In [1]:

```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import scipy
import statsmodels.api as sm
import scipy.stats as stats
```

In [2]:

```python
!pip install fitter
```

```
Collecting fitter
  Downloading fitter-1.4.0.tar.gz (27 kB)
Collecting easydev
  Downloading easydev-0.12.0.tar.gz (47 kB)
Requirement already satisfied: numpy in c:\users\hp\anaconda3\lib\site-packages (from fitter) (1.20.3)
Requirement already satisfied: matplotlib in c:\users\hp\anaconda3\lib\site-packages (from fitter) (3.4.3)
Requirement already satisfied: scipy>=0.18 in c:\users\hp\anaconda3\lib\site-packages (from fitter) (1.7.1)
Requirement already satisfied: pandas in c:\users\hp\anaconda3\lib\site-packages (from fitter) (1.3.4)
Requirement already satisfied: click in c:\users\hp\anaconda3\lib\site-packages (from fitter) (8.0.3)
Requirement already satisfied: joblib in c:\users\hp\anaconda3\lib\site-packages (from fitter) (1.1.0)
Requirement already satisfied: colorama in c:\users\hp\anaconda3\lib\site-packages (from click->fitter) (0.4.4)
Requirement already satisfied: pexpect in c:\users\hp\anaconda3\lib\site-packages (from easydev->fitter) (4.8.0)
Collecting colorlog
  Downloading colorlog-6.6.0-py2.py3-none-any.whl (11 kB)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\hp\anaconda3\lib\site-packages (from matplotlib->fitter) (2.8.2)
Requirement already satisfied: cycler>=0.10 in c:\users\hp\anaconda3\lib\site-packages (from matplotlib->fitter) (0.10.0)
Requirement already satisfied: pillow>=6.2.0 in c:\users\hp\anaconda3\lib\site-packages (from matplotlib->fitter) (8.4.0)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\hp\anaconda3\lib\site-packages (from matplotlib->fitter) (1.3.1)
Requirement already satisfied: pyparsing>=2.2.1 in c:\users\hp\anaconda3\lib\site-packages (from matplotlib->fitter) (3.0.4)
Requirement already satisfied: six in c:\users\hp\anaconda3\lib\site-packages (from cycler>=0.10->matplotlib->fitter) (1.16.0)
Requirement already satisfied: pytz>=2017.3 in c:\users\hp\anaconda3\lib\site-packages (from pandas->fitter) (2021.3)
Requirement already satisfied: ptyprocess>=0.5 in c:\users\hp\anaconda3\lib\site-packages (from pexpect->easydev->fitter) (0.7.0)
Building wheels for collected packages: fitter, easydev
  Building wheel for fitter (setup.py): started
  Building wheel for fitter (setup.py): finished with status 'done'
  Created wheel for fitter: filename=fitter-1.4.0-py3-none-any.whl size=25036 sha256=48e23e884144f922c42142162ba741f59f0e67951b7316f9c3b95eb2964a43ab
  Stored in directory: c:\users\hp\appdata\local\pip\cache\wheels\26\07\d7\685f1a5643d927b18e983ec3cf3b4ff18ec4e1bdbfc1455301
  Building wheel for easydev (setup.py): started
  Building wheel for easydev (setup.py): finished with status 'done'
  Created wheel for easydev: filename=easydev-0.12.0-py3-none-any.whl size=64232 sha256=d337f9dacf0a289f90c2db7beebab50520862e5f0f307ca7202ebd8d57cd2d87
  Stored in directory: c:\users\hp\appdata\local\pip\cache\wheels\91\1a\c5\9dfcc86c5bb27991b4dd27741dd03847dfca83ce975c186ddb
Successfully built fitter easydev
Installing collected packages: colorlog, easydev, fitter
Successfully installed colorlog-6.6.0 easydev-0.12.0 fitter-1.4.0
```

In [3]:

```python
from fitter import Fitter,get_common_distributions, get_distributions
```

In [4]:

```python
# Importing the datas
data =pd.read_excel('Jishu Raj Baruah_213110045_Datas_Building Energy Efficiency.xls')
```

In [5]:

```python
data
```

Out[5]:

