 FV= 15000 P/Y= 1 C/Y= 2 PMT: (END) BEGIN

How much more than 7812.40 is 12380.86?

$$\text{difference} = 12380.86 - 7812.40$$
$$= 4568.46$$

∴ He will need to invest an additional $4568.46

Homework
Page 441 #C2,1b,2,4-6,8,9,11,14,17

https://www.youtube.com/watch?v=TN7tM7iOx4E   Virtual TI for Mac users.