Panel 1

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) } Excel!

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

Payments: =PMT(rate, nper, pv)

1

Panel 2

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

(2) You want to setup a trust fund of $50,000 in 17 years at 3% interest compounded monthly with monthly payments of $150.- (PV)

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

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

2

Panel 3

① You sign for a loan with payments of $200 per month at 10% over 10 years compounded monthly How much money do you get?

= PV(rate, nper, pmt, fv)

= PV(0.1/12, 120, -200) 0| = 15134.-

Estimate: 120 × 200 = 24000 you pay ↗ difference in profit for Bank.

3

Panel 4

② You want to setup a trust fund of $50,000 in 15 years at 3% interest compounded monthly with monthly payments of $150. What's the principle to pay initially?

Guess: 150 × 15 × 12 ~ 27000

You plunk down 23000

= PV(0.03/12, 15×12, -150, 50000) = 8975

4

Panel 5

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

$= FV\left(\frac{0.07}{12}, 4\times12, -150\right) = \$9191.39$

5

Panel 6

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

$= PMT\left(\frac{0.04}{12}, \underbrace{60}_{5\cdot12}, -20000\right) = \$368.33$

Guess: $20000/60 = \$333.33$ per month

6

Panel 7

Last question: Suppose you want to purchase a house. You need a loan of $200,000 over 30 years. Bank A offers 5%, Bank B offers 4.7%. What is the savings over the life of the loan if you make monthly payments and monthly compoling.

A: PMT((0.07/12), 30·12, -200000) = 1073.64 / month

total payments are 1073.64 · 360 = $386510

B: PMT(0.047/12, 30·12, -200000) = 1037.28 > difference is $13089

total payments are 1037.28 · 360 = $373420

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Panel 8

Suppose you invest $250 at a nominal interest rate of 7% compounded quarterly.
a) What is the *effective* rate of interest?
b) How much is your investment worth after 5 years?
c) How would you use the *effective* rate to compute the answer for part (b)

a) $r_e = \left(1 + \frac{0.07}{4}\right)^4 - 1 = 0.0718$ or 7.18%

b) $S = 250\left(1 + \frac{0.07}{4}\right)^{4\cdot 5} = 353.69$

c) $S = 250(1 + 0.0718)^5 = 353.59$

8

Panel 9

8. Suppose $8,000 is invested in an account. How much money is in the account in 6 years if the interest rate is 5% compounded: a) monthly b) continuously?

a) $S = 8000\left(1+\frac{0.05}{12}\right)^{6\cdot 12} = \$10792.14$

Note: $\left(1+\frac{r}{n}\right)^n$ is rate compounded n-times per year.

$\lim_{n\to\infty}\left(1+\frac{r}{n}\right)^n = e^r$ Fact! $(e \approx 2.7182\ldots)$

$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e$

Cont. Compounding interest Formula: $S = Pe^{rt} = 8000e^{0.05\cdot 6} =$ $\$10799.89$

r = rate per year, t = # of years

9

Panel 10

integrate 2x^2 / (5-x^3)

Indefinite integral:

$$\int \frac{2x^2}{5-x^3}\,dx = -\frac{2}{3}\log(x^3-5) + \text{constant}$$

integrate 32x^2/(5-x)^4 for x from 0 to 1

Definite integral:

$$\int_0^1 \frac{32x^2}{(5-x)^4}\,dx = \frac{1}{30} \approx 0.0333333$$

Lecture on Copy right

Richard Stallman

Tues 2:30 - 4:30 pm

JH Auditorium

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