



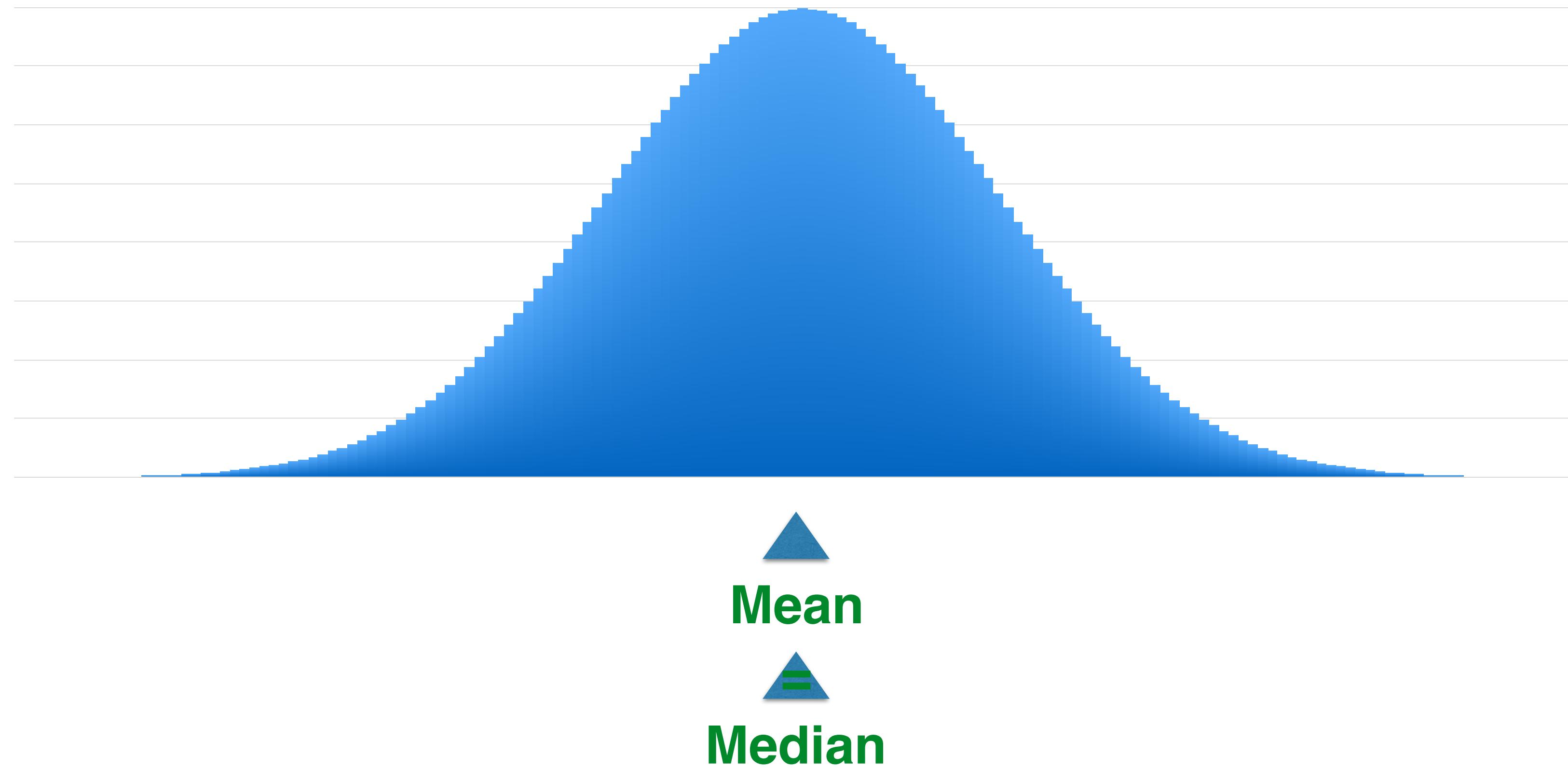
Statistical Concepts and Market Returns

Skewness and Kurtosis in Returns Distributions

1. Normal Distributions
2. Skewness
3. Kurtosis

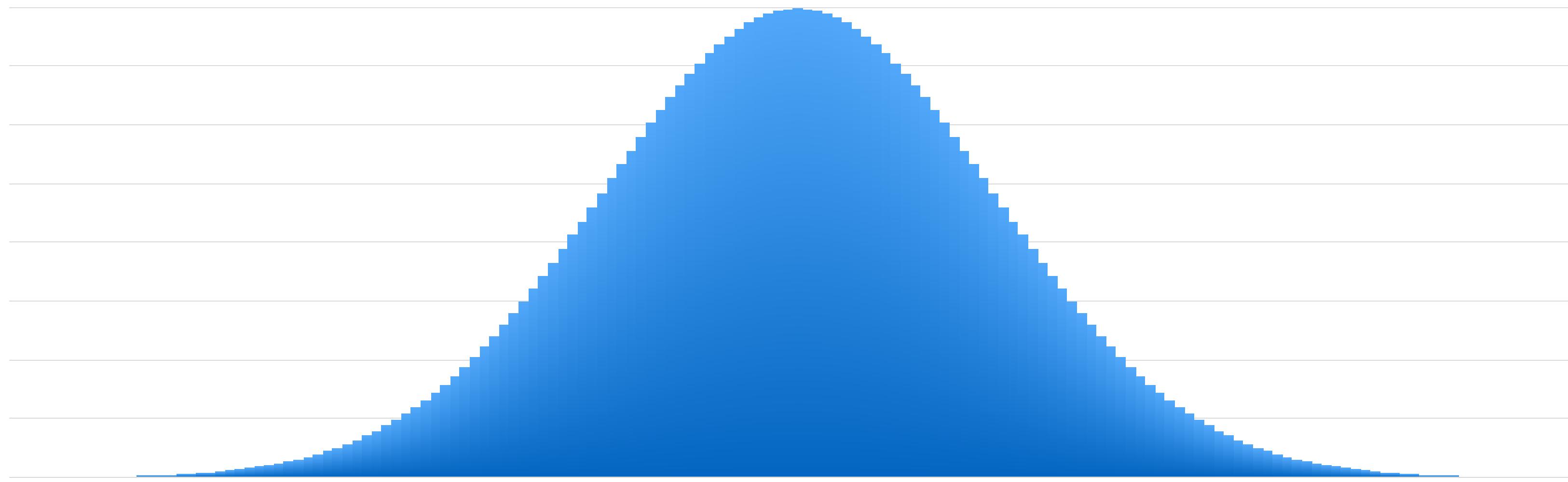
What makes a distribution “normal”?

Normal Distribution



What makes a distribution “normal”?

