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Lognormal Distribution of Subjects by Income

XL5A: 0H

Milo Schield Augsburg College Editor: www.StatLit.org US Rep: International Statistical Literacy Project

Output, slides and data at www.StatLit.org/ pdf/Excel2013-Schield-LogNormal-Income1-Demo.pdf pdf/Excel2013-Schield-LogNormal-Income1-Slides.pdf Excel/Excel2013-Schield-LogNormal-Income1-Data.xlsx

Log-Normal Distributions

The log of a Normal distribution is not symmetric. It is never negative and it typically has a long right tail.

- Some things are distributed log-normally:
- People by income, assets, weight and blood pressure
- Cities by population; insurance claims by amount

ASSIGNMENT:

XL5A: 0H

- 1) Create the table shown on slide 4 (See demo output)
- 2) Create the graph shown on slide 5. Upload results.
- 3) Review the questions shown on slide 6.

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	Manual 6	nu statis	lics		mut SA2/2	3.912	-LN(D4)
	Manual	Entry			mu+5.2/2	4.362	=LIN(B5)
median	50				Sigma ²	0.940	=2*(G3-G2)
mean	80				Sigma	0.970	=SQRT(G4
					Underlying	g math	statistics
B9	=Exp(G2	-G4)					
	Mode	PDF	C9				
	19.531	1.32E-0	2 =LOGNORM.DIST(B		,G\$2,G\$5,0)		
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If median = \$50K and mean = \$80K,

what percentage of subjects have incomes ...

- a. below 10K? 4.8%.
 Solution: Find 10K in column B in row 15.
 Find matching CDF in same row, column E,
- b. ABOVE 10K? 100% 4.8% = 95.2%

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Enter data and formulas for top section

Enter 50 (median income) and 80 (average income) in B4 and B5. Enter formulas in G2:G5. Enter formulas in B9 & C9. Verify values for all formula.

А	В	С	D	E F		G	Н
	Real-wo	orld statisti	cs		mu	3.912	=LN(B4)
	Manual	Entry			mu+S^2/2	4.382	=LN(B5)
median	50				Sigma^2	0.940	=2*(G3-G2)
mean	80				Sigma	0.970	=SQRT(G4)
					Underlying	g math s	statistics
B9	=Exp(G2	2-G4)			Underlying	g math ៖	statistics
B9	=Exp(G2 Mode	2-G4) PDF	C9		Underlyin	g math ៖	statistics
B9	=Exp(G2 Mode 19.531	2-G4) PDF 1.32E-02	C9 =LOGNORI	V.DIST(B9,0	Underlying G\$2,G\$5,0)	g math ៖	statistics

Enter formula in B14:E14 Pull B14:E14 down to Row 28

									i
	В	С	D	E	F	G	Н	l I	10
	B14	C14	D14	E14	C14				11
=,	A14*B\$4	Copy F12	=C14/C\$9	Copy F14	=LOGNOR	M.DIST	B14,\$G\$2,	\$G\$5,0)	12
	Income	PDF	% of mode	CDF	E14				13
	5	4.90E-03	37.2%	0.9%	=LOGNOR	M.DIST	(B14,G\$2,G	\$\$5,1)	14
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					CDF: C	Cumulativ	e Distributi	on Function	21
					CDF: P	ercentag	e of subjec	ts who	22
						have inc	ome below	Col B.	23
									24
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Create this graph. Data: Col B, D & E; Rows 13-28



CDF Percentages; Practice Problems a and b

- If X is income, then CDF(X) is the percentage of subjects who have LESS than X thousand dollars in income [Cumulative Distribution Function]
- If median = \$50K and mean = \$80K,

what percentage of subjects have incomes ...

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