Panel 1

Last Time.

Compound Interest Formula:

$$S = P(1+r)^4$$

Wed. : Quiz
Mon : Review
Wed 4/20 : Exam 3
Computer work.

Effective Rate Formula:

$$r_e = \left(1+\frac{r}{n}\right)^n - 1$$

A: 5.0% compd quarterly
$\left(1+\frac{0.05}{4}\right)^4 - 1$

B: 4.8% compd. weekly
$\left(1+\frac{0.048}{52}\right)^{52} - 1$

Present Value

amount of money to invest now to get X in the future

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Panel 2

Ex: Suppose you need \$1,000 in three years, and your bank offers 9% compounded monthly. Find the present value of \$1,000 in 3 years.

$$1000 = P\left(1+\frac{0.09}{12}\right)^{36}$$ → solve for P

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Panel 3

Present Value	*The PV function returns the present value of an investment. The present value is the total amount that a series of future payments is worth now. For example, when you borrow money, the loan amount is the present value to the lender.*
Excel Formula:	**=PV(rate, nper, pmt, fv)**, where
	rate: is the interest rate per period.
	nper: is the total number of payment periods in an annuity.
	pmt: is the payment made each period; it cannot change over the life of the annuity.
	fv: is the future value, or a cash balance you want to attain after the last payment is made.

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Panel 4

Example:	*Find the present value of $1000 due after 3 years if the interest rate is 9% compounded monthly.*		
Solution:			
	Interest rate:	*0.09*	
	Compound Periods:	*12*	
	Number of years:	*3*	
	rate:	**0.0075**	= *Interest rate / compound periods*
	nper:	**36**	= *Number of years * compound periods*
	pmt:	**0**	
	fv:	**1000**	← positive (you get)
	PV(rate, nper, pmt, fv) =	**($764.15)**	← neg. (you pay)

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Panel 5

Ex: A trust fund for a child should yield $50,000 in 15 years at 7% comp. semiannually. How much should you invest?

$= PV\left(\frac{.07}{2}, 30, 0, 50000\right) = \$17\,813.-$

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Panel 6

Ex: A trust fund should yield $50000 after 15 years, at 7% compounded semiannually, and every period we make a payment of $100.

$= PV\left(\frac{.07}{2}, 30, -100, 50000\right)$

negative, because I pay it!

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Panel 7

Other useful Excel formulas for financial math

Future value : future value of an investment

= FV(rate, nper, pmt, pv)

rate = interest per period

nper = # of periods

pmt = payment per period negative

pv = investment amount. negative

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Panel 8

Ex: Invest $1000 at 8% compounded quarterly for 7 years.

$S = 1000\left(1 + \frac{0.08}{4}\right)^{20}$

$= FV\left(\frac{0.08}{4}, 20, 0, -1000\right)$

} $485,-

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Panel 9

Ex: Value of $1000 at 8% compounded quarterly in 5 years if $100 payments are made every quarter.

(1) Guess: $1000 \cdot 0.09 = 80 \times 5 = 400$

payments $100 \times 4 \times 5 = 2000$

initial 1000

3400

(2) $= FV\left(\frac{0.08}{4}, 20, -100, -1000\right) = \$3917.-$

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Panel 10

Ex: What is the present value of $3917.68 in 5 years at 8% compounded quarterly, if $100 payments are made?

$= PV\left(\frac{0.08}{4}, 20, -100, 3917.68\right) = \$1000.-$

PV and FV are inverse (opposites) of each other.

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Panel 11

Annuities: A finite sequence of payments made at fixed periods over a given interval.

Ex:
- Buy annuity, i.e. monthly payments over 20 years.
- Pension
- car payments
- mortgage for house

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Panel 12

Ex: Suppose you can afford payments of $100 per month for a loan at 6% compounded monthly over 3 1/2 years. How much money is this worth now?

① You pay: $100 \times 12 \times 3.5 = \$4200.-$

② $= PV\left(\frac{0.06}{12}, 3.5 \cdot 12, -100, 0\right) = \$3279.83$

(0 optional)

Rate changed to 10%

③ $\left(\frac{0.1}{12}\right)$ $3531.+

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Panel 13

The "Payment" Function: calculates the payments per period for a loan at given conditions:

= PMT (rate, nper, pv, fv)

rate = interest per period

nper = # of periods

pv = present value or loan amount — negative (bank's point of view)

fv = zero usually (optional)

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Panel 14

Ex: The bank loans you $ 3779.93 over 3 ½ years at 6% compounded monthly. What are the monthly payments?

= PMT (0.06/12, 3.5·12, 3779.93)

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Panel 15

Ex: You get a short-term loan of $1500 over 3 months at a nominal rate of 12% compounded monthly. What are your monthly rates?

① Guess: Bonko gets $500 a month
Interest: 0.01 × 1500 = 15 per month
⇒ rate: $515,-

② = PMT(0.01, 3, -1500) ≈ $510.03 ← Coley?

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Panel 16

Loan $1500 at 12% compounded monthly for 3 months.

	you owe	interest	pmt	pay off
month 1	1500	0.01·1500 = 15	510.03	510.03 − 15 = 495.03
month 2	1500 − 495.03 = 1004.97	0.01·1004.97 = 10.05	510.03	510.03 − 10.05 = 499.98
month 3	1004.97 − 499.98 = 504.99	0.01·504.99 = 5.05	510.03	510.03 − 5.05 = 504.98
		30.09	1530.09	1506

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Panel 17

Summary

Compound interest: $S = P(1+r)^n$

Effective rate: $\left(1+\frac{r}{n}\right)^n - 1$

Present Value: =PV(rate, nper, pmt, fv)

Future Value: =FV(rate, nper, pmt, pv)

Payments: =PMT(rate, nper, pv, 0)

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Panel 18

(1) You sign for a loan with payments of $200 per month at 10% over 10 years compounded monthly

(2) You want to setup a trust fund of $50,000 in 15 years at 3% interest compounded monthly with monthly payments of $150.- (HW)

(3) You invest $150 per month at 7% compounded monthly for 4 years. How much will you have?

(4) You take out a loan for $20,000 over 5 years at 4% interest compounded monthly. Payments per month?

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