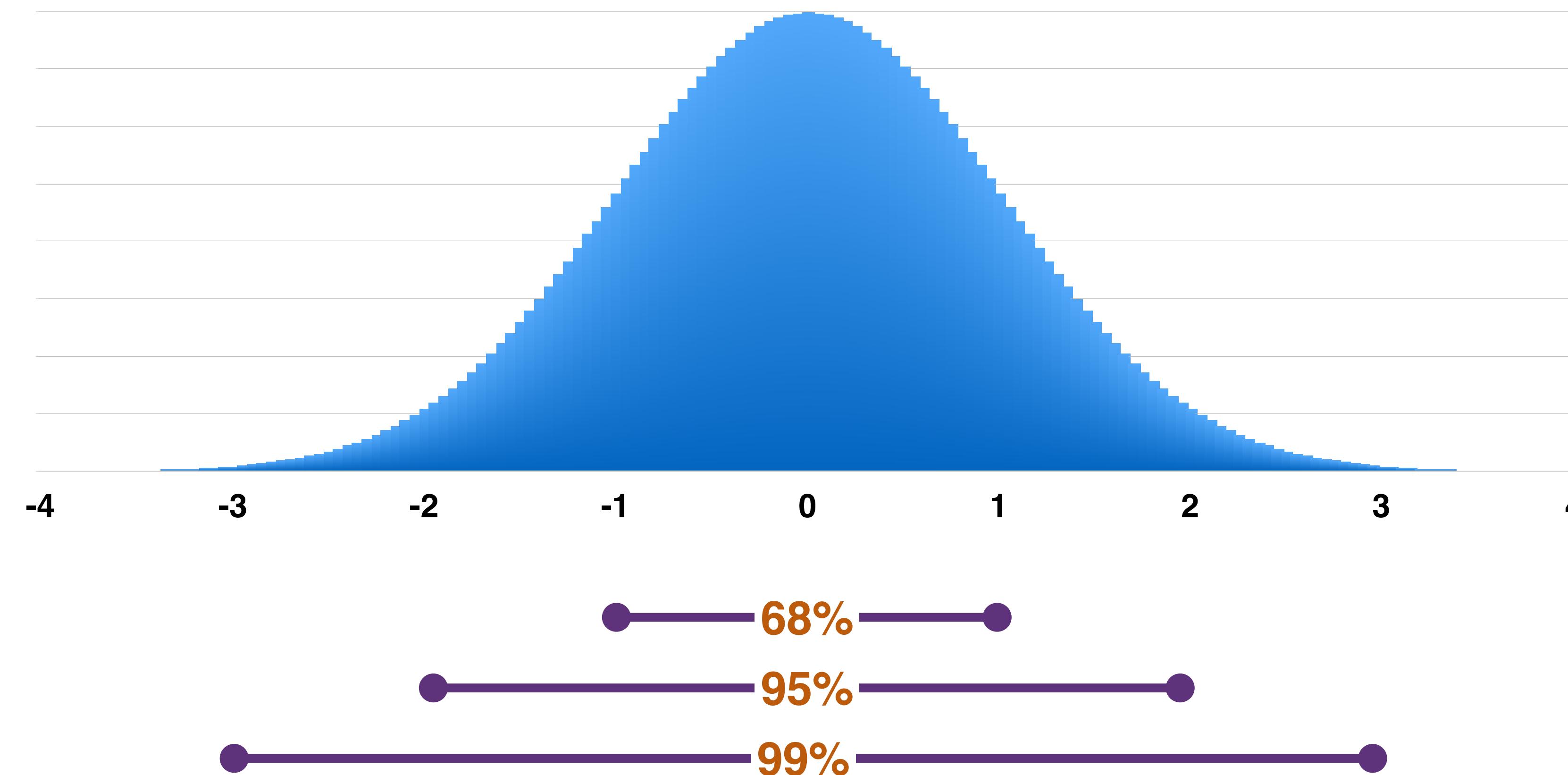
Normal Distribution

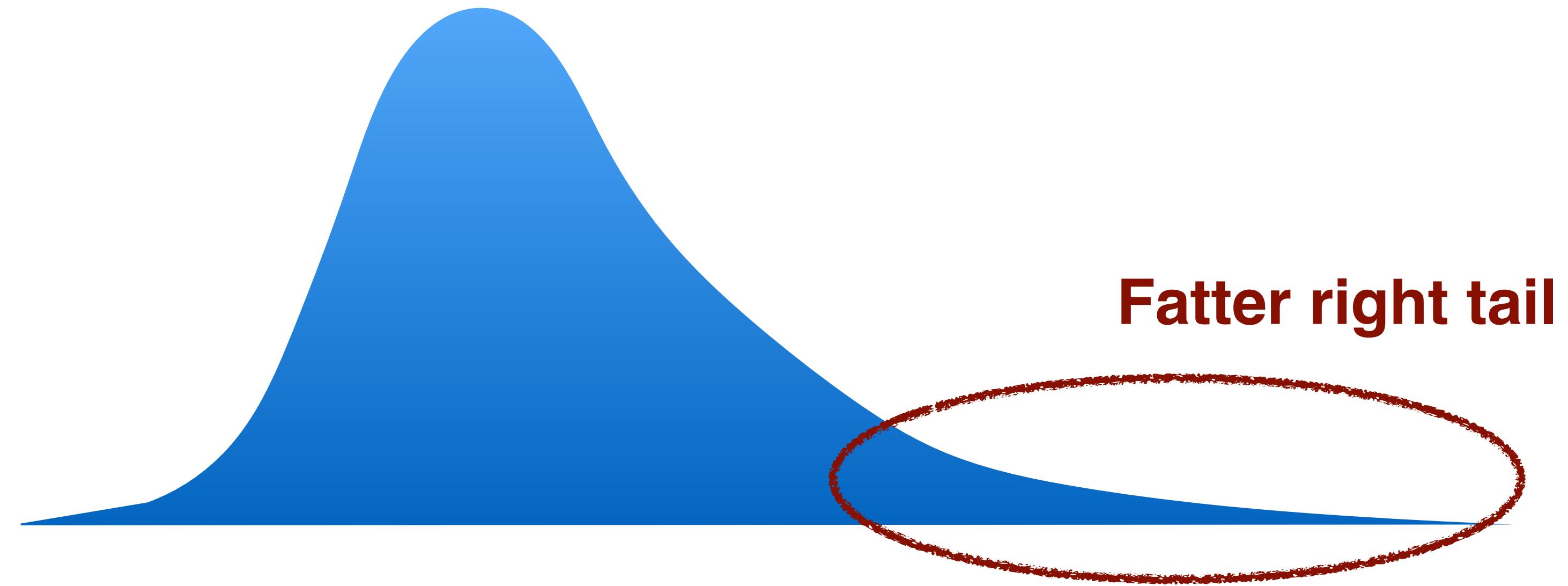


$$N(\mu, \sigma^2)$$

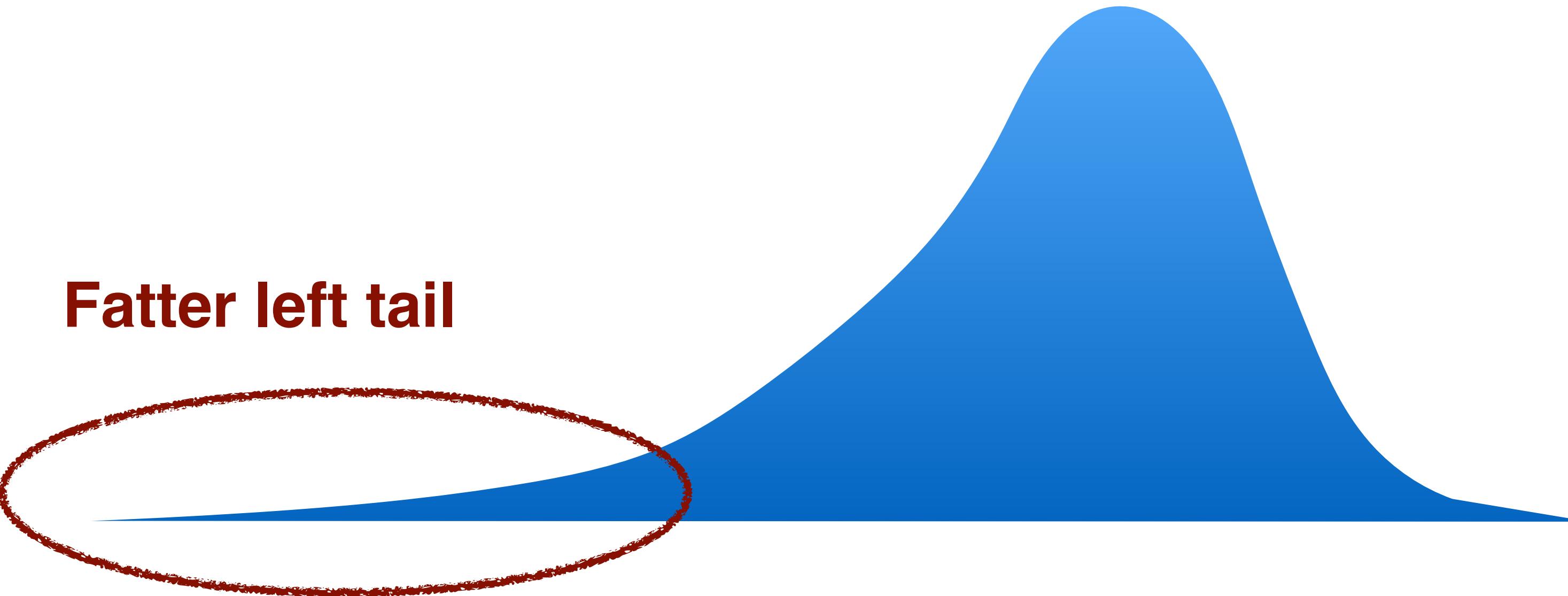
What makes a distribution “normal”?

Normal Distribution



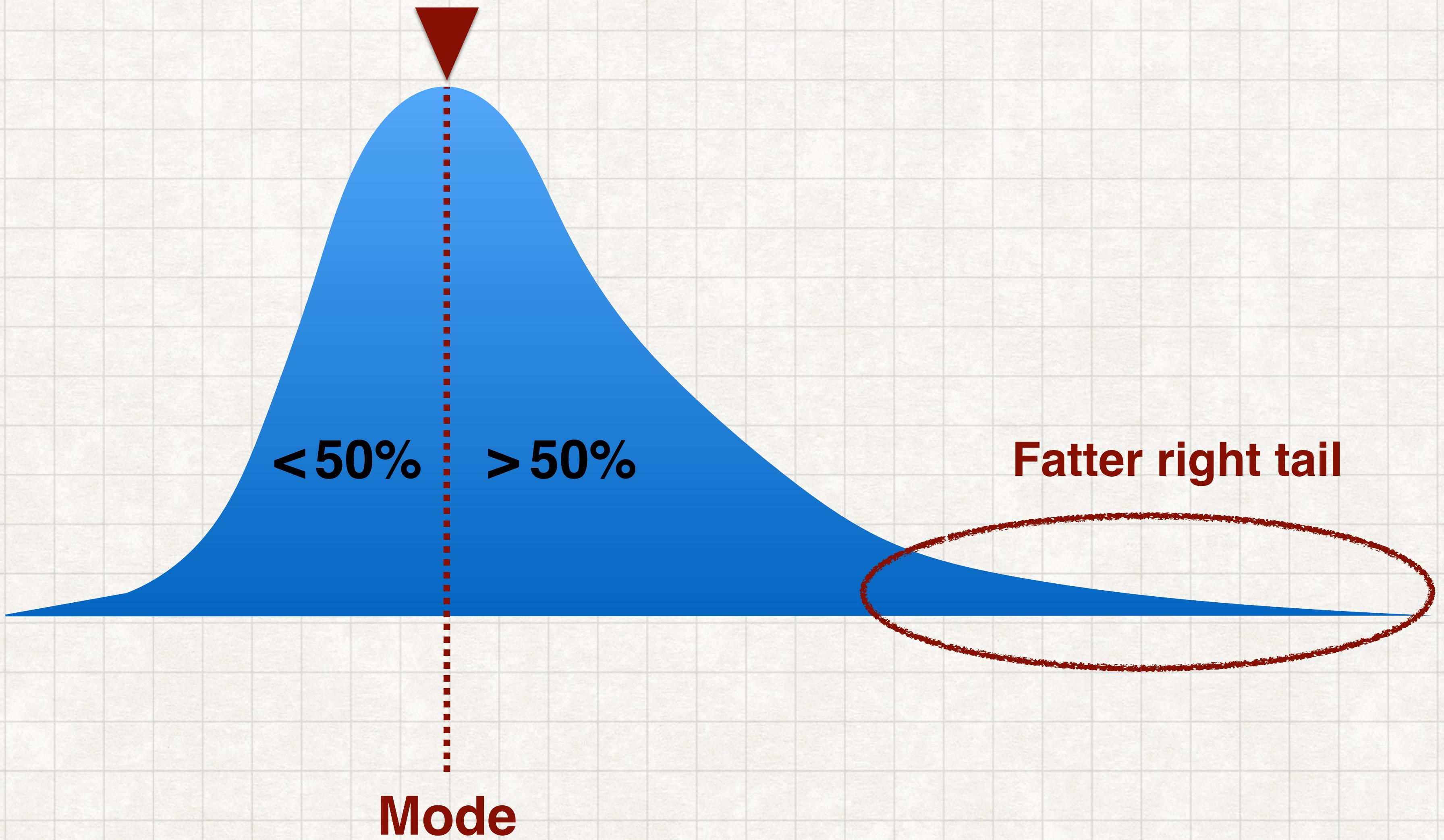


Positively Skewed Distribution



Negatively Skewed Distribution

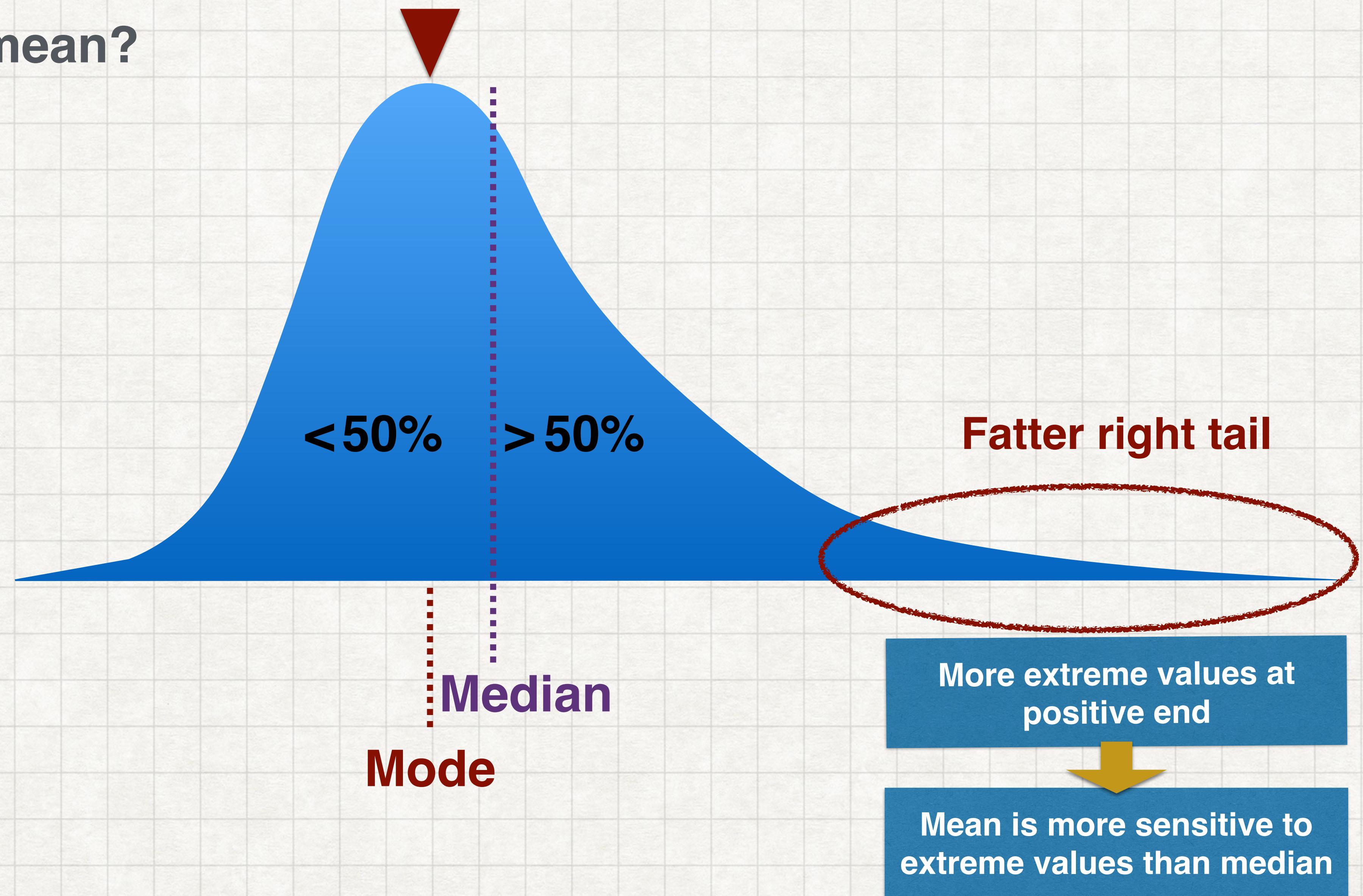