	Relative Compactness	Surface Area(in m^2)	Wall Area(in m^2)	Roof Area(in m^2)	Overall Height(in m)	Orientation(2:North, 3:East, 4:South, 5:West)	Glazing Area(0%,10%,25%,40% of floor area)	Glazing Area Distribution\n(1: Uniform, 2:North, 3:East, 4:South, 5:West)	Heating_load	Cooling_load
0	0.7638	514.5	294.0	110.25	7.0	2	0.0	0	15.55	21.33
1	0.9800	514.5	294.0	110.25	7.0	3	0.0	0	15.55	21.33
2	0.9800	514.5	294.0	110.25	7.0	4	0.0	0	15.55	21.33
3	0.9800	514.5	294.0	110.25	7.0	5	0.0	0	15.55	21.33
4	0.9000	563.5	318.5	122.50	7.0	2	0.0	0	20.84	28.28
...	...	...	...	...	...	...	...	...	...	...
763	0.6400	784.0	343.0	220.50	3.5	5	0.4	5	17.88	21.40
764	0.6200	808.5	367.5	220.50	3.5	2	0.4	5	16.54	16.88
765	0.6200	808.5	367.5	220.50	3.5	3	0.4	5	16.44	17.11
766	0.6200	808.5	367.5	220.50	3.5	4	0.4	5	16.48	16.61
767	0.6200	808.5	367.5	220.50	3.5	5	0.4	5	16.64	16.03

768 rows × 10 columns

In [6]:

```python
# Filling Null value with mean value
data= data.fillna(data.mean())
data
```

Out[6]:

	Relative Compactness	Surface Area(in m^2)	Wall Area(in m^2)	Roof Area(in m^2)	Overall Height(in m)	Orientation(2:North, 3:East, 4:South, 5:West)	Glazing Area(0%,10%,25%,40% of floor area)	Glazing Area Distribution\n(1: Uniform, 2:North, 3:East, 4:South, 5:West)	Heating_load	Cooling_load
0	0.7638	514.5	294.0	110.25	7.0	2	0.0	0	15.55	21.33
1	0.9800	514.5	294.0	110.25	7.0	3	0.0	0	15.55	21.33
2	0.9800	514.5	294.0	110.25	7.0	4	0.0	0	15.55	21.33
3	0.9800	514.5	294.0	110.25	7.0	5	0.0	0	15.55	21.33
4	0.9000	563.5	318.5	122.50	7.0	2	0.0	0	20.84	28.28
...	...	...	...	...	...	...	...	...	...	...
763	0.6400	784.0	343.0	220.50	3.5	5	0.4	5	17.88	21.40
764	0.6200	808.5	367.5	220.50	3.5	2	0.4	5	16.54	16.88
765	0.6200	808.5	367.5	220.50	3.5	3	0.4	5	16.44	17.11
766	0.6200	808.5	367.5	220.50	3.5	4	0.4	5	16.48	16.61
767	0.6200	808.5	367.5	220.50	3.5	5	0.4	5	16.64	16.03

768 rows × 10 columns

In [7]:

```python
# Statistical summary of the datas
data.describe()
```

Out[7]:

	Relative Compactness	Surface Area(in m^2)	Wall Area(in m^2)	Roof Area(in m^2)	Overall Height(in m)	Orientation(2:North, 3:East, 4:South, 5:West)	Glazing Area(0%,10%,25%,40% of floor area)	Glazing Area Distribution\n(1: Uniform, 2:North, 3:East, 4:South, 5:West)	Heating_load	Cooling_load
count	768.000000	768.000000	768.000000	768.000000	768.00000	768.000000	768.000000	768.00000	768.000000	768.000000
mean	0.763885	671.708333	318.500000	176.604167	5.25000	3.500000	0.234375	2.81250	22.307201	24.587760
std	0.105490	88.086116	43.626481	45.165950	1.75114	1.118763	0.133221	1.55096	10.090196	9.513306
min	0.620000	514.500000	245.000000	110.250000	3.50000	2.000000	0.000000	0.00000	6.010000	10.900000
25%	0.682500	606.375000	294.000000	140.875000	3.50000	2.750000	0.100000	1.75000	12.992500	15.620000
50%	0.750000	673.750000	318.500000	183.750000	5.25000	3.500000	0.250000	3.00000	18.950000	22.080000
75%	0.820000	741.125000	343.000000	220.500000	7.00000	4.250000	0.400000	4.00000	31.667500	33.132500
max	0.980000	808.500000	416.500000	220.500000	7.00000	5.000000	0.400000	5.00000	43.100000	48.030000

