

# How can the Log-Normal Distribution be used in Python?

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## RECOMMENDED CITATION

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The Log-Normal Distribution is a commonly used probability distribution in statistics and mathematics. It is often used to model data that is skewed to the right, meaning that the majority of the data is clustered towards lower values with a few extreme values. In Python, the Log-Normal Distribution can be utilized through the `scipy.stats` library, which provides functions for calculating the probability density function, cumulative distribution function, and other statistical parameters such as mean and standard deviation. This allows users to easily generate random data that follows a Log-Normal Distribution, as well as perform statistical analyses and visualizations on the data. The Log-Normal Distribution in Python is a useful tool for analyzing real-world data and making informed decisions based on its properties and characteristics.

## Use the Log-Normal Distribution in Python

You can use the function from the SciPy library in Python to generate a random variable that follows a log-normal distribution.

The following examples show how to use this function in practice.

### How to Generate a Log-Normal Distribution

You can use the following code to generate a random variable that follows a log-normal distribution with  $\mu = 1$  and  $\sigma = 1$ :

```
import math
import numpy as np
from scipy.stats import lognorm

#make this example reproducible
```

```
np.random.seed(1)
```

```
#generate log-normal distributed random variable with  
1000 values
```

```
lognorm_values = lognorm.rvs(s=1, scale=math.exp(1),  
size=1000)
```

```
#view first five values
```

```
lognorm_values
```

```
array()
```

**Note that within the `lognorm.rvs()` function, `s` is the standard deviation and the value inside `math.exp()` is the mean for the log-normal distribution that you'd like to generate.**

**In this example, we defined the mean to be 1 and the standard deviation to also be 1.**

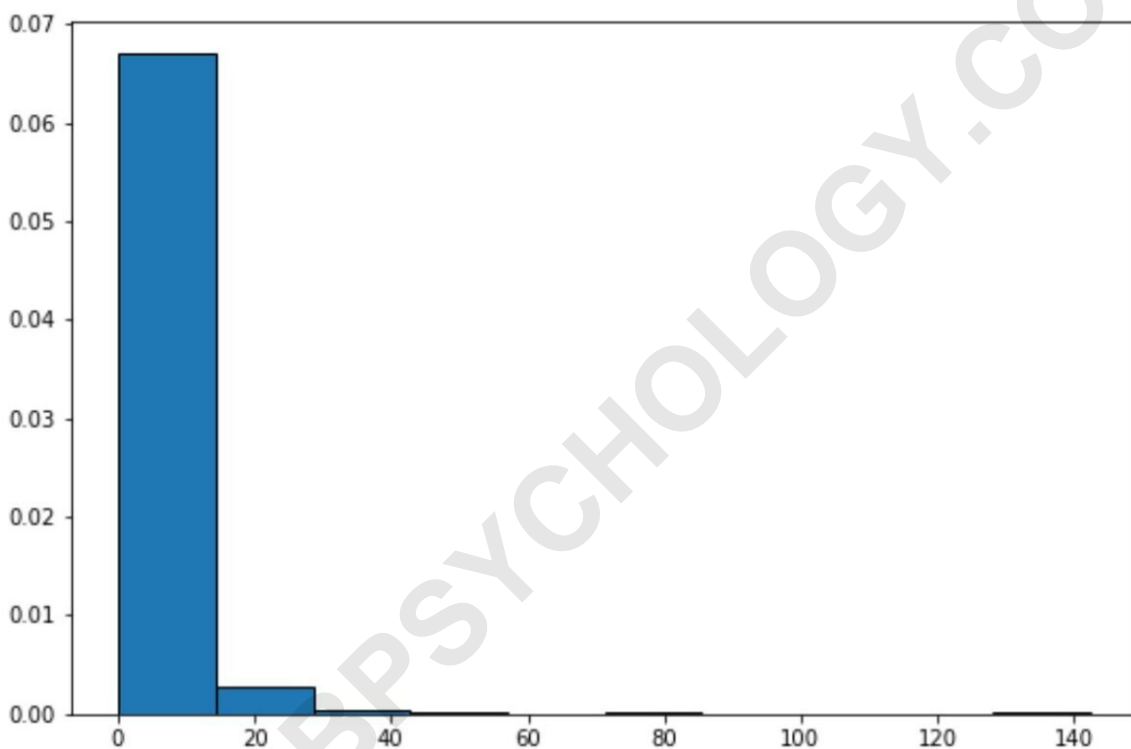
**How to Plot a Log-Normal Distribution**