Where is the mode?
Where is the median?



Where is the mode?

Where is the median?

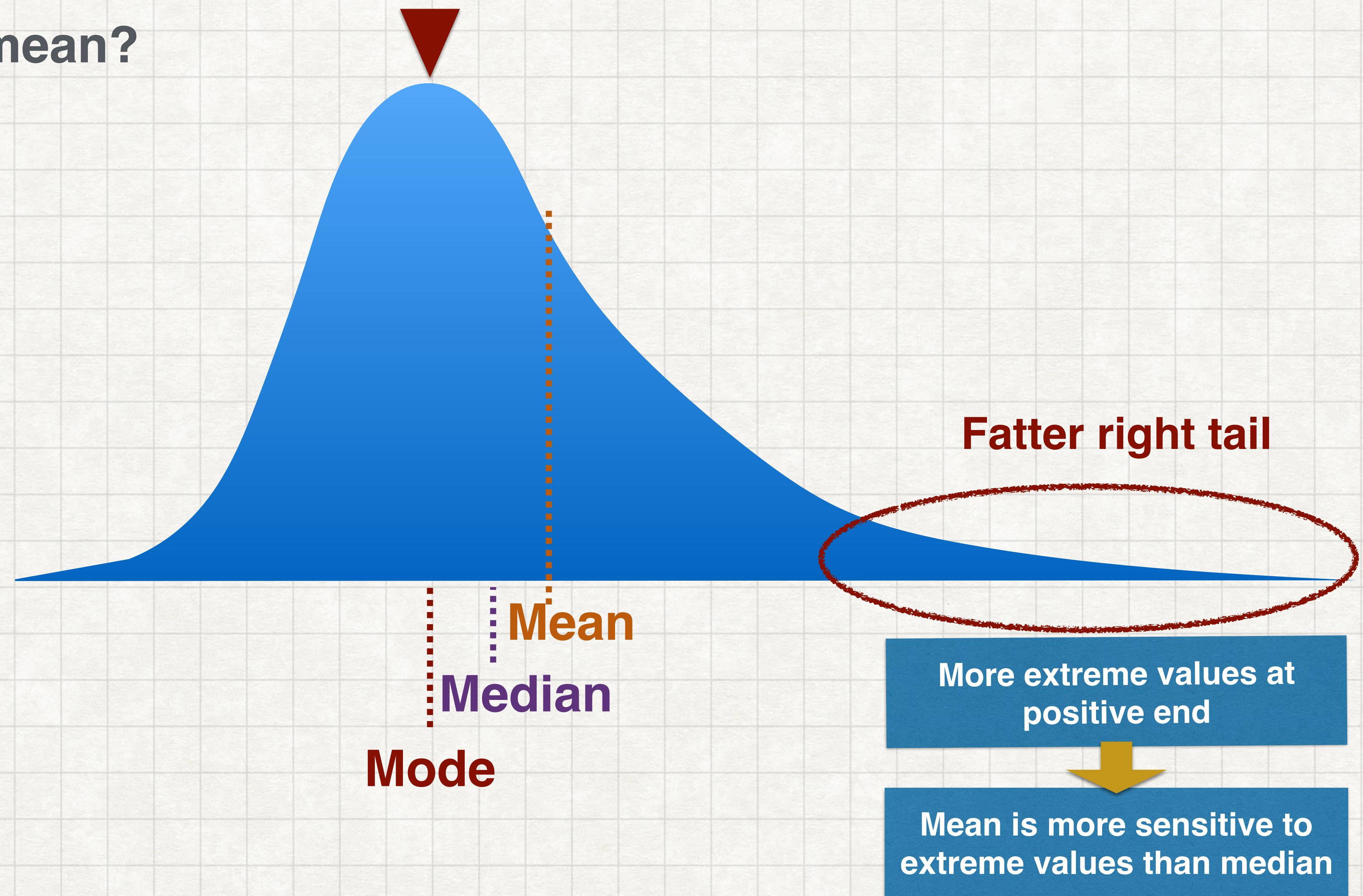
Where is the mean?



Where is the mode?

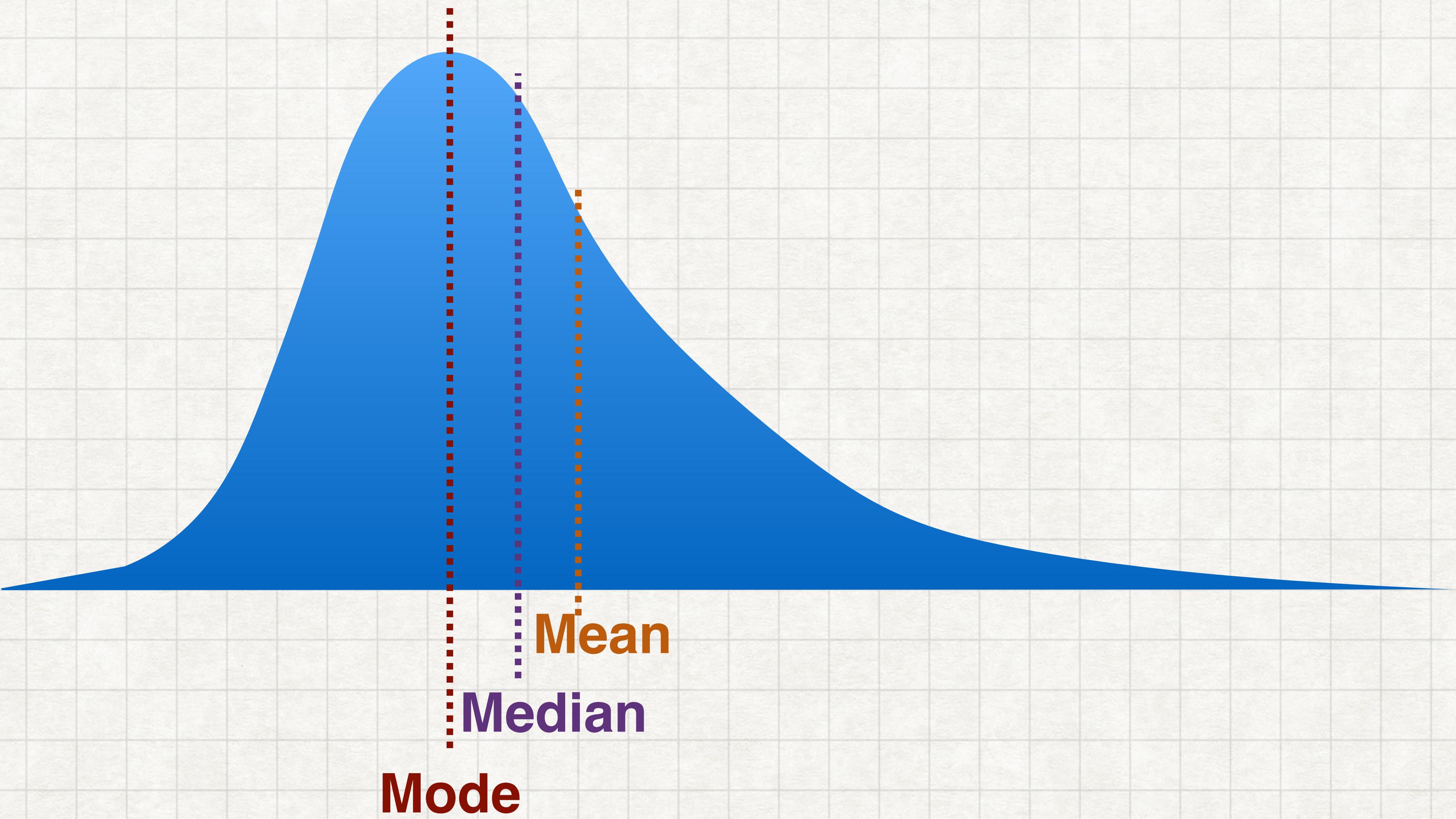
Where is the median?

Where is the mean?