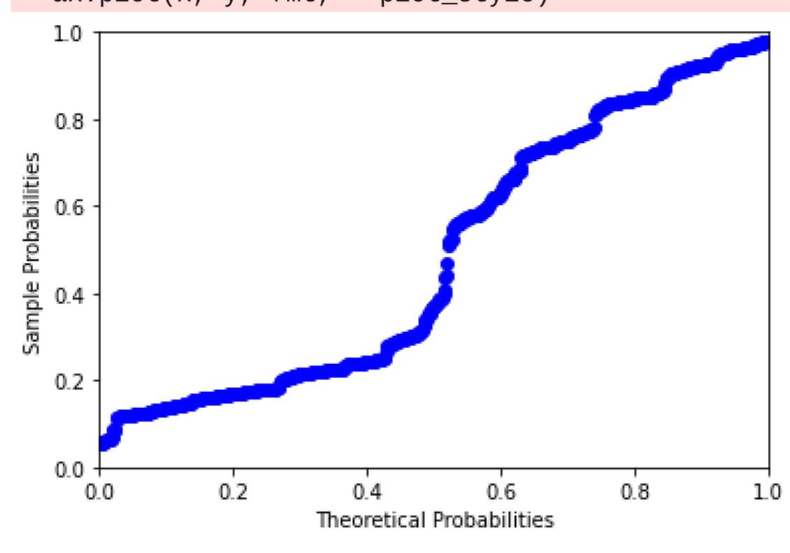
In [8]:

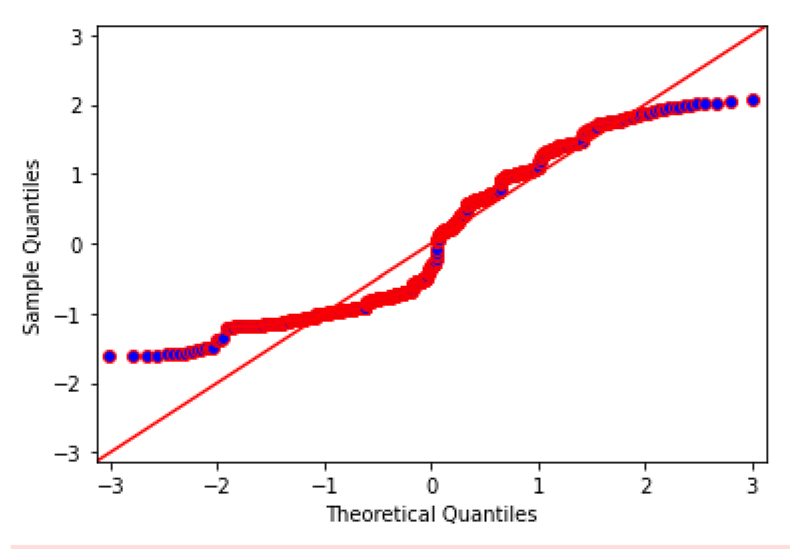
```python
# Plotting P-P plot, Q-Q plot and distribution plot for Heating_load Column
pp=sm.ProbPlot(data['Heating_load'],loc=0,scale=1,fit=True,a=1)
fig =pp.ppplot()

sm.qqplot(data['Heating_load'],line='45',fit=True,dist=stats.norm,color='red')
plt.show()

sns.distplot(data['Heating_load'],bins=40,kde=True,hist_kws={"linewidth":10,'alpha':1})
```

```
C:\Users\HP\anaconda3\lib\site-packages\statsmodels\graphics\gofplots.py:993: UserWarning: marker is redundantly defined by the 'marker' keyword argument and the fmt string "bo" (-> marker='o'). The keyword argument will take precedence.
  ax.plot(x, y, fmt, **plot_style)
C:\Users\HP\anaconda3\lib\site-packages\statsmodels\graphics\gofplots.py:993: UserWarning: marker is redundantly defined by the 'marker' keyword argument and the fmt string "bo" (-> marker='o'). The keyword argument will take precedence.
  ax.plot(x, y, fmt, **plot_style)
C:\Users\HP\anaconda3\lib\site-packages\statsmodels\graphics\gofplots.py:993: UserWarning: color is redundantly defined by the 'color' keyword argument and the fmt string "bo" (-> color='b'). The keyword argument will take precedence.
  ax.plot(x, y, fmt, **plot_style)
```

