Article Review


Outline

- Examples of normal vs. log-normal distribution
- Genesis of log-normal distribution
- Log-normal distribution
- Density functions
- Comparisons
- Examples of log-normal distribution
- Future challenge

Examples of normal and log-normal distribution

Genesis of normal and log-normal distributions

A log-normal distribution

Density functions of log-normal distributions vs. normal distribution
Normal vs. log-normal distributions

<table>
<thead>
<tr>
<th>Property</th>
<th>Normal distribution</th>
<th>Log-normal distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effects</td>
<td>Addictive</td>
<td>Multiplicative</td>
</tr>
<tr>
<td>Shape</td>
<td>Symmetrical</td>
<td>Skewed</td>
</tr>
<tr>
<td>Models</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triangle shape</td>
<td>Isosceles</td>
<td>Scalene</td>
</tr>
<tr>
<td>Effects at each point x</td>
<td>x ± c</td>
<td>x ' / c'</td>
</tr>
<tr>
<td>Mean</td>
<td>Arithmetic</td>
<td>Geometric</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>Addictive</td>
<td>Multiplicative</td>
</tr>
<tr>
<td>Measures of dispersion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence interval</td>
<td>68.3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>95.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>99.7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>x ± s</td>
<td>x ' / s'</td>
</tr>
<tr>
<td></td>
<td>x ± 2s</td>
<td>x ' (s')^2</td>
</tr>
<tr>
<td></td>
<td>x ± 3s</td>
<td>x ' (s')^3</td>
</tr>
</tbody>
</table>

Examples

- Geology and mining
- Human medicine
- Environment
- Atmospheric sciences
- Microbiology
- Plant physiology
- Ecology
- Food technology
- Linguistics
- Social sciences and economics

Future challenge

- Comparison of s* values (e.g., mobility of different chemicals)
- Farther-reaching analysis
  - estimate error variation, s*E, holding other conditions constant (e.g., population mixing, s*, x*)
- Sigmoid curves based on log-normal distributions
  - the steepness of the sigmoid: inversely proportional to s*, x* = ED₅₀

Normal or log-normal

- The range of log-normal variability
- Why the normal distribution is so popular?
  - more inherent appeal on symmetry
  - handy, well-known, and sufficient to represent
  - has been well-known and applied
  - more positive associations for nonstatisticians
- Why the log-normal distribution is usually better model for original data?
  - Multiplication rule in physics and chemistry
  - In nature distribution is log normal!

Conclusions

- Advantages of log-normal distribution
- Why not use it?

Discussion

- Geographic data are inherently log-normal distribution?
- How can we use this?