2/9/2021

Graphs

Categorical Data and Numerical Data

Categorical Data can be turned into Pie charts or Bar charts
Categorical data measures variables in words

Numerical Data takes answers that are numbers, and averaging make sense
Line graphs are for numerical data that is **collected in sequence**
Often relate data to time

What makes a good graph or a bad graph?

1) Appropriate for the data
2) Descriptive Titles
3) Axis Labels and/or a Legend
4) Avoid 3D (misleading)
5) Color blindness?
6) Not too busy

Pie charts—
To graph a single categorical variable with percentages of a whole

Bar charts –
For categorical data, can display percentages or counts, can compare variables

See Excel

Math of Finance

Simple Interest

$$I = Prt$$

I is Interest earned ($)
P is the principal ($ earning interest)
r is the annual interest rate (rate per period)
t is time (years, or the stated period)

Borrow $500 from a loan shark who charges 30% interest per year and I have to it pay back in 6 months. How much interest is owed?

$$I = 500 \times (0.30) \times \left(\frac{1}{2}\right) = \$75$$

Amount Owed: 500+75=575

$$A = P + Prt$$
$$A = P(1 + rt)$$

Linear is constant over time. Compound interest is exponential: the amount changes over time.

Compound interest

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A is the amount in account
P is the principal
r is the annual interest rate
n is the number of times interest is compounded each year
t is time in years

Interest = A-P

Suppose you set aside $3000 to pay for a vacation. You put it in an account earning 4% annual interest compounded monthly. How much will be in the account at the end of 2 years?

Payments
Savings:

$$S = FV = \frac{R\left[\left(1 + \frac{r}{n}\right)^{nt} - 1\right]}{\frac{r}{n}} = \frac{PMT\left[\left(1 + \frac{r}{n}\right)^{nt} - 1\right]}{\frac{r}{n}}$$

R is payment per compounding period (or PMT)

Loan:

$$PV = \frac{R\left[1 - \left(1 + \frac{r}{n}\right)^{-nt}\right]}{\frac{r}{n}} = \frac{PMT\left[1 - \left(1 + \frac{r}{n}\right)^{-nt}\right]}{\frac{r}{n}}$$

You don't have to use these formulas. Use Excel.

Suppose you deposit $50 every month into an account earning 5% interest compounded monthly. After 5 years, how much is in the account?

Daily = 365
Weekly = 52
Quarterly = 4
Annually = 1
Monthly = 12

You want to buy a used car, but you can only afford $150 per month. You can get a loan for 5% compounded monthly. How expensive a car can you afford? You want to pay it off in 36 months (3 years).

Continuous Compounding

$$A = Pe^{rt}$$

A is the amount
P is the principal
e is a number (2.71828…)
r is the annual rate
t is time (in years)

e is EXP()

Exponential Growth

Growth that changes by multiplication and not addition
1, 2, 4, 8, 16, 32, …

Exponential growth has a common ratio between successive terms.
A,B,C,D,… B/A=C/B=D/C,…