Statistics I (Eco 255)

Formula Sheet

1. Definitions:

\[ n = \text{The number of observations in the sample.} \]
\[ x_i, y_i = \text{Series of observations on } x \text{ and } y \text{ indexed by } i \text{ (i goes from 1 to } n). \]
\[ P = \text{Percentile. A number satisfying the requirement that at least } P \text{ percent of the observations take on values less than or equal to that value and at least } 100 - P \text{ percent take on values greater than or equal to that value.} \]
\[ s_t = \text{Value of a share at time } t. \]

2. Descriptive Statistics and Graphs

Percentile Index \[ i = \frac{P}{100} n \]
Approx. Class Width \[ w \approx \frac{\max x_i - \min x_i}{n} \]
Sample Mean \[ \bar{x} = \frac{\sum x_i}{n} \]
Sample Variance \[ s^2 = \frac{\sum (x_i - \bar{x})^2}{n - 1} \]
Sample Covariance \[ s_{xy} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{n - 1} \]
Standard Deviation \[ s = \sqrt{s^2} \]
Sample Correlation \[ r_{xy} = \frac{s_{xy}}{sx sy} \]

3. Chebychev’s Inequality and the Empirical Rule

Let \( x \) denote the value of a random variable with mean \( \mu_x \) and standard deviation \( \sigma_x \). For any value of \( k \) \((k > 0)\),

\[ P (|x - \mu| \geq k\sigma) < \frac{1}{k^2} \quad P (|x - \mu| \leq k\sigma) \geq 1 - \frac{1}{k^2} \]

This is referred to as Chebychev’s Inequality (sometimes ‘rule’).

3.1 Probability Rules

<table>
<thead>
<tr>
<th>Chebychev</th>
<th>Empirical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 1( \sigma ) of mean</td>
<td>( \geq 00% )</td>
</tr>
<tr>
<td>Within 2( \sigma ) of mean</td>
<td>( \geq 75% )</td>
</tr>
<tr>
<td>Within 3( \sigma ) of mean</td>
<td>( \geq 89% )</td>
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