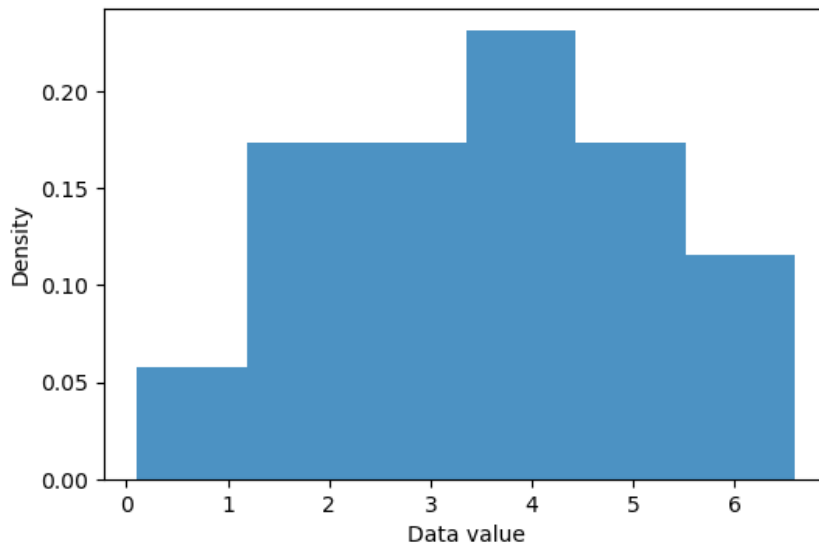


TIE4203 Decision Analysis in Industrial & Operations Management Solutions to Tutorial #8

Question 1 (P7.1)

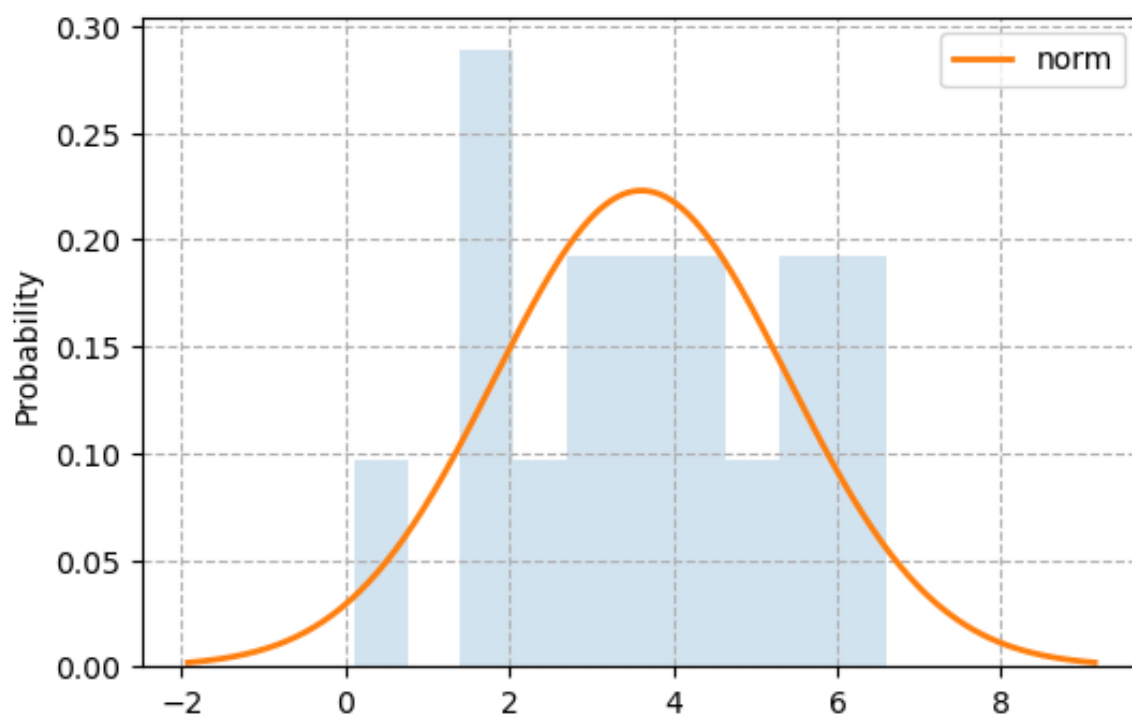


Data Description:

size = 16
minmax = (0.1077, 6.5941)
mean = 3.61086875
var = 3.41809
std dev = 1.7901

