

Statistics

- **Descriptive statistics** describe the properties of a large data set
- **Inferential statistics** uses a sample from a population to make probabilistic statements about the characteristics of a population
- A **population** is a complete set of outcomes
- A **sample** is a subset of outcomes drawn from a population

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Measurement Scales (NOIR)

- **Nominal** – only names make sense
(e.g., robin, parrot, seagull)
- **Ordinal** – order makes sense
(e.g., large-cap, mid-cap, small-cap)
- **Intervals** – intervals make sense
(e.g., 40°F is 10° greater than 30°F)
- **Ratio** – ratios make sense (absolute zero)
(e.g., \$200 is twice as much as \$100)

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Quantitative Methods: Basic Concepts

Statistics Terms

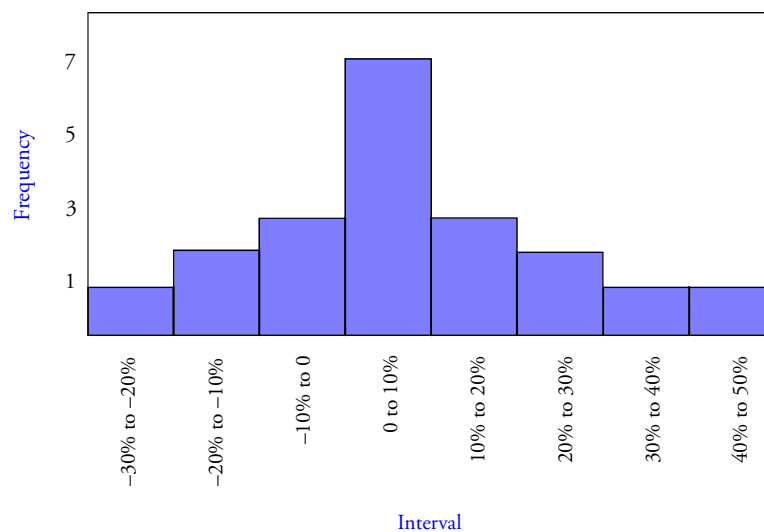
- A **parameter** describes a characteristic of a population
- A **sample statistic** describes a characteristic of a sample (drawn from a population)
- A **relative frequency distribution** shows the percentage of a distribution's outcomes in each interval
- A **cumulative frequency distribution** shows the percentage of observations less than the upper bound of each interval

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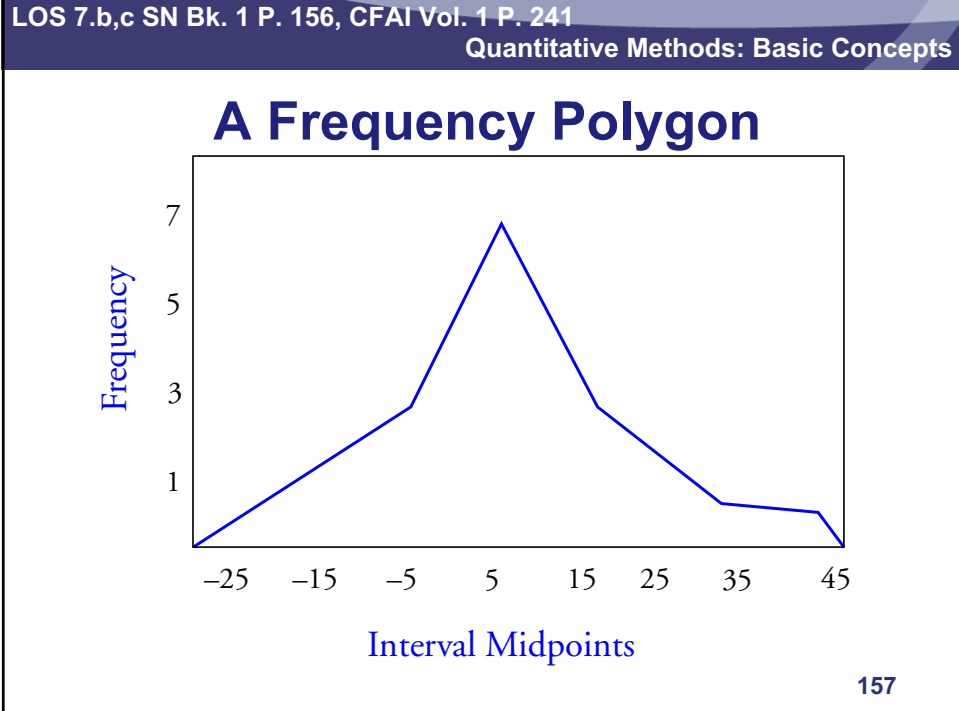
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Quantitative Methods: Basic Concepts

A Histogram



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Quantitative Methods: Basic Concepts

Measures of Central Tendency: Population and Sample Means

Population and sample means have different symbols but are both arithmetic means

$$\text{Population Mean: } \mu = \frac{\sum_{i=1}^N X_i}{N}$$
$$\text{Sample Mean: } \bar{X} = \frac{\sum_{i=1}^n X_i}{n}$$

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Quantitative Methods: Basic Concepts

- **Geometric mean** is used to calculate periodic **compound** growth rates
- If the returns are constant over time, geometric mean equals arithmetic mean
- The greater the variability of returns over time, the more the arithmetic mean will exceed the geometric mean

$$\text{Periodic } R_{\text{compound}} = [(1+R_1)(1+R_2)\dots\dots(1+R_n)]^{\frac{1}{n}} - 1$$

Actually, the compound rate of return is the geometric mean of the price relatives, minus one

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Quantitative Methods: Basic Concepts

Geometric Mean: Example

An investment account had returns of +50% over the first year and returns of -50% over the second year.

Calculate the average annual compound rate of return (time weighted rate of return).

$$1+R_G = \sqrt{(1+0.5)(1-0.5)} = \sqrt{(1.5)(0.5)} = 0.866$$

$$R_G = 0.866 - 1 = -0.134 \text{ or } -13.4\%$$

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