XL5A: 0H 2014 Schield Log-Normal Income1 1

Lognormal Distribution of Subjects by Income

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

XL5A: 0H 2014 Schield Log-Normal Income1 2

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:

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.

XL5A: 0H 2014 Schield Log-Normal Income1 3

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.

	A	B	C	D	E	F	G	H
		Real-world statistics				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 math statistics		

B9 =Exp(G2-G4)

Mode	PDF	C9
19.531	1.32E-02	=LOGNORM.DIST(B9,G$2,G$5,0)

Sometimes ######### appears in a cell. Either the font is too large, or Excel is trying to show the number with at least 10 digits after decimal. Either way, select the cell. Right-mouse and select Format Cells. Change font size or digits after decimal as needed.

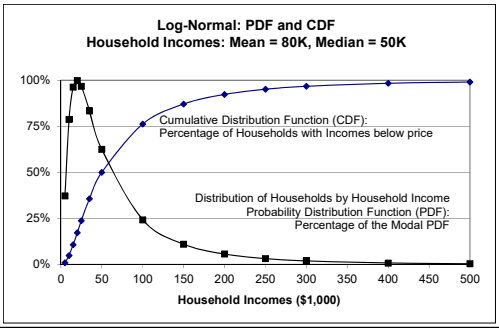
XL5A: 0H 2014 Schield Log-Normal Income1 4

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

	B	C	D	E	F
11	B14	C14	D14	E14	C14
12	=A14*B$4	Copy F12	=C14/C$9	Copy F14	=LOGNORM.DIST(B14,G2,G5,0)
13	**Income**	PDF	% of mode	**CDF**	E14
14	**5**	4.90E-03	37.2%	**0.9%**	=LOGNORM.DIST(B14,G$2,G$5,1)
15					
16					**Table: Distribution of subjects**
17					**by income ($1,000)**
18					
19					PDF: Probability Density Function
20					
21					CDF: Cumulative Distribution Function
22					CDF: Percentage of subjects who
23					have income below Col B.
24					
25					
26					
27					
28					

XL5A: 0H 2014 Schield Log-Normal Income1 5

Create this graph. Data: Col B, D & E; Rows 13-28



XL5A: 0H 2014 Schield Log-Normal Income1 6

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 …

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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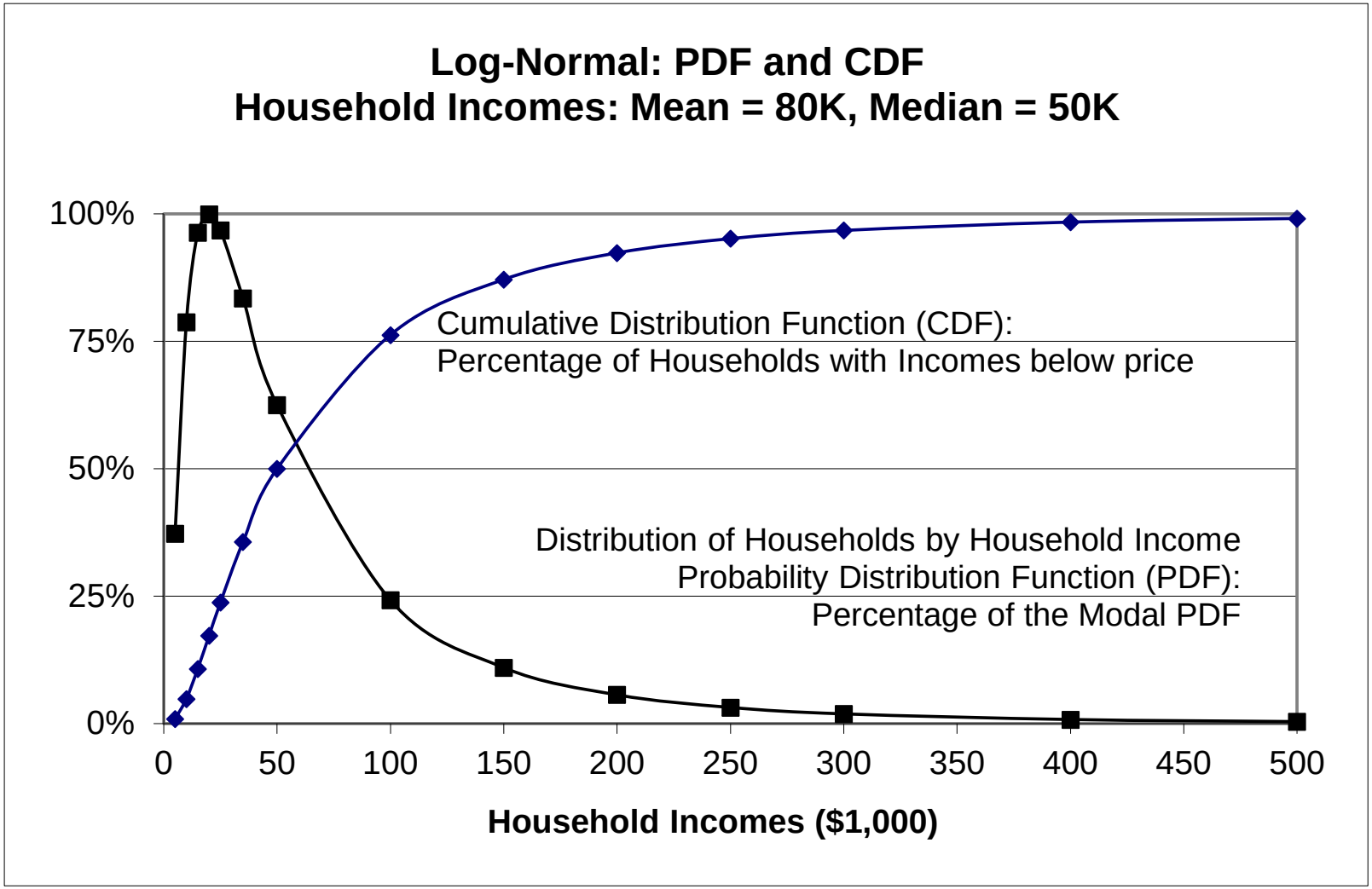

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