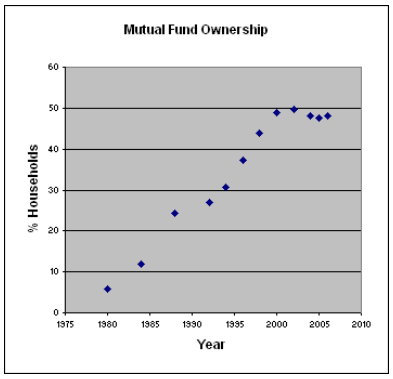
Key: Homework for Graphing

This homework uses the data in Angel, Excel Documents > Excel for Algebra, Lesson 6 (Basic Graphing).

For each sheet in the workbook, use Excel graphs to answer the following questions:

Mutual Funds Ownership

1. *Over what period did ownership rise at a roughly constant rate?*

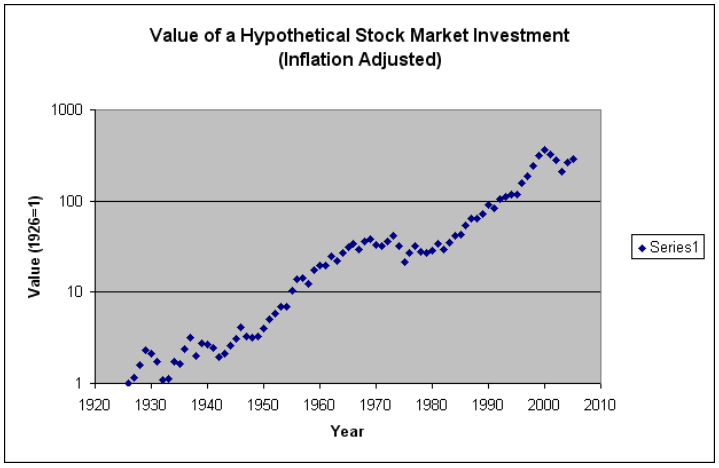


Reasonable answers include 1980-2000 and (1992-,1994-)1996-2000, depending on how persnickety you get about what "roughly constant rate" means. The main point is that in 2000, something dramatically different happened. The graph indicates that something did, but gives no clue about why. (I don't know the answer to "why?")

2. *In what year did ownership "level off"?* I'd probably say 2002, but that's a judgment call about what it means to "level off". The first actual drop is in 2004.

3. *From 1980 through 2000, what was the average rate of growth? (A good unit for this is "additional percent per year")* Excel's linear trendline says 2.1% per year. Notice that this is growth by addition, not growth by multiplication like we would see in exponential growth. If you wanted to calculate this straight from the data, you might use just the 1980 and 2000 points, (49% - 5.7%)/(20 years) = 2.2% per year.

Stock Market Investment



4. *During what period did the stock market investment exhibit no real growth for over 15 years?* 1965-1980. This was a period of "stagflation", where the economy was "stagnant", but there was significant inflation. Invested dollars held

their value fairly well during this period (as shown in the graph), but dollars "kept under the mattress" and "fixed income" dollars such as many pension funds lost real value by a factor of 2.45, over 6% per year (data in spreadsheet, but not shown). The period 1926-1941, which appears flat when the plot is drawn with a linear y-axis, actually exhibited around 5-6% average growth, depending on how one computes the "average".

5. *Considering only the period 1960-1985, what was the average annual growth?* Excel's "exponential trendline" says $e^{0.0149x}$, indicating "average" annual growth of around 1.5% ($e^{0.0149}$*-1*, expressed as a percent). If you compute growth from just the 1960 and 1985 figures (two values), you get $(42.3/19.4)^{1/25} = 1.032$, about 3.2% growth. (This is because 1960 falls significantly below the trendline, and 1985 falls significantly above it.)

Anscombe's Quartet

6. *Which data set is linear except for one point that clearly does not fit the pattern of the others?* Data set III. Data sets III and IV both have all of their points except one "lined up". However in data set IV, that line consists of 9 points that all have the same x-coordinate, a relationship that would not be called "linear".

7. *Which data set consists of points that are uniformly scattered around a straight line? What is the equation of that line?* Data set I, $y = 0.5x+3$.

8. *Which data set represents a smooth curve? What is the equation of that curve? (Hint: try a Polynomial trendline, Order=2.)* Data set II, $y = -0.1267x^2 + 2.7808x - 5.9957$.

9. *Which dataset contains only two distinct values for x?* Data set IV.

Common Functions

The graph of each function can be made into a straight line by proper choice of axes: linear X / linear Y, linear X / logarithmic Y, or logarithmic X / logarithmic Y.

10. *Which choice of axes makes the proportional function look straight?* Linear X / linear Y. (The line is also straight with logarithmic X / logarithmic Y, as we would expect since $y = kx = kx^1$ is also a power function with power=1.)

11. *Which choice of axes makes the power function look straight?* Logarithmic X / logarithmic Y.

12. *Which choice of axes makes the exponential function look straight?* Linear X / Logarithmic Y. This is what Bartlett's presentation calls "semilog graph paper".

13. *Which choice of axes makes the linear function look straight?* Linear X / linear Y. (In this case, log/log won't work.)