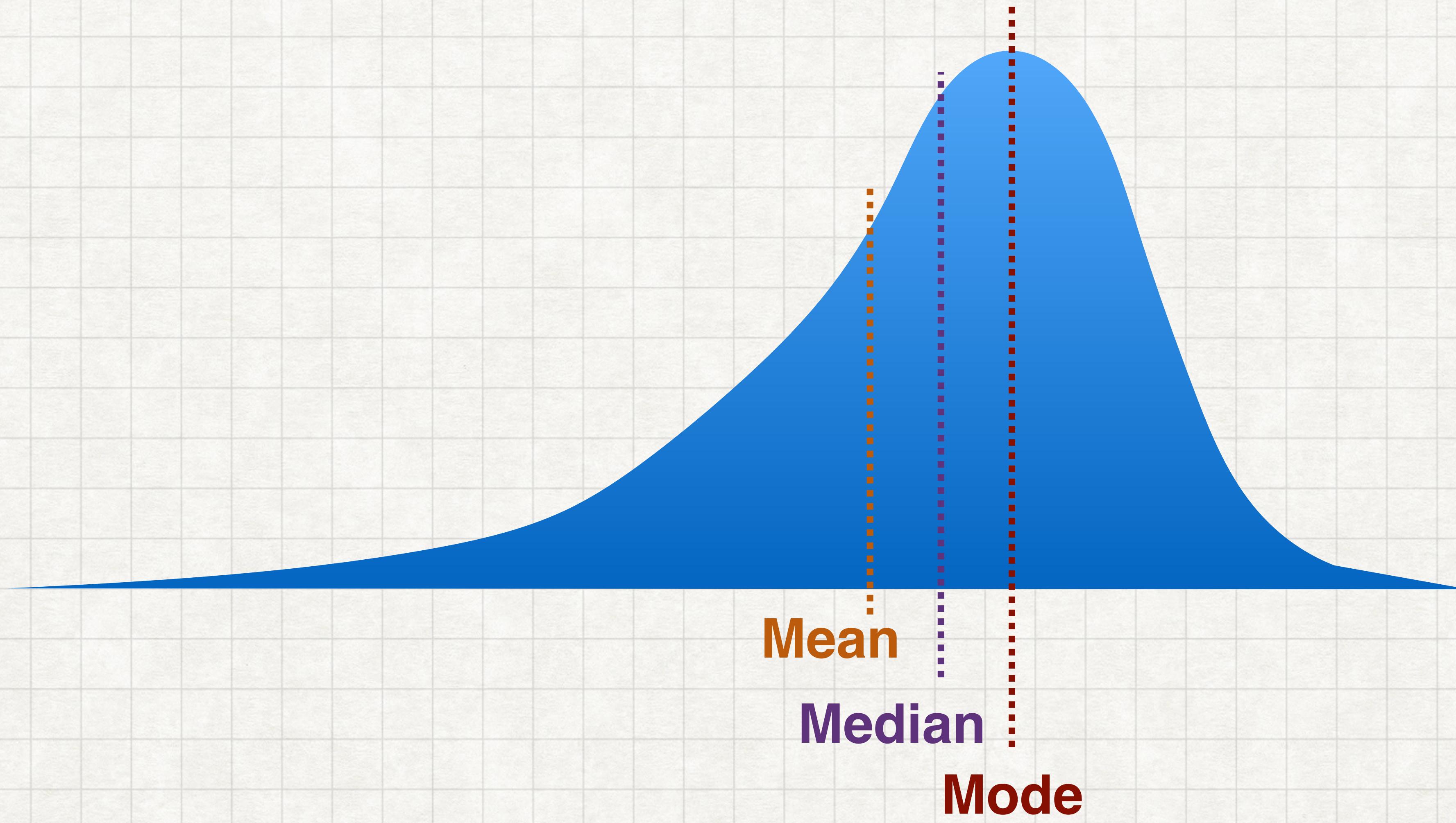
Positively Skewed Distribution

Mode < Median < Mean

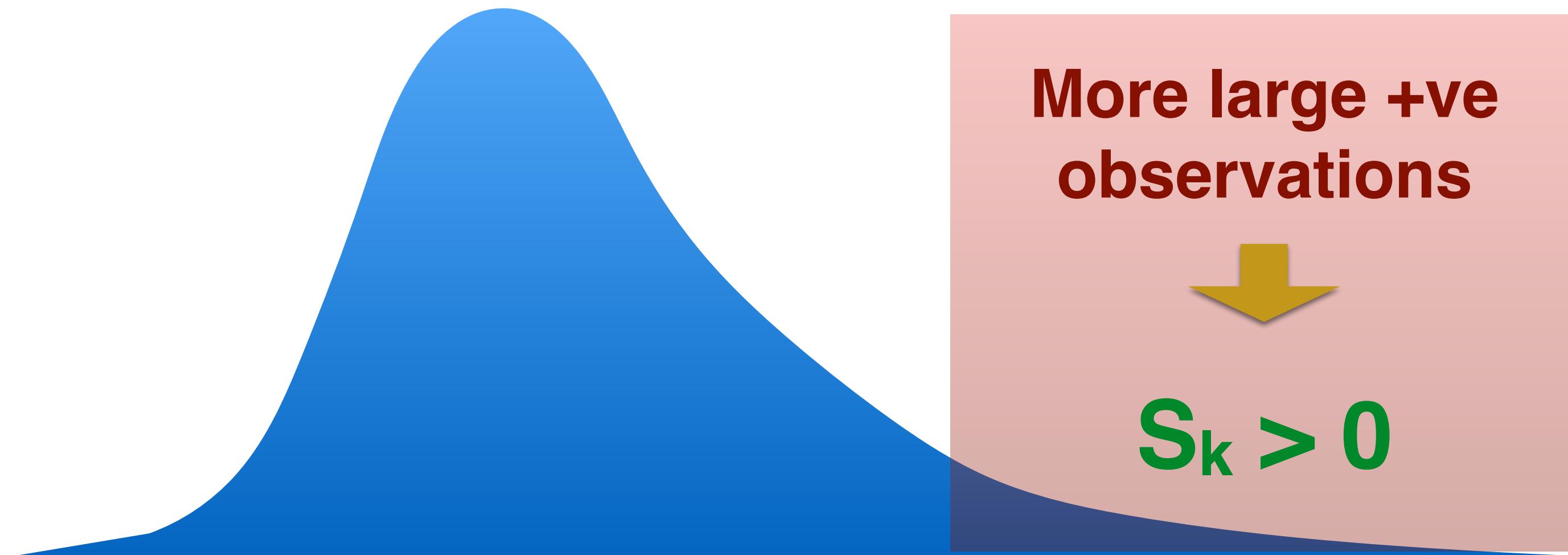


Negatively Skewed Distribution

Mean < Median < Mode



Positively Skewed Distribution



Sample skewness $S_k = \frac{1}{n} \frac{\sum_{i=1}^n (X_i - \bar{X})^3}{s^3}$

Depends on dominant high magnitude observations

Always positive as $n>0$ and $s>=0$

Negatively Skewed Distribution

$|S_k| > 0.5$
→ Significant skewness



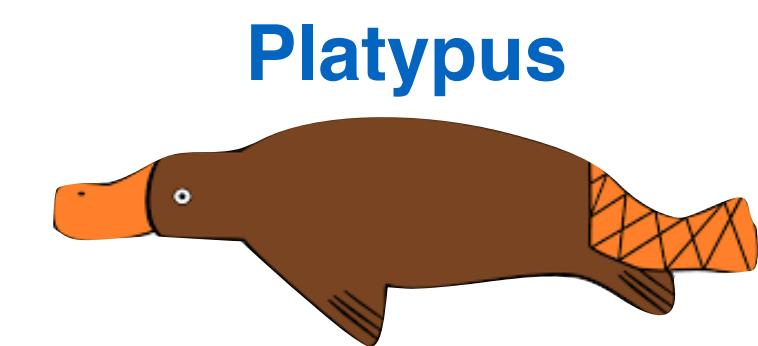
Sample skewness S_k =
$$\frac{1}{n} \frac{\sum_{i=1}^n (X_i - \bar{X})^3}{s^3}$$

