

Compounding & Discounting

Five Basic Factors to Compounding and Discounting

n = # Of Periods (Time)

i = Interest Rate/Discount Rate

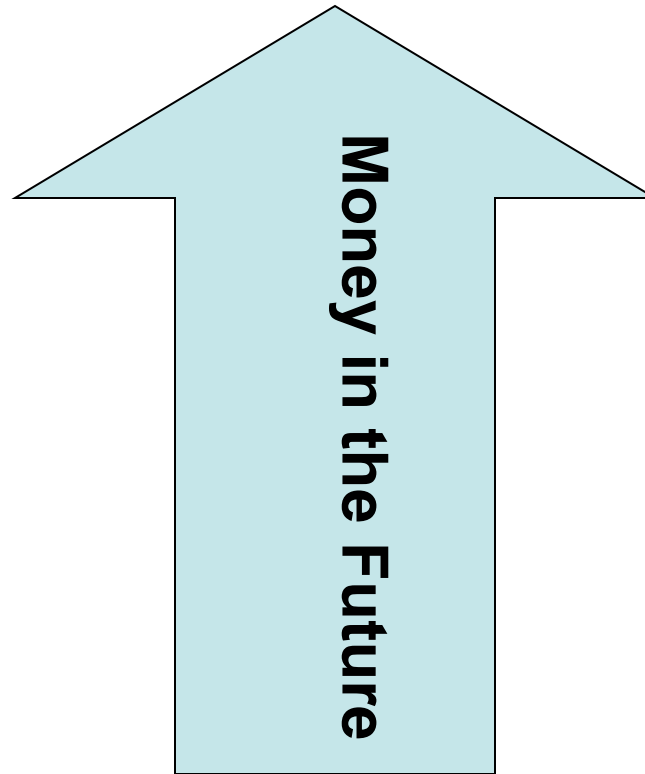
pv = Present Value (Money Today)

pmt = Periodic Payment/Periodic Investment

fv = Future Value (Money Later)

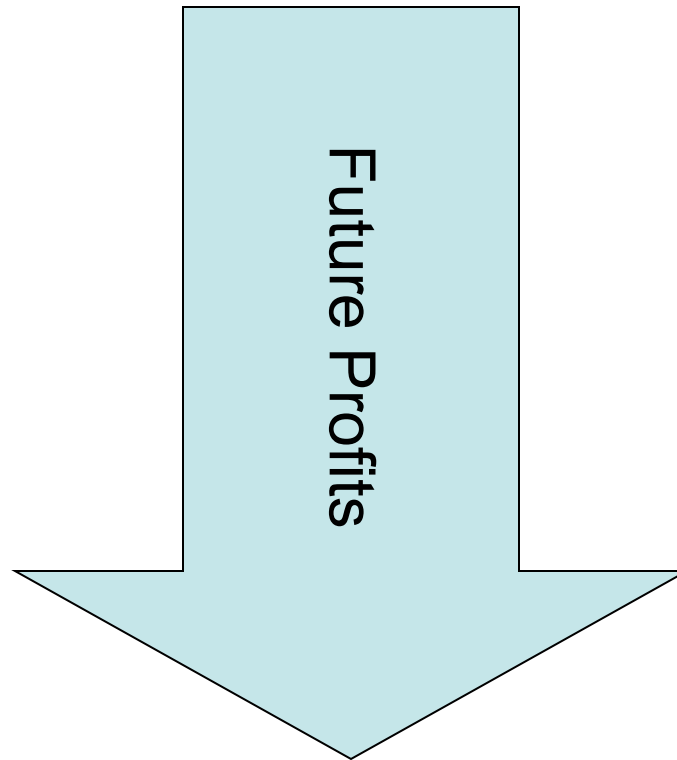
Compounding

Investing Money Today



Discounting

What Will You Pay Today



Compounding

There are Three Types of Compounding Equations

- 1) Compounding a Single Investment
- 2) Compounding an Annuity
- 3) Sinking Fund Investment

Compounding an Annuity

Compounding an Annuity: Investing a specific amount periodically, (monthly or annually) at a rate for a period of time. (e.g. If I invest \$1,000 per year for the next ten years and I earn 10.5% interest, what will this investment be worth at the end?)

$$n=10$$

$$I = 10.5\%$$

$$pv=$$

$$pmt=(\$1,000)$$

$$fv= ?$$

e.g. Compounding an Annuity

How much will I have if I invest \$500 per month earning 9% compounded monthly for five yrs:

n	=	60
I	=	9
pv	=	na
pmt	=	(\$500)
fv	=	?

