

Name:

Date:

LOG Scale

Part I: Defining LOG Scale

The linear function $y = 2x + 1$ generates the following table:

x	1	2	3	4	5	6	7	8	...
y	3	5	7	9	11	13	15	17	...

1. If we increase the x by one what happens to the y ?
2. Describe this relationship such that it holds for any two consecutive y values.

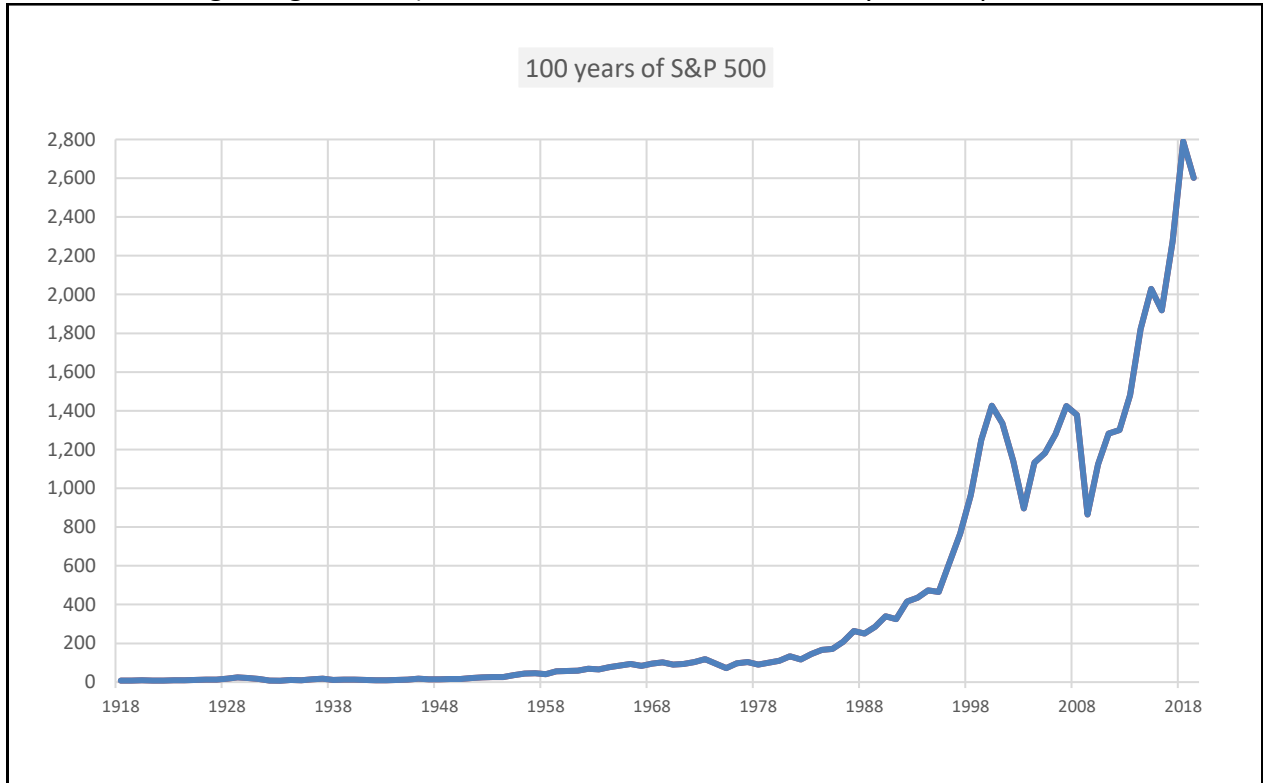
The exponential function $y = 3^x$ generates the following table:

x	1	2	3	4	5	6	7	8	...
y	3	9	27	81	243	729	2,187	19,683	...

3. If we increase the x by one what happens to the y ?
4. Describe this relationship such that it holds for any two consecutive y values.

Part II: Linear Scale

Dow Jones Industrial Average is a stock market index that can be used to track the overall behavior the stock market. Below is a graph of the S&P 500 from 1918 till 2018 (all of our recorded history of the market since its beginning till 2018). We refer to the numbers on the y-axis as points.



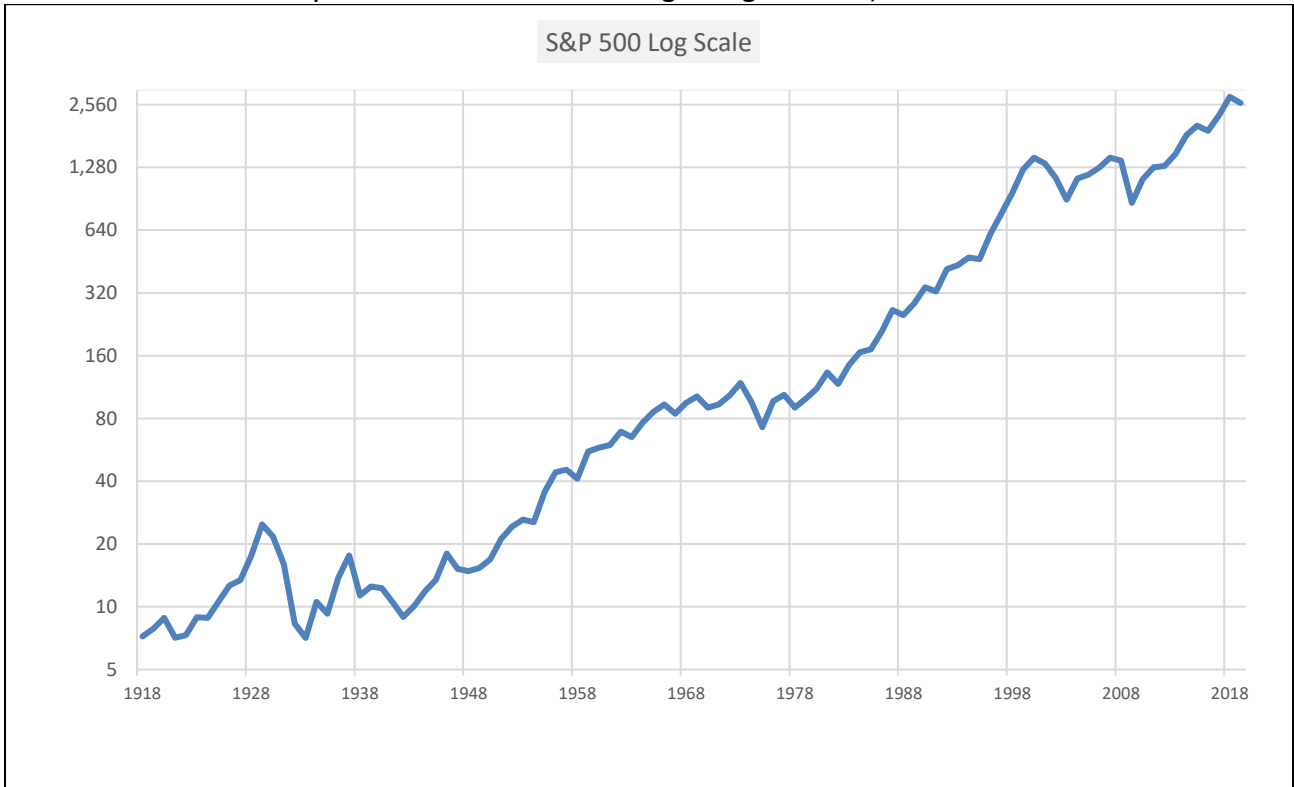
Source: Mutpl - <https://www.mutpl.com/s-p-500-historical-prices/table/by-year>

The y-axis is using a *linear scale*. You can tell because even amount of space on the graph represent the same amount of points.

1. Along the x-axis, how much time does one unit (one box) represent?
2. Along the y-axis, how much does one unit (one box) represent?
3. What kind of sequence do the numbers along a linear scale form?
4. Using this graph, approximately what year (or years) was the biggest drop in the history of the stock market?

Part III: LOG Scale

Below is a graph of the S&P 500 from 1918 till 2018
 (all of our recorded history of the market since its beginning till 2018)



Source: Mutpl - <https://www.mutpl.com/s-p-500-historical-prices/table/by-year>

The y-axis is using a *logarithmic scale*. You can tell because even amount of space on the graph represents the same ratio (or same percent increase) between the numbers along the axis.

1. Along the x-axis, what does one unit (one box) represent?
2. Looking vertically along the y-axis, pick any two boxes that are the same size and compare the larger and the smaller number at the top and bottom of each of those boxes? What do they have in common? Do they have a common difference? Do they have a common ratio?

	Box 1	Box 2
Larger # (on y axis)		
Smaller # (on y axis)		

3. Looking again at each box you chose, what is the percent increase from the smaller number at the bottom of the box to the larger number at the top of the box? Do this for the other box you chose?

4. What kind of sequence do the numbers along a log scale form?
5. Using this graph, approximately what year (or years) was the biggest drop in the history of the stock market?

Part IV: Comparing Linear Scale and LOG Scale

Compare the two graphs from Part II and Part III:

1. Are these two graphs showing you the same data? Explain your reasoning.
2. What is the difference between the two graphs?
3. Historians and economists point the great depression of the 1930s as the most severe economic decline since the beginning of the stock market. The depression had a profound effect on the stock market, causing many stocks to drastically drop in value. Which scale allows us to see this drop in the stock market better?