TIME VALUE OF MONEY

Return of vs. Return on Investment: We **EXPECT** to get more than we invest!

Invest $1,000 it becomes $1,050 $1,000 return of $50 return on

Factors to consider when assessing "Return on" investment

1. Time - $50 return in one year $60 return in two years.
2. Common Size Measurement

   Which is better $1,000 or $10,000 return on investment?

   Rate of Return – assumes one year

   $$\frac{\text{\$ Amount of Return}}{\text{\$ Amount of Investment}}$$

   (Negative Rate of Return)

Uncertainty: RISK

Expected Rate of Return: Takes into consideration chance of an outcome occurring. It is a weighted average of possible rates of return.

Risk Factors: Inflation + Business Risk + Liquidity Risk

Risk Preferences: Risk Taker vs. Risk Averse

Simple vs. Compound Interest

Principal x Rate x Time = Interest

The interest rate used takes into consideration the risk factors above.

Simple: Interest on Principal Only

2008 $10,000 x .1 x 1 = $1,000

2009 $10,000 x .1 x 1 = $1,000

2010 $10,000 x .1 x 1 = $1,000

Total Interest	$ 3,000
Return of Principal	10,000
	$13,000

Compound Interest: Interest added to Principal at Specified Points in Time
Compounding Period: Point where interest is added to Principal.

Annual Compounding – Interest added to principal once a year.

2008 $10,000 x .1 x 1 = $1,000

2009 $11,000 x .1 x 1 = $1,100

2010 $12,100 x .1 x 1 = $1,210

Total Interest	$ 3,310
Return of Principal	10,000
	$13,310

Where did the extra $310 come from?

What if Compounded Semi- Annually?

2008 $10,000 x .1 x 1/2 = $500

$10,500 x .1 x 1/2 = $525

2009 $11,025 x .1 x 1/2 = $551.25

$11,576.25 x .1 x 1/2 = $578.81

2010 $12,155.06 x .1 x 1/2 = $607.75

$12,762.81 x .1 x 1/2 = $638.14

Total Interest	$ 3,400.95
Return of Principal	10,000.00
	$13,400.95

What if compounded Monthly for 3 years? NO!!!!!!!

1. How many compounding?
2. How will interest differ from above?

The desired NOT to do 36 compounds leads us to:

$(1 + r/c)^n$ Where r = Annual Rate
c = Number of Compounds per year
n = Total Number of Compounding

$(1 + .10/2)^6 = 1.340095$

Therefore: If invest $10,000 3 years compounded semiannually

$10,0000 x 1.340095 = $13,400.95

FUTURE VALUE OF AMOUNT OF $1

PV = Lump sum of money today
FV = Lump sum of money at some point in the future
r = Annual Rate of Return
c = Number of compoundings in a year
n = Total number of compounding over time period

$$\mathbf{FV = PV \times (1 + r/c)^n}$$

$10,000 invested 3 years compounded monthly will become ?
Use calculator to solve:
$FV = \$10,000 \times (1 + .10/12)^{36} = \$13,481.82$ Why Higher?

PRESENT VALUE OF $1

You want to have $13,400.95 in 3 years how much would you have to invest today to achieve this goal assuming you can earn 10% compounded semiannually?

$$FV = PV \times (1 + r/c)^{n}$$

$$\$13,400.95 = PV \times (1 + .10/2)^{6}$$

$$FV \times \frac{1}{(1 + r/c)^{n}} = PV$$

$$\$13,400.95 \times \frac{1}{(1 + .10/2)^{6}} = PV$$

$$\$10,000 = PV$$

Another View: $10,000 today is the equivalent of $13,400.95 3 years from today ASSUMING the interest rate is 10% and is compounded semiannually.

Do monthly compounding using calculator.

You want to have $10,000 in 5 years how much must you invest today if you can earn 8% that is compounded quarterly?

$$PV = FV \times \frac{1}{(1 + r/c)^{n}}$$

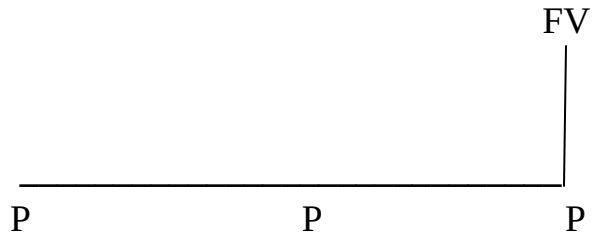
FV = $10,000 r = 8% c = 4 n = 20 PV = ?

PV $6,729.71

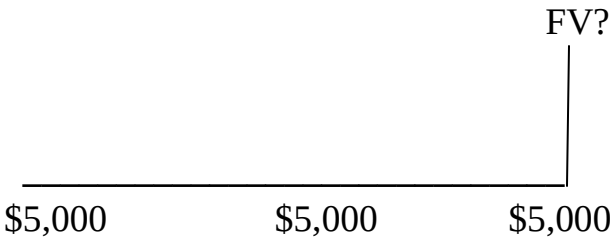
Ask for example from Class:

ANNUITIES: Equal cash payments at equal time intervals with the same interest rate of the entire time period. Interest is compounded at each payment date.