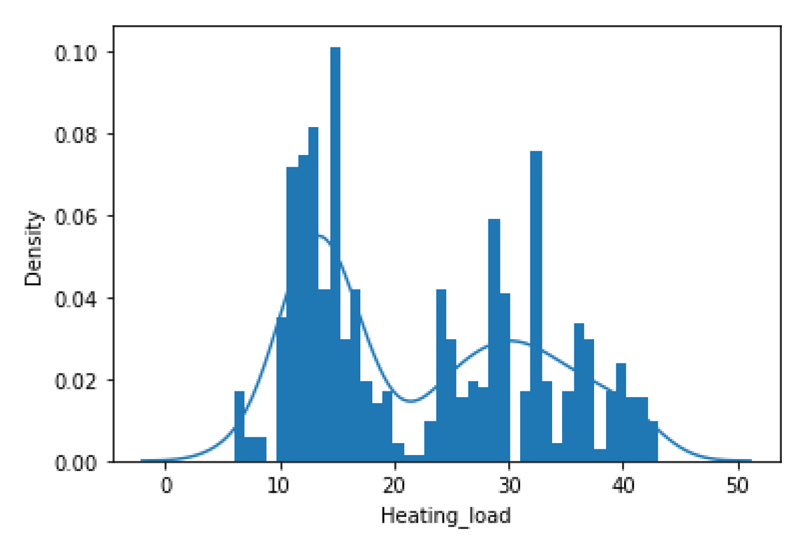





```
C:\Users\HP\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[8]:

```
<AxesSubplot:xlabel='Heating_load', ylabel='Density'>
```

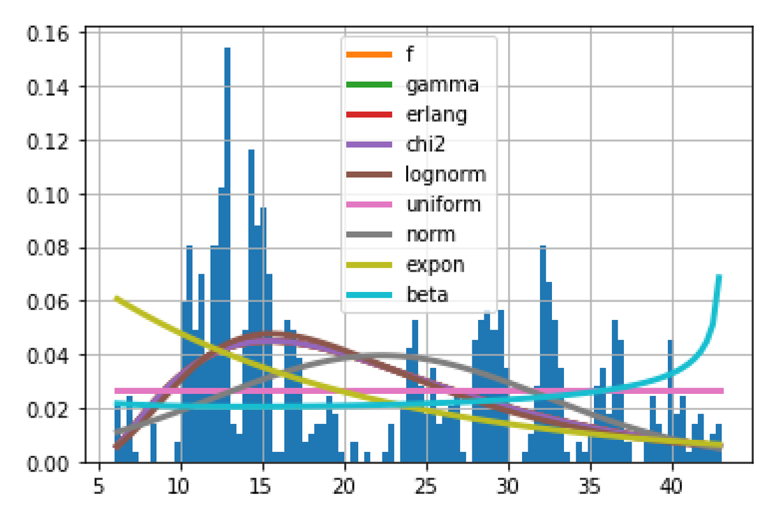


In [9]:

```python
# Best fitting distribution comparison for Heating_column datas
fitting_test=Fitter(data['Heating_load'],distributions=['gamma','lognorm',"beta","chi2","norm","erlang","uniform","expon","f",])
fitting_test.fit()
fitting_test.summary(clf=True,lw=3,Nbest=9)
```

Out[9]:

	sumsquare_error	aic	bic	kl_div
f	0.081484	776.093573	-7001.499894	inf
gamma	0.081492	774.162141	-7008.064874	inf
erlang	0.081492	774.162247	-7008.063504	inf
chi2	0.081492	774.162171	-7008.063398	inf
lognorm	0.082222	781.704765	-7001.219141	inf
uniform	0.086465	726.669478	-6969.221951	inf
norm	0.094028	767.673600	-6904.817253	inf
expon	0.096502	789.783769	-6884.875995	inf
beta	0.099090	756.231929	-6851.262658	inf



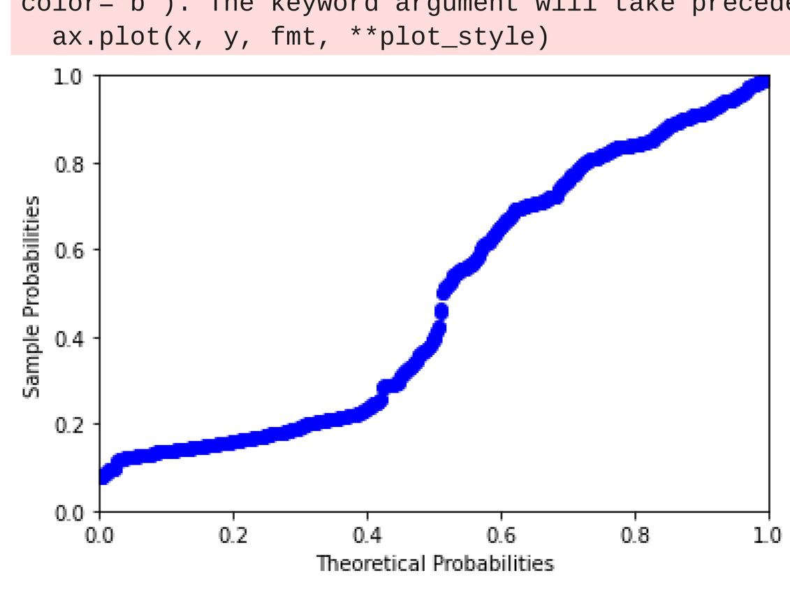
In [10]:

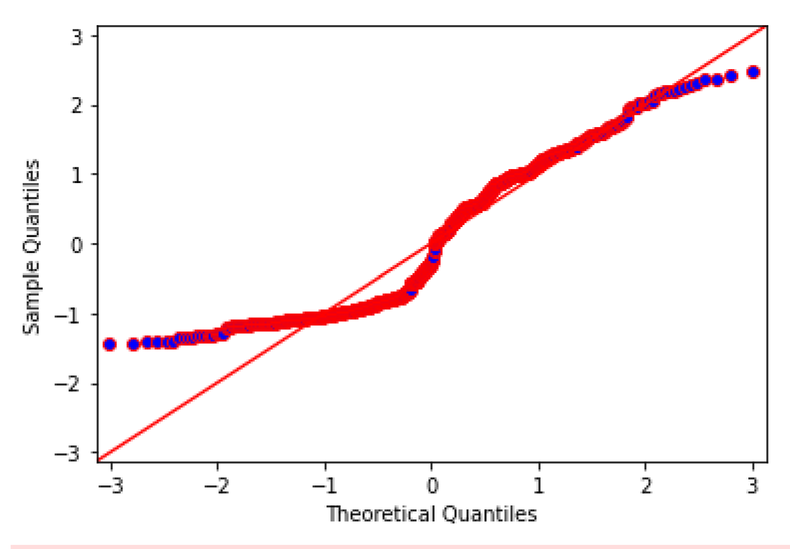
```python
# Plotting P-P plot, Q-Q plot and distribution plot for Cooling_load Column
pp=sm.ProbPlot(data['Cooling_load'],loc=0,scale=1,fit=True,a=1)
fig =pp.ppplot()

sm.qqplot(data['Cooling_load'],line='45',fit=True,dist=stats.norm,color='red')
plt.show()

sns.distplot(data['Cooling_load'],bins=40,kde=True,hist_kws={"linewidth":10,'alpha':1})
```

