Panel 1

Organizational

No class Wed (Imm. Conc. Exam) ← open book/notes

Send you Exam 3 as Take-Home on Wed, due on Monday

Maple 2 due today

Final Exam Wed, Dec 15 @ 7:45

Room : TBD (not our classroom)

Review on Monday in class for final

Review on Tuesday, TBD

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Panel 2

Last Time

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

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

Present Value: value of $X in the future now

Excel: = PV(rate, nper, pmt, fv)

rate = rate per period

nper = # of periods

pmt = payments per period ← negative

fv = future value

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Panel 3

Use effective rate to find sum of investing $200 at 5% compounded monthly for 3 years.

① $S = P(1+r)^n = 200\left(1+\frac{0.05}{12}\right)^{36} = 232.29$

② $r_e = \left(1+\frac{r}{n}\right)^n - 1 = \left(1+\frac{0.05}{12}\right)^{12} - 1 = 0.05117 \approx 5.12\%$

$S = P(1+r_e)^n = 200(1+0.0512)^3 = 232.67$

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Panel 4

Other useful Excel formulas for financial math

Future value: future value of an investment

$= FV(rate, nper, pmt, pv)$

rate = rate per period

nper = # of periods

pmt = payment per period → negative

pv = present value

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Panel 5

Ex: Invest $1000 at 8% compounded quarterly for 5 years.

$S = 1000\left(1+\frac{0.08}{4}\right)^{4\cdot 5} = \$1485.95$

$= FV(0.08/4, 20, 0, -1000) = \$1485.95$

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Panel 6

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

① Estimate 8% of 1000 = 80 × 5 years = 400

20 payments of $100 = $2000

initial amount $1000

$3400.-

② $= FV(0.08/4, 20, -100, -1000) = \$3915.65$

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Panel 7

Ex: What is the present value of $3915.68 in 5 years at 9% compounded quarterly, if $100 payments are made?

= PV(0.09/4, 20, -100, 3915.68) =

i.e. PV and FV are inverse of each other

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Panel 8

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

Ex:
- sequence of payments monthly after you retire, for 20 years.
- sequence of car payments
- mortgage payments

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Panel 9

Ex: Suppose you can afford payments of $100 per month for a loan at 6% compounded monthly over 3 ½ years. How much money is this worth now?

① Estimate: $100 \times 3.5 \times 12 = 4200$

② $= PV(0.06/12, 3.5 \cdot 12, -100, 0) = 3779.93$

Bank B has 10% on the loan:

$= PV(0.1/12, 3.5 \cdot 12, -100, 0) = 3531.69$ (less)

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Panel 10

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

$= PMT(rate, nper, pv, fv)$

rate = rate per period

nper = # of periods

pv = present value or loan amount ← negative

fv = zero (future value)

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Panel 11

Ex: The bank loans you $3779.93 over 3½ years at 6% compounded monthly. What are the monthly payments?

= PMT(0.06/12, 3.5·12, −3779.93, 0)

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Panel 12

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 estimate: 1500 over 3 months ⇒ per month 500
total interest 3 · 0.01 · 1500 = 45
monthly payments are ≈ 515.–

② = PMT(0.12/12, 3, −1500, 0) ≈ $510.03

Why the difference?

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Panel 13

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

	you owe	interest	pmt	payoff
month 1	1500	0.1 · 1500 = $15	510.03	510.03 − 15 = $495.03
month 2	1500 − 495.03 = $1004.97	0.1 · 1004.97 = $10.05	510.03	510.03 − 10.05 = $499.98
month 3	1004.97 − 499.98 = $504.99	504.99 · 0.1 = $5.05	510.03	510.03 − 5.05 = 504.98
		$30.10	1530.09	1499.99

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Panel 14

Summary

Compound interest: $S = P(1+r)^4$

Effective rate: $r_e = \left(1 + \frac{r}{n}\right)^4 - 1$

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

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

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

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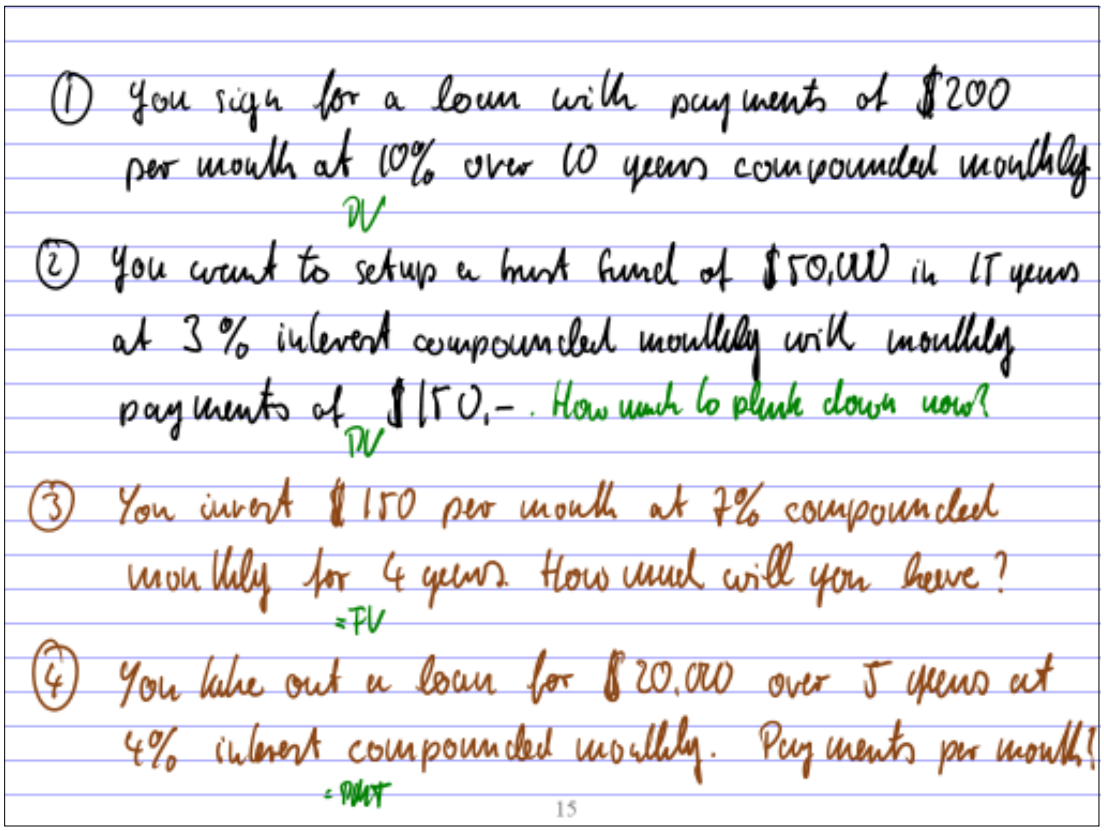
Panel 15



Panel 16