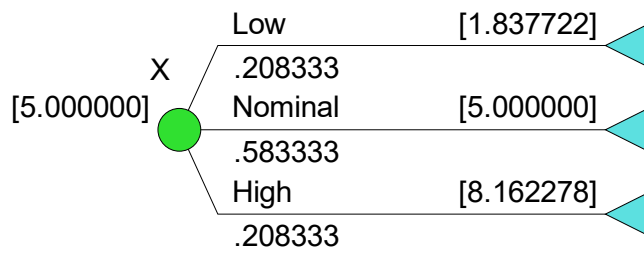
The Maximum Likelihood Estimators (MLE) for the mean and standard deviation of the Normal Distribution is the mean and standard deviation of the observed data.

Hence, we will fit a Normal distribution with mean = 3.611 and standard deviation = 1.790



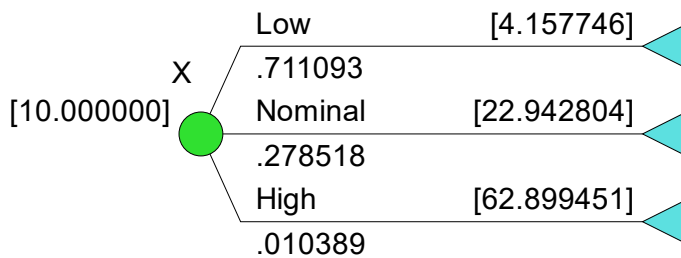
Question 2 (P7.2)

(a) Triangular (0, 10, 5)



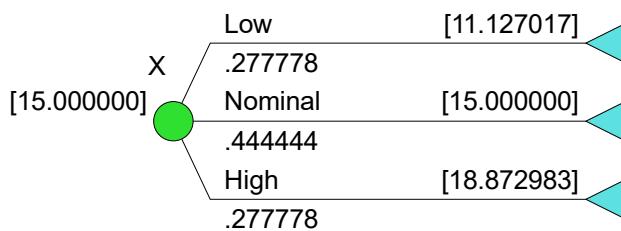
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(b) Exponential (1/10)



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(c) Uniform (10, 20)

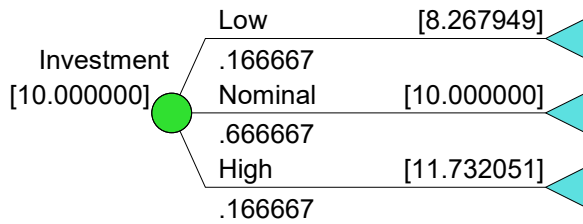


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Question 3 (P7.3)

Let the utility function be $u(x) = 1 - e^{-x/5}$ where x is in millions of dollars.

(a) Discrete 3-branch approximation (moments matching) using DPL:



$$E[u(x)] = (1/6) u(8.267849) + (2/3) u(10) + (1/6) u(11.732051) = 0.861931$$

$$CE = u^{-1}(0.861931) = \$ 9.9000 \text{ millions}$$

(b) Stanford/SDG 3-branch quick approximation:

From the CDF, the 10th, 50th, and 90th percentiles are 8.718, 10.0, and 11.282, respectively.

$$E[u(x)] = 0.25 u(8.718) + 0.5 u(10.0) + 0.25 u(11.282) = 0.86243$$

$$CE = u^{-1}(0.86243) = \$ 9.9181 \text{ millions}$$

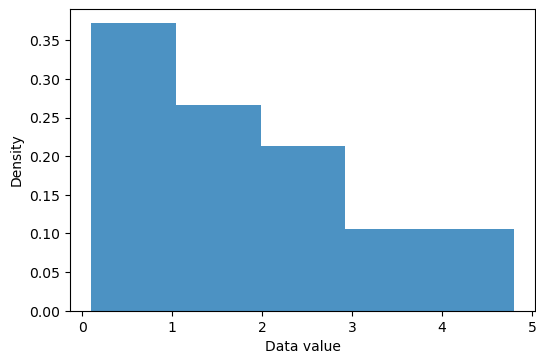
(c) Pearson-Tukey 3-branch approximation method:

From the CDF, the 5th, 50th, and 95th percentiles are 8.355, 10.0, and 11.645, respectively.

$$E[u(x)] = 0.185 u(8.355) + 0.63 u(10.0) + 0.185 u(11.645) = 0.86193$$

$$CE = u^{-1}(0.86193) = \$ 9.9000 \text{ millions}$$

Question 4 (P7.5)



Data Description:

size = 20

minmax = (0.1, 4.8)