Depends on dominant high magnitude observations

Always positive as $n>0$ and $s>=0$

Rhymes
with 'Flat'

or

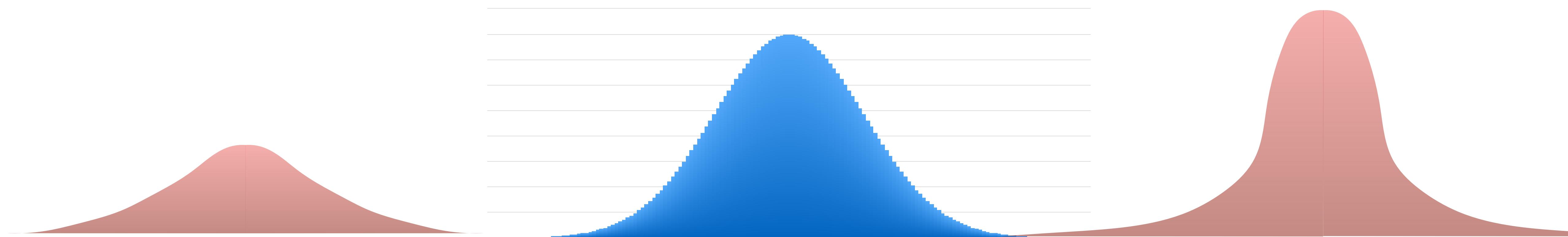


Kurtosis

Platykurtic Distribution

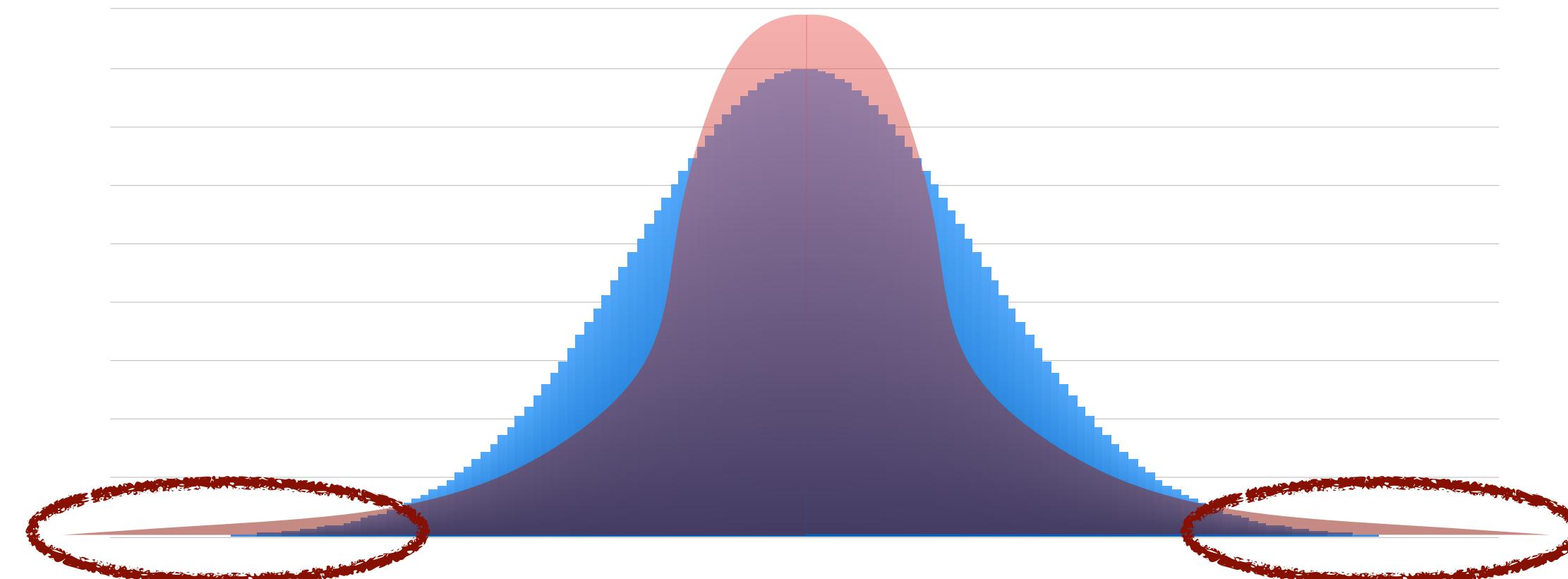
Normal Distribution
Mesokurtic Distribution

Leptokurtic Distribution



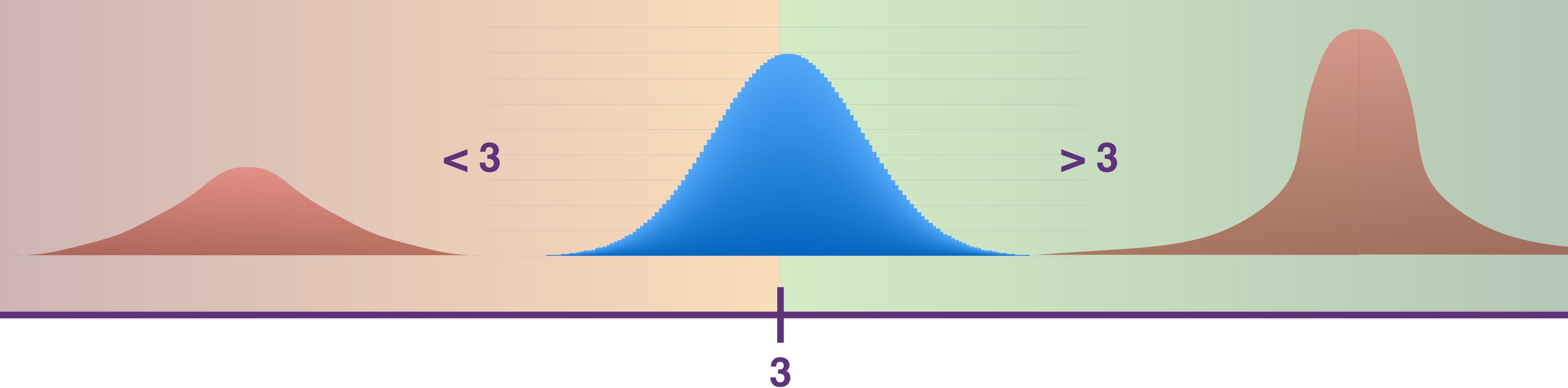
Kurtosis

Leptokurtic Distribution



Fatter tails than normal distribution

More risky than normal distribution



Sample kurtosis

$$= \frac{1}{n} \frac{\sum_{i=1}^n (X_i - \bar{X})^4}{s^4}$$

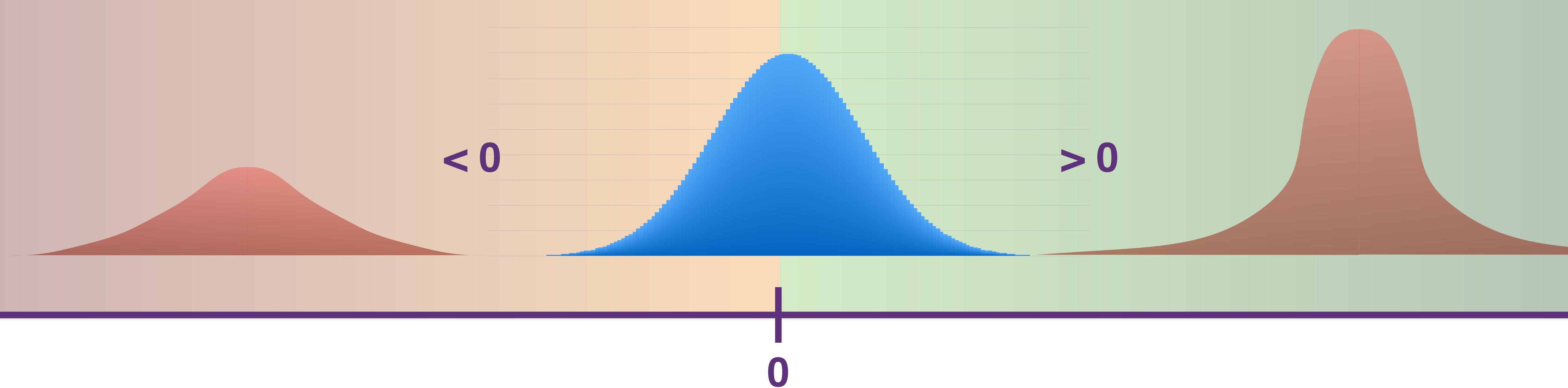
- 3

Compare
Sample skewness

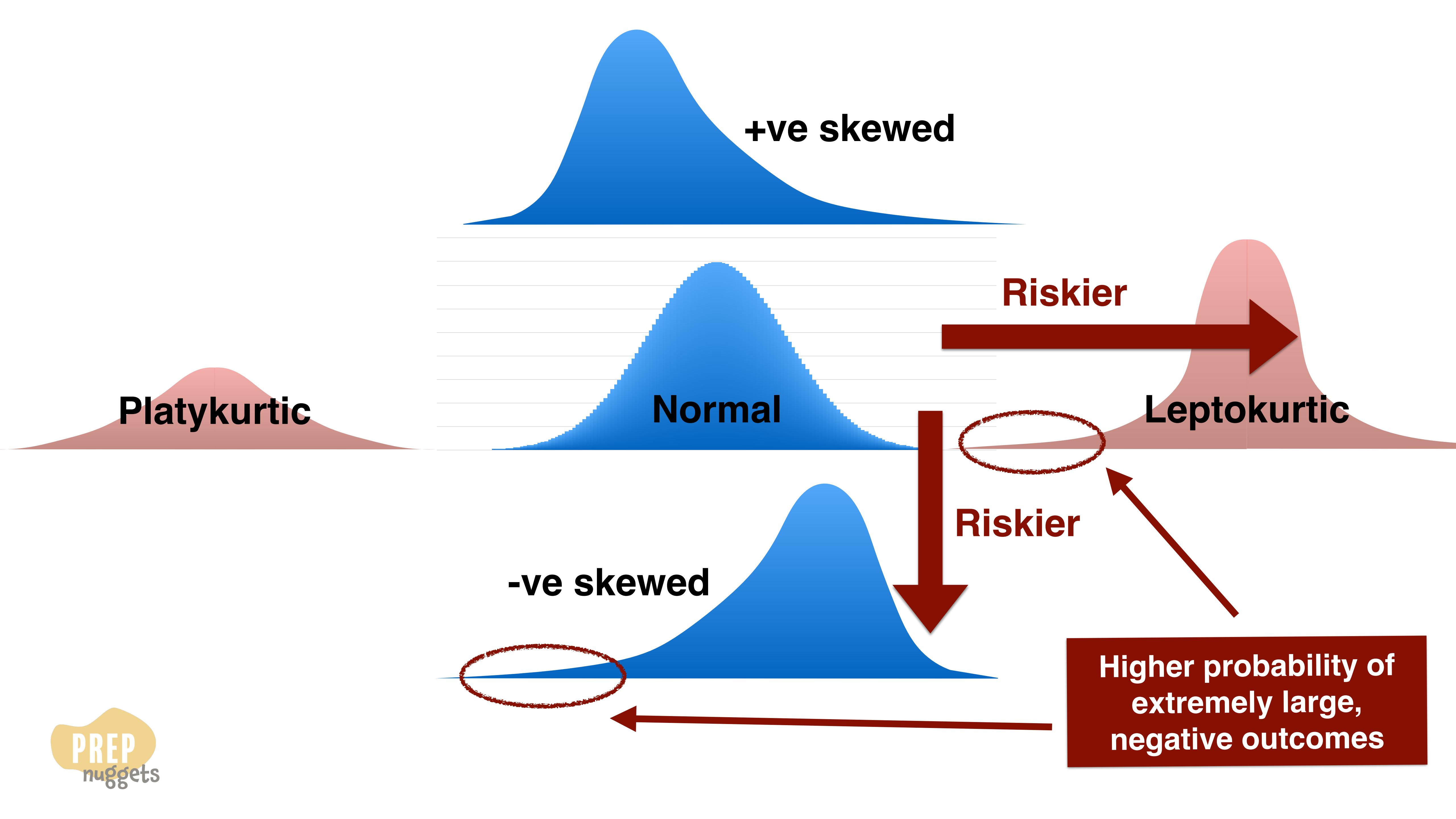
$$\frac{1}{n} \frac{\sum_{i=1}^n (X_i - \bar{X})^3}{s^3}$$

Skewness and Kurtosis in Returns Distributions

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2. Skewness
3. Kurtosis



Excess kurtosis = $\frac{1}{n} \frac{\sum_{i=1}^n (X_i - \bar{X})^4}{s^4} - 3$





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