Unit 8: Financial Applications

Day 4: Compound Interest - Present Value

Today we will...

1. Rearrange the compound interest formula to solve for the principal.

2. Use the rearranged formula to solve for the principal.

MCF3MI: **Unit 8: Financial Applications** **Day 4: Compound Interest – Present Value**

Warm up: You lent out $500 to a friend. They've agreed to pay you back at the end of one year with 8% interest compounded monthly. How much will they pay you at the end of the year?

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

$= 500(1+0.006)^{12}$

$= 541.71$

$i = \frac{0.08}{12} = 0.006\overline{6}$

$n = 1 \times 12$

A Definition:

Present Value: How much money do I need NOW to get a certain amount in the future?

EX. 1. Joanne needs $2500 for tuition in 15 months. What sum of money must she invest now if interest is paid at 4.5% compounded monthly?

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

$A = 2500$

$2500 = P(1+0.00375)^{15}$

$2500 = P(1.057750829)$

$\frac{2500}{1.057750829} = \frac{P(1.057750829)}{1.057750829}$

$2363.51 = P$ ∴ She needs $2363.51 now.

$i = \frac{0.045}{12}$

$= 0.00375$

leave all this in your calc. DO NOT Round off!

EX. 2. William arranged a loan where he must pay back $3500 at the end of 2 years. If the interest rate is 6.75% compounded quarterly, how much did he borrow?

$A = P(1+i)^n$ (P = ?, A = 3500)

$3500 = P(1.016875)^8$

$\frac{3500}{(1.016875)^8} = \frac{P(1.016875)^8}{(1.016875)^8}$

$3061.45 = P$

$i = \frac{0.0675}{4}$

$i = 0.016875$

$n = 2 \times 4$

$n = 8$

∴ he borrowed $3061.45

Present Value: If we rearrange the formula $A = P(1+i)^n$ to isolate P, we get…

$$P = \frac{A}{(1+i)^n} \quad \text{OR} \quad P = A(1+i)^{-n}$$

P = Principal
A = Accumulated value
i = interest rate (per comp period)
n = number of comp periods.

EX. 3. Upon your birth, your parents decided to invest some money so that they could give you a $16,000 gift on your 16th birthday. They purchased a compound-interest government bond that pays 8%/a compounded annually. After that initial amount was invested, there were no further transactions until the bond reached maturity. What was the "present value" that your parents' invested when you were born?

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

$= \frac{16\,000}{(1.08)^{16}}$

$= 4670.25$

$i = 0.08$

$n = 16$

∴ $4670.25 needed

EX. 4. You have $3000 in your savings account. You intend to buy a new laptop computer and printer, and then invest the remainder of your savings for 2 years, compounding monthly at an annual interest rate of 3%/a. You want to have $2000 in your account 2 years from now. (A)

Determine the amount you can spend on the laptop and printer.

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

$= \frac{2000}{(1+0.0025)^{24}}$

$= 1883.67$

$i = \frac{0.03}{12} = 0.0025$

$n = 2 \times 12 = 24$

$3000 - 1883.67 = 1116.33$

∴ you can spend $1116.33 on the laptop

Homework: p. 476 #4, 8-12, 14