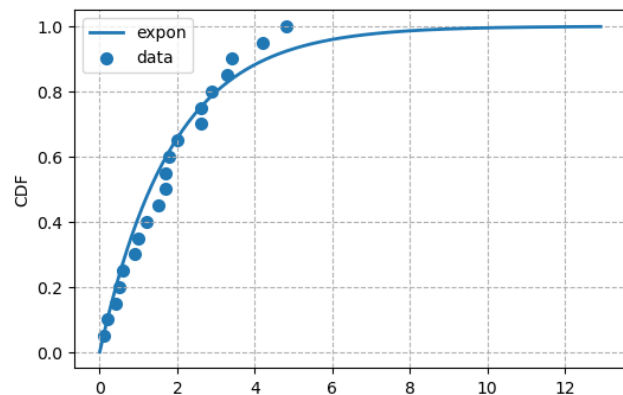
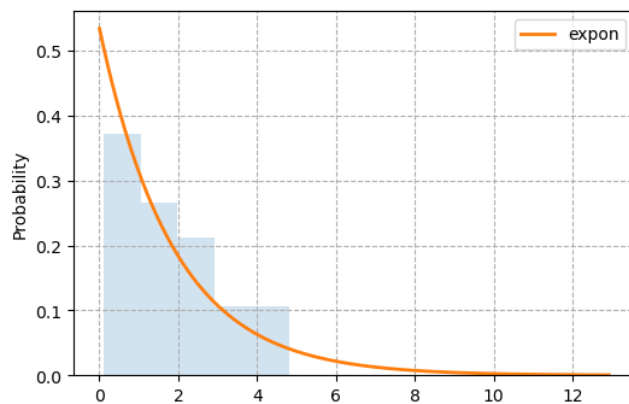
mean = 1.8699999999999999

var = 1.8137894736842104

skewness = 0.5802772894968783

kurtosis = -0.5649727424575377

We will fit an exponential distribution with one parameter (location = 0).



Distribution: expon

Parameters = (0.0000, 1.8700)

KS statistic = 0.15163114014127343

KS p-value = 0.6921603208893784

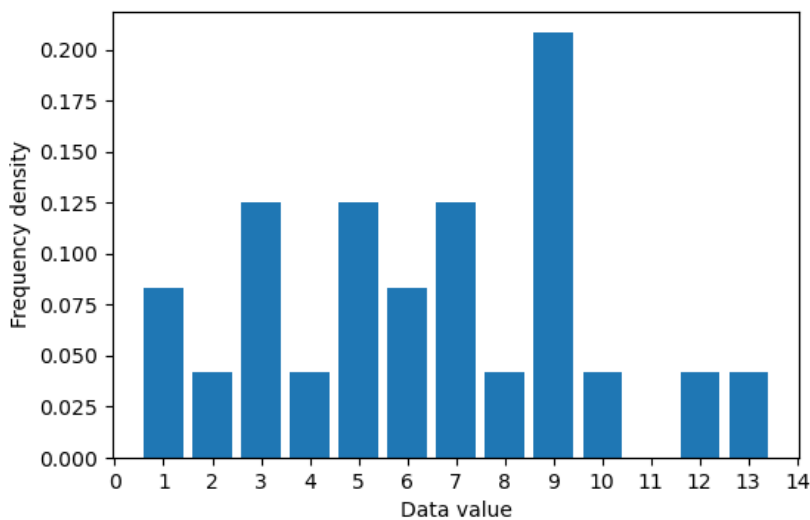
mean = 1.8700

var = 3.4969

std dev = 1.8700

Question 5 (P7.6)

(a) Histogram of the data



Data Description:

size = 24
minmax = (1, 13)
mean = 6.375
var = 10.853260869565217
skewness = 0.1004975735577767
kurtosis = -0.7612716019447299

(b) Try fitting the Poisson, Binomial, Negative binomial, and Beta Binomial distributions

The top 2 distributions are:

Distribution: betabinom

Parameters = (1.3050e+01, 2.1898e+00, 2.2715e+00)
KS statistic = 0.13735397910174652
KS p-value = 0.705329716862781
mean = 6.4053
var = 10.4571
std dev = 3.2337

Distribution: nbinom

Parameters = (8.3030e+00, 5.6568e-01)
KS statistic = 0.17272838916584243
KS p-value = 0.4233763247639363
mean = 6.3750
var = 11.2697
std dev = 3.3570

(c) Comparing the PMF and CDF of the fitted distributions with the data