Future Value of an Annuity:



3 annual payments of $5,000 starting 1/1/08 how much will you have when the last payment is made if you can earn 10% interest?



Date	Payment	Interest	Future Value
1/1/08	$5,000	$ 0	$ 5,000
1/1/09	$5,000	500	10,500
1/1/10	$5,000	1,050	16,550

Math formula $FV = Annuity \times \frac{[(1 + r/c)^n - 1]}{r/c}$

Calculator does math for us:

Ann = Annuity
c = Number of Payments/ Compoundings per year
r = Annual rate of interest
n = Number of payments
FV = Future Value

FV = ? Ann = $5,000 r = 10% c = 1 n = 3 FV = $16,550

What if made 15 annual payment with 10% annual interest?

FV = $31,772.48 NOTE THAT NUMBER COME OUT NEGATIVE!

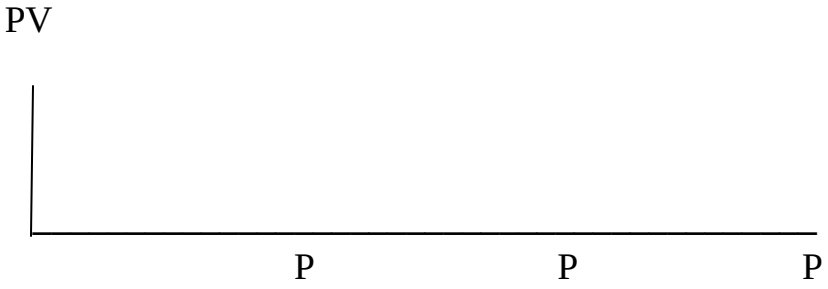
What if you wanted to have $31,772.48 after making 15 payments how much would each payment have to be?

FV = $31,772.48 Ann = ? c = 1 n = 15

What if you wanted to have $1,000,000 after making monthly payments for 40 years and you could earn an 8% annual interest rate? How much must the monthly payments be?

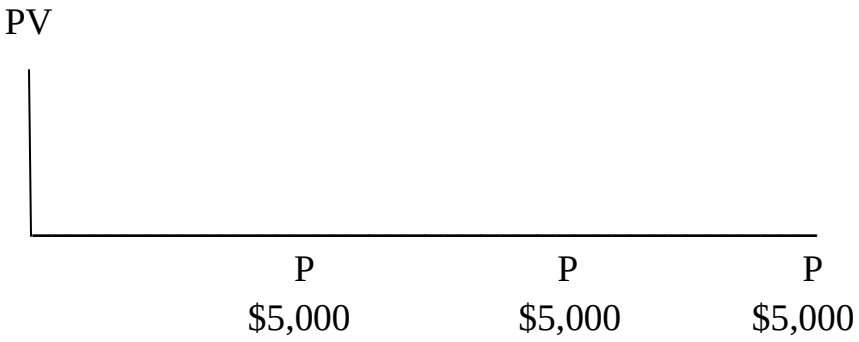
How much you would you have if you made monthly payments of $300 per month for 40 years and could earn 10%? 8%? 5%?

Present Value of an Annuity: What is an annuity worth today



Formula: $PV = \text{Annuity} \times \frac{[1 - 1/(1 + r/c)^n]}{r/c}$

What are three annual $5,000 payments worth today if the interest rate is 10% and the first payment is one year from today. Stated another way – How much could you borrow if you agreed to pay $5,000/ year for 3 years at 10% annual interest rate?



PV = ? Ann = $5,000 r = 10% c = 1 n = PV = $12,434.26

Proof:

Date	Payment	Interest	Principal	Present Value
1/1/08				$12,434.26
1/1/09	$5,000	$ 1,243.43	$3,756.57	8,677.87
1/1/10	$5,000	867.77	4,132.23	4,545.64
1/1/11	$5,000	454.56	4,545.64	0

Doesn't this look like a car payment?

You borrowed $2,000 to buy a new stereo. The interest rate is 8% and the payments are semi-annual for 2 years. How much are your payments?

PV = $2,000 Ann = ? r = 8% c = 2 n = 4

Ann = $550.98

HOW DO YOU KNOW WHICH METHOD TO USE?

You want to have $40,000 in 5 year, how much do you need to invest annually starting today to achieve this goal if the interest rate is 6%?

Is this a FV of $1?
PV of $1?
FV of Annuity?
PV of Annuity?

Use Steps:

#1 Is this an annuity?
#2 Is it a present or future value?
#3 Identify the missing element
#4 Solve for the missing element.