

9-13-05

All HW Exercises are  
now due in lecture on  
Thursdays

• Only one paper per  
group


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Lab B Practice Table p 288  
 $\Delta \text{price} / \Delta \text{time}$

$$C12: = (B12 - B11) / (A12 - A11)$$

$$D11: = y = mx + b$$

$$\hookrightarrow = \$6 * A11 + d\$7$$

$$E13: \quad (\text{Actual} - \text{predicted})^2 \\ (\overset{B}{B}13 - \overset{D}{D}13)^2$$


Root  
Mean  
Square  
Resid

$$D8: = \text{Sqrt}(\text{average}(E11: E50))$$

↑  
from book

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(2)

		# y	263	Her. B	
		t	#	$\Delta\#/\Delta t$	$\Delta\#/\#$
1989	$\leftrightarrow$	0	23.4		
		1	21.1	-2.3	$-2.3/23.4 = -0.098 = -9.8\%$
		2	18.0	-3.1	$-3.1/21.1 = -0.147 = -14.7\%$
		3	16.1	-1.9	$-1.9/18. = -10.6\%$
		4	13.4	-2.7	$= -16.8\%$
		5	12.5	-0.9	$= -6.7\%$
		6	10.8	-1.7	$= -13.6\%$

① Is a linear model reasonable? - Look at slopes to decide. Either they're close to  $\sim -2$ , or not b/c lot of variation in slopes. Also say a linear model is not w/ slope =  $-2$  is not reasonable since it predicts a  $- \#$  in 6-7 yrs.

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(3)

② Is an exponential model appropriate? Since  $\Delta t = 1$  - constant, check % growth (decline)

③ Find an exponential model regardless

$$y = K \cdot a^t$$

$K$  = initial value

$$= 23.4$$

$a$  = growth factor

$$= 1 + \text{growth rate} = .879$$

Choose median of % growth

-9.8%		<del>-10.5%</del>	
-14.7%	Order	-14.7%	overst
-10.6%	→	-13.6%	} -12.1%
-16.8%		-10.6%	
-6.7%		<del>-9.8%</del>	$a = 1 + -.121$
-13.6%		<del>-6.7%</del>	$= .879$

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(4)

$$y = 23.4 (.879)^t$$

$y$  = # cases Hep-B (thous)

$t$  = yrs since 1989

The # of cases of Hep B was 23.4 thousand in 1989 and has been decreasing at a rate of 12.1% per year since

$$(12.1\% = \overset{.879}{\cancel{.879}} - 1)$$

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If  $y = k \cdot a^t$

Doubling time = ~~#~~ value of  $t$  where  $y = 2k$

( $y$  starts at  $k$  when  $t = 0$ ,  
 ~~$y$~~  is doubled at  $2k$ )

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(5)

$$2 \frac{k}{k} = \frac{k}{k} \cdot a^t$$

$$2 = a^t$$

$$\begin{aligned} \log(2) &= \log(a^t) \\ &= t \cdot \log a \end{aligned}$$

$$\boxed{\frac{\log 2}{\log a} = t = \text{doubling time}}$$

4% Bank example

$$a = 1 + 4\% = 1.04$$

$$\text{Doubling time} = \frac{\log 2}{\log 1.04} = 17.7 \text{ yrs}$$

$$\left( \log \left( \frac{a}{b} \right) = \log a - \log b \right)$$

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6

Rule of 70:  $\text{growth rate} = \frac{70}{DT}$

Doubling Time  $\approx \frac{70}{\text{growth rate}}$

e.g. 4%  $DT \approx \frac{70}{4} = 17.5$  yrs

US Pop 1%  $DT \approx \frac{70}{1} = 70$  yrs

Mexico Pop

2%  $DT \approx \frac{70}{2} = 35$  yrs

3%  $DT \approx \frac{70}{3} \approx 23$

$$Q = 2^{\frac{1}{DT}}$$

$$DT = \frac{\log 2}{\log a}$$

doubling time

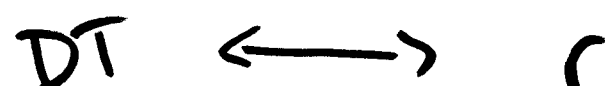
growth factor

a

$$a = 1 + r$$

$$r = a - 1$$

growth rate



Rule of 70

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$$A = 2^{\frac{1}{5T}}$$

Example:

We want to double money in 20 ~~hrs~~ yrs. What is a?

$$A = 2^{\frac{1}{20}} = 2^{\wedge(1 \div 20)}$$

$$= 20$$

$$= 20 \text{ [1/x] } \text{sto} \text{ (M)}$$

$$\bullet 2 \text{ [x^y] RM } \neq$$