**We can use the following code to create a histogram of the values for the log-normally distributed random variable we created in the previous example:**

```
import matplotlib.pyplot as plt
```

```
#create histogram
```

```
plt.hist(lognorm_values, density=True, edgecolor='black')
```



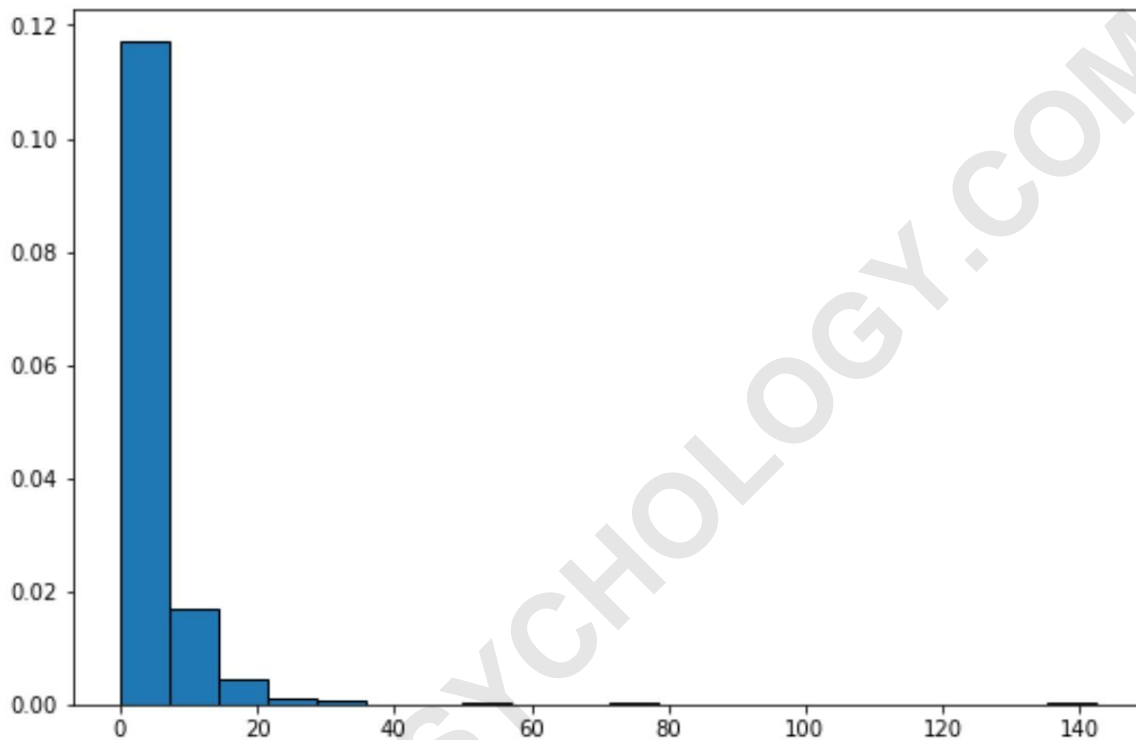
Matplotlib uses 10 bins in histograms by default, but we can easily increase this number using the bins argument.

For example, we can increase the number of bins to 20:

```
import matplotlib.pyplot as plt
```

```
#create histogram
```

```
plt.hist(lognorm_values, density=True, edgecolor='black', bins=20)
```



The greater the number of bins, the more narrow the bars will be in the histogram.

**Related:**

**Additional Resources**

The following tutorials explain how to work with other probability distributions in Python: