STAT 479
Spring 2022
Quiz 4
March 8, 2022

1. You are given the following claim amounts:

   8 12 24 30

   Your hypotheses are:

   H_0: The data is from an exponential distribution with a mean of 20.

   H_1: The data is not from an exponential distribution with a mean of 20.

   a. Calculate the Kolmogorov-Smirnov test Statistic to test this hypothesis.

      Solution:

x	$F_5(x^-)$	$F_5(x)$	$F^*(x)$	K-S Value
8	0	0.25	$1-e^{-8/20}=0.32968$	0.32968
12	0.25	0.50	$1-e^{-12/20}=0.45119$	0.20119
24	0.50	0.75	$1-e^{-24/20}=0.69881$	0.19881
30	0.75	1.00	$1-e^{-30/20}=0.77687$	0.22313
Max Value				0.32968

   b. State the critical value at a 95% confidence level.

      Solution:

      Critical Value = $\frac{1.36}{\sqrt{n}}=\frac{1.36}{\sqrt{4}}=0.68$

   c. State your conclusion from this Hypothesis Test.

      Solution:
      Since 0.32968<0.68, we fail to reject the Null Hypothesis

2. Del wants to test the following hypothesis using the Chi Square Test with a 99% significance level:

   H_0: The data is from a Poisson distribution.

   H_1: The data is not from a Poisson distribution.

   Del uses the data in the following table to complete the Chi Square Test:

Number of Accidents in 2021	Number of Policies
0	2400
1	3400
2	2400
3+	1800

(a) Calculate the Chi Square test statistic.

Solution:

This problem is flawed as we should estimate λ using MLE we cannot do. The best we can do is approximate the MLE for λ as

$$\bar{X} = \frac{(0)(2400)+(1)(3400)+(2)(2400)+(3)(1800)}{10,000} = 1.36$$

	O_j	E_j	$\frac{(E_j - O_j)^2}{E_j}$
0	2400	$10,000\,p_0 = (10,000)e^{-1.36} = 2566.61$	10.82
1	3400	$10,000\,p_1 = (10,000)(1.36)e^{-1.36} = 3490.6$	2.35
2	2400	$10,000\,p_2 = (10,000)\frac{(1.36)^2 e^{-1.36}}{2} = 2373.6$	0.29
3+	1800	$10,000(1 - p_0 - p_1 - p_2 = 1569.2$	33.94
Total			47.4

(b) Calculate the critical value for this test.

Solution:

Degrees of Freedom= 4 – 1 – Estimated Parameters = 4 – 1 – 1 = 2
Critical Value = 9.21

(c) State Del's conclusion.

Solution:

Since 47.4 > 9.21, we reject the null hypothesis