How much will it be if I invested \$6,000 annually for five years @ 9% ?

What interest rate must I earn in order to have \$20,000 in an account in 10 years \$750/year:

n	=	10
I	=	?
pv	=	na
pmt	=	(\$750)
fv	=	\$20,000

How about if I invested \$62.50/month for 10 years: ?

Sinking Fund Account

Compounding for a Sinking Fund: Investing a single amount or periodic payment into an account with a specific future goal/need. (e.g. I need \$20,000 five years from today and I can earn an interest rate of 8% compounded annually. How much must I invest each year?)

n	=	5
I	=	8
pv	=	na
pmt	=	?
fv	=	\$20,000

e.g. Compounding a Sinking Fund

You buy an annuity which will grow to \$100,000 40 years from today with a growth rate of 6.0%. How much will you need to invest annually?

n	=	40
I	=	6.0
pv	=	na
pmt	=	?
fv	=	100,000

You have \$250 per month to invest and you must have \$150,000 18 years from today. What rate of return must you earn?

n	=	216
I	=	? pv = na
pmt	=	(\$250)
fv	=	\$150,000

How much would you have to invest monthly?

Discounting

There are Three Types of Discounting Equations (the opposite three of compounding)

- 1) Discounting a single future value to a present value
- 2) Discounting a future stream of payments into a single present value
- 3) Calculating a stream of future payments which will amortize a present value

Discounting a FV to a PV

Discounting a Future Value: Converting an amount of money to be received in the future into value today. (e.g. What is the value today for the right to receive \$10,000, ten years from today, assuming a discount rate of 7.5%)

n	=	10
I	=	7.5%
pv	=	?
pmt	=	na
fv	=	\$10,000

e.g. Discounting a Future Value

How much would you pay today for the right to receive \$100,000 in twenty years assuming you required a 11.5% return?

n	=	20
I	=	11.5
pv	=	?
pmt	=	na
fv	=	100,000

How much would you pay if you required a 11.5% return compounded monthly?

If you paid \$5,000 for the right to receive \$15,000 in ten years what would your annual rate of return be?

n	=	10
I	=	?
pv	=	(\$5,000)
pmt	=	na
fv	=	\$15,000

What is your monthly rate of return on this investment?

Discounting a Future Payment Stream

Discounting a Future Stream of Payments : Converting a future stream of payments into a value today. (e.g. What is the value today of a payment stream of \$1,000,000 to be received every year for the next 26 years assuming a discount rate of 5,6,or7%)

n	=	26
I	=	5%, 6%, 7%
pv	=	?
pmt	=	\$1,000,000
fv	=	na

e.g. Discounting a Future Stream of Payments

How much would you pay today for the right to receive \$12,000 per year for the next 10 years if you require a 7% return annually?

n	=	10
I	=	7
pv	=	?
pmt	=	\$12,000
fv	=	na

How much would you pay for \$1,000 per month for 10 years with a 7% return compounded monthly?

Congratulations, you just won the CA state lottery you will receive \$52,000,000. payable over 26 years, what is the cash value today assuming a 6% discount rate?

n	=	26
I	=	6
pv	=	?
pmt	=	\$2,000,000
fv	=	0

Future Payments to Amortize a Present Value

Future Payments to Amortize a Present Value: Calculating the future payments necessary to amortize a present value is used most often in real estate (e.g. What are the annual payments necessary to payoff \$100,000 in ten years assuming an interest rate of 8.5%?)

n	=	10
I	=	8.5%
pv	=	\$100,000
pmt	=	?
fv	=	na

e.g. Amortization

What are the annual payments necessary to amortize a thirty year loan of \$500,000 @ 5.25%?

n	= 30
I	= 5.25%
pv	=\$500,000
pmt	=
fv	= 0 or na

What is the interest rate on a loan of \$650,000 with monthly payments of \$3,000 over a thirty year term?

n	=30x12=360
I	= ?
pv	= \$650,000
pmt	= (\$3,000)
fv	= 0

What are the monthly payments for the same loan?