```
C:\Users\HP\anaconda3\lib\site-packages\statsmodels\graphics\gofplots.py:993: UserWarning: marker is redundantly defined by the 'marker' keyword argument and the fmt string "bo" (-> marker='o'). The keyword argument will take precedence.
  ax.plot(x, y, fmt, **plot_style)
C:\Users\HP\anaconda3\lib\site-packages\statsmodels\graphics\gofplots.py:993: UserWarning: marker is redundantly defined by the 'marker' keyword argument and the fmt string "bo" (-> marker='o'). The keyword argument will take precedence.
  ax.plot(x, y, fmt, **plot_style)
C:\Users\HP\anaconda3\lib\site-packages\statsmodels\graphics\gofplots.py:993: UserWarning: color is redundantly defined by the 'color' keyword argument and the fmt string "bo" (-> color='b'). The keyword argument will take precedence.
  ax.plot(x, y, fmt, **plot_style)
```

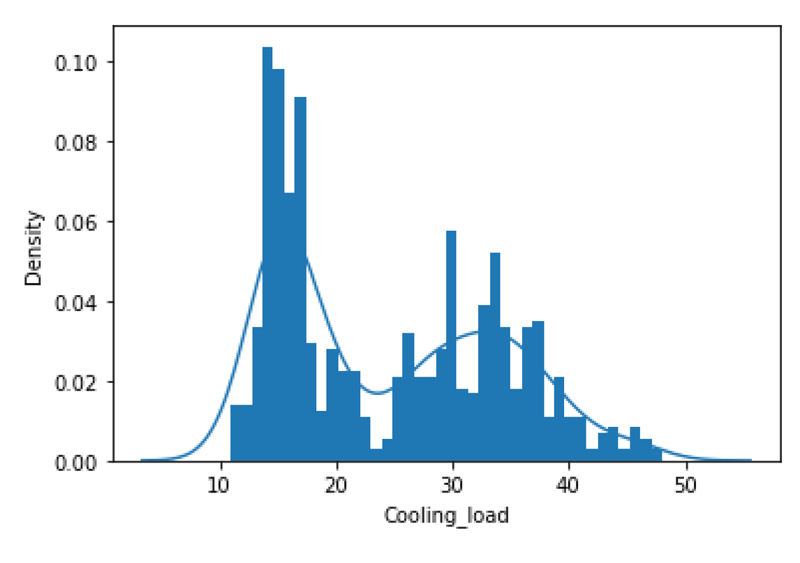





```
C:\Users\HP\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[10]:

```
<AxesSubplot:xlabel='Cooling_load', ylabel='Density'>
```

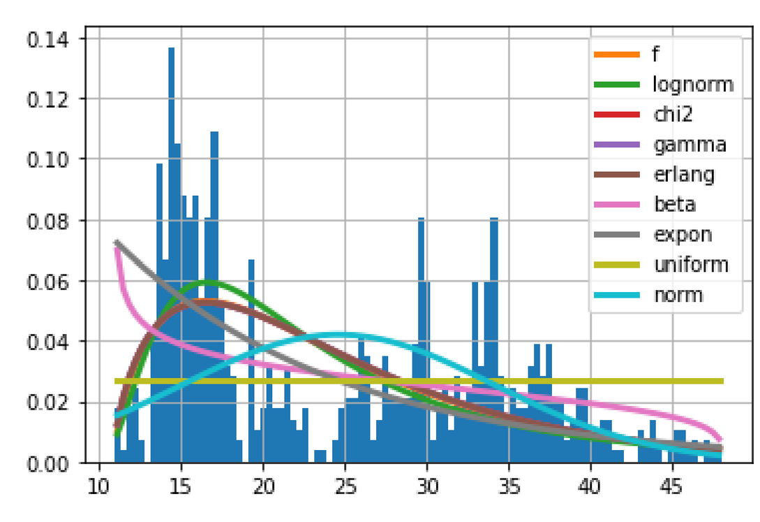


In [11]:

```python
# Best fitting distribution comparison for Cooling_load column datas
fitting_test=Fitter(data['Cooling_load'],distributions=['gamma','lognorm',"beta","chi2","norm","erlang","uniform","expon","f",])
fitting_test.fit()
fitting_test.summary(clf=True,lw=3,Nbest=9)
```

Out[11]:

	sumsquare_error	aic	bic	kl_div
f	0.060840	793.647588	-7225.883232	inf
lognorm	0.061084	804.893526	-7229.445474	inf
chi2	0.061202	790.036900	-7227.968023	inf
gamma	0.061202	790.036508	-7227.966174	inf
erlang	0.061202	790.037043	-7227.965899	inf
beta	0.067371	745.272292	-7147.568394	inf
expon	0.068792	798.564652	-7144.822649	inf
uniform	0.077104	726.885054	-7057.216875	inf
norm	0.079348	791.608507	-7035.190391	inf



In [ ]: