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Assignment 3 Template

<u>Problem 1:</u> Fill in the information below based on your data which were generated using your ID number as the seed for the random number generator.

n = 30 theta = 0.5282993

The first 10 approximate 95% confidence intervals are:

[,1] [,2]

[1,] 0.3548087 0.7118580

[2,] 0.4608896 0.8057770

[3,] 0.3210773 0.6789227

[4,] 0.4246923 0.7753077

[5,] 0.1646434 0.5020233

[6,] 0.3548087 0.7118580

[7,] 0.3210773 0.6789227

[8,] 0.4979767 0.8353566

[9,] 0.2560082 0.6106585

[10,] 0.3893415 0.7439918

Do all 10 intervals contain only values between 0 and 1? YES

Depending on the value of theta is it possible that some intervals will not contain only values between 0 and 1? Why or why not?

Since theta = 0. 5282993, it's not quite possible that some intervals will contain only values between 0 and 1. Since we want to be 95% confident that the

interval contains data, and theta is not close to either 0 or 1, it is not quite possible

The proportion of approximate 95% confidence intervals which contain the true value of theta = 0.9362

What factors affect how close this proportion is to 0.95? Under what circumstances might you expect this proportion to be close to 0.95, and under what circumstances would you expect this proportion to be not as close to 0.95?

A number of experiments will affect this proportion. If a number of experiments is large, each time a 95% confidence interval for theta is constructed using data, then approximately 95% of these constructed intervals would contain the true theta. If a number of experiments is small, it will affect this proportion to be not as close to 0.95 and vice versa. In this case, theta = 0.9362 is close to 0.95 but not equal because we only constructed 10 intervals which is not a large number of experiment, so it is not close to 0.95

The first ten 15% likelihood intervals (approximate 95% likelihood-based confidence intervals) are:

[,1] [,2]

[1,] 0.3586556 0.7025961

[2,] 0.4562528 0.7887964

[3,] 0.3276569 0.6723431

[4,] 0.4229261 0.7608423

[5,] 0.1840830 0.5096281

[6,] 0.3586556 0.7025961

[7,] 0.3276569 0.6723431

[8,] 0.4903719 0.8159170

[9,] 0.2678842 0.6095882

[10,] 0.3904118 0.7321158

Do all 10 likelihood intervals contain only values between 0 and 1? YES

Depending on the value of theta is it possible that some likelihood intervals will not contain only values between 0 and 1? Why or why not?

Since theta = 0. 5282993, it's not quite possible that some likelihood intervals will contain only values between 0 and 1. Since we want to be 95% confident that the interval contains data, and theta is not close to either 0 or 1, it is not quite possible

The proportion of 15% likelihood intervals which contain the true value of theta = 0.9592

What factors affect how close this proportion is to 0.95? Under what circumstances might you expect this proportion to be close to 0.95, and under what circumstances would you expect this proportion to be not as close to 0.95?

A number of experiments (n) will affect this proportion. If a number of experiments is large, each time a 95% confidence interval for theta is constructed using data, then approximately 95% of these constructed intervals would contain the true theta. If a number of experiments is small, it will affect this proportion to be not as close to 0.95 and vice versa. In this case, theta = 0.9592 is close to 0.95

Insert the plot of the sampling distribution of the likelihood ratio statistic for n=30 here.

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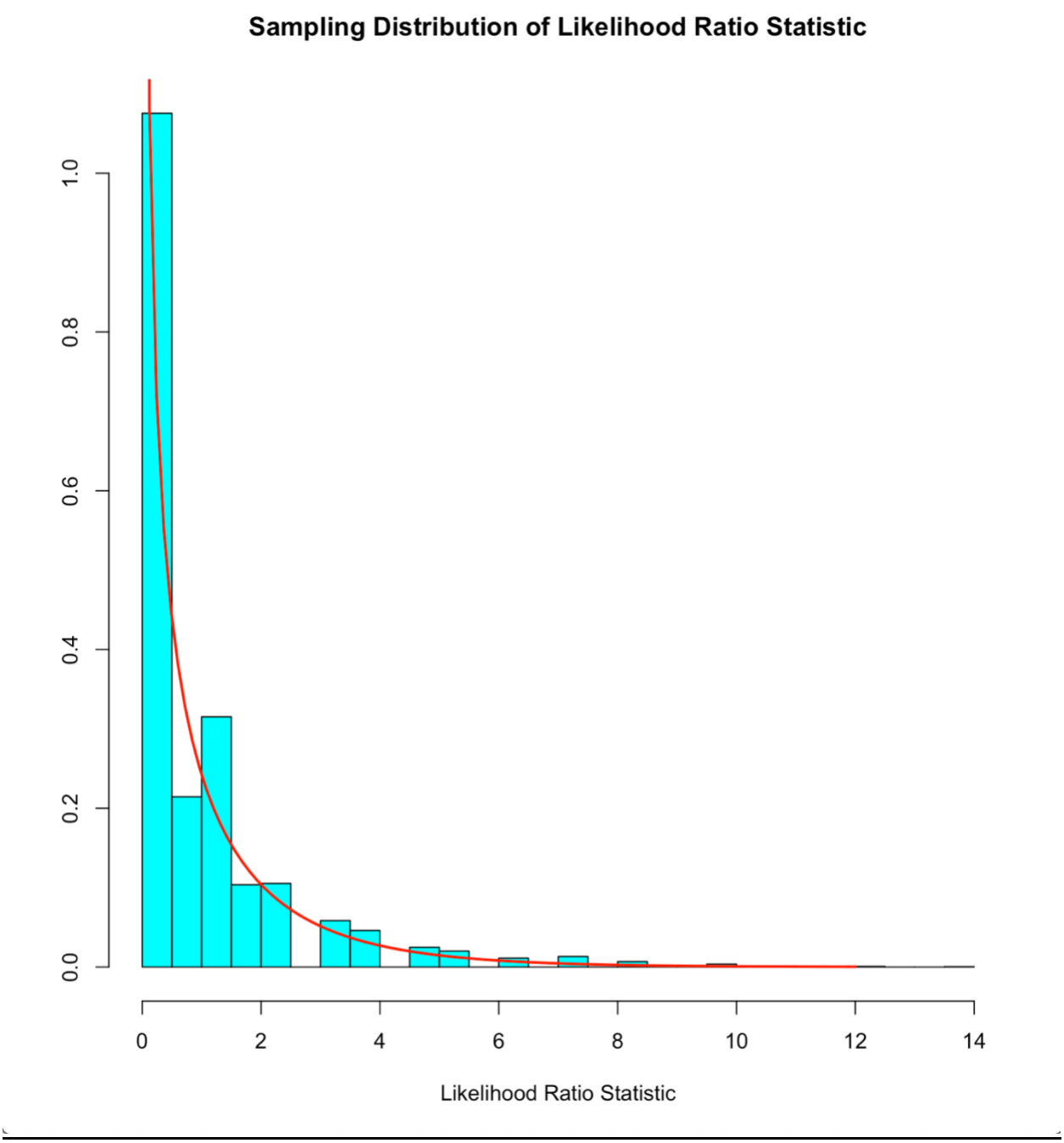

For Binomial data the likelihood ratio statistic is a discrete or continuous random variable?

Discrete random variable

How well does the Chi-squared(1) probability density function agree with the sampling distribution of the likelihood ratio statistic as approximated by the relative frequency histogram?

Chil-squared(1) probability density function agree quite well with the samepling distribution of the likelihood ratio statistic as approximated by the relative frequency histogram

n = 100 **theta = 0.5282993**

The first 10 approximate 95% confidence intervals are:

[,1] [,2]

[1,] 0.4120196 0.6079804

[2,] 0.4524912 0.6475088

[3,] 0.4120196 0.6079804

[4,] 0.3820784 0.5779216

[5,] 0.3920196 0.5879804

[6,] 0.4321766 0.6278234

[7,] 0.4321766 0.6278234

[8,] 0.3721766 0.5678234

[9,] 0.4627082 0.6572918

[10,] 0.3232625 0.5167375

The proportion of approximate 95% confidence intervals which contain the true value of theta = 0.9396

What factors affect how close this proportion is to 0.95? Under what circumstances might you expect this proportion to be close to 0.95, and under what circumstances would you expect this proportion to be not as close to 0.95?

A number of experiments will affect this proportion. If a number of experiments is large, each time a 95% confidence interval for theta is constructed using data, then approximately 95% of these constructed intervals would contain the true theta. If a number of experiments is small, it will affect this proportion to be not as close to 0.95 and vice versa. In this case, theta = 0.9396 is close to 0.95 but not equal because we only constructed 10 intervals which is not a large number of experiment, so it is not close to 0.95

The first ten 15% likelihood intervals (approximate 95% likelihood based confidence intervals) are:

[,1] [,2]

[1,] 0.4132612 0.6062142

[2,] 0.4527500 0.6447761

[3,] 0.4132612 0.6062142

[4,] 0.3840947 0.5769224

[5,] 0.3937858 0.5867388

[6,] 0.4329329 0.6255409

[7,] 0.4329329 0.6255409

[8,] 0.3744591 0.5670671

[9,] 0.4627113 0.6543121

[10,] 0.3267810 0.5172482

The proportion of 15% likelihood intervals which contain the true value of theta = 0.9396

What factors affect how close this proportion is to 0.95? Under what circumstances might you expect this proportion to be close to 0.95, and under what circumstances would you expect this proportion to be not as close to 0.95?

A number of experiments will affect this proportion. If a number of experiments is large, each time a 95% confidence interval for theta is constructed using data, then approximately 95% of these constructed intervals would contain the true theta. If a number of experiments is small, it will affect this proportion to be not as close to 0.95 and vice versa. In this case, theta = 0.9396 is close to 0.95 but not equal because we only constructed 10 intervals which is not a large number of experiments, so it is not close to 0.95

Insert the plot of the sampling distribution of the likelihood ratio statistic for n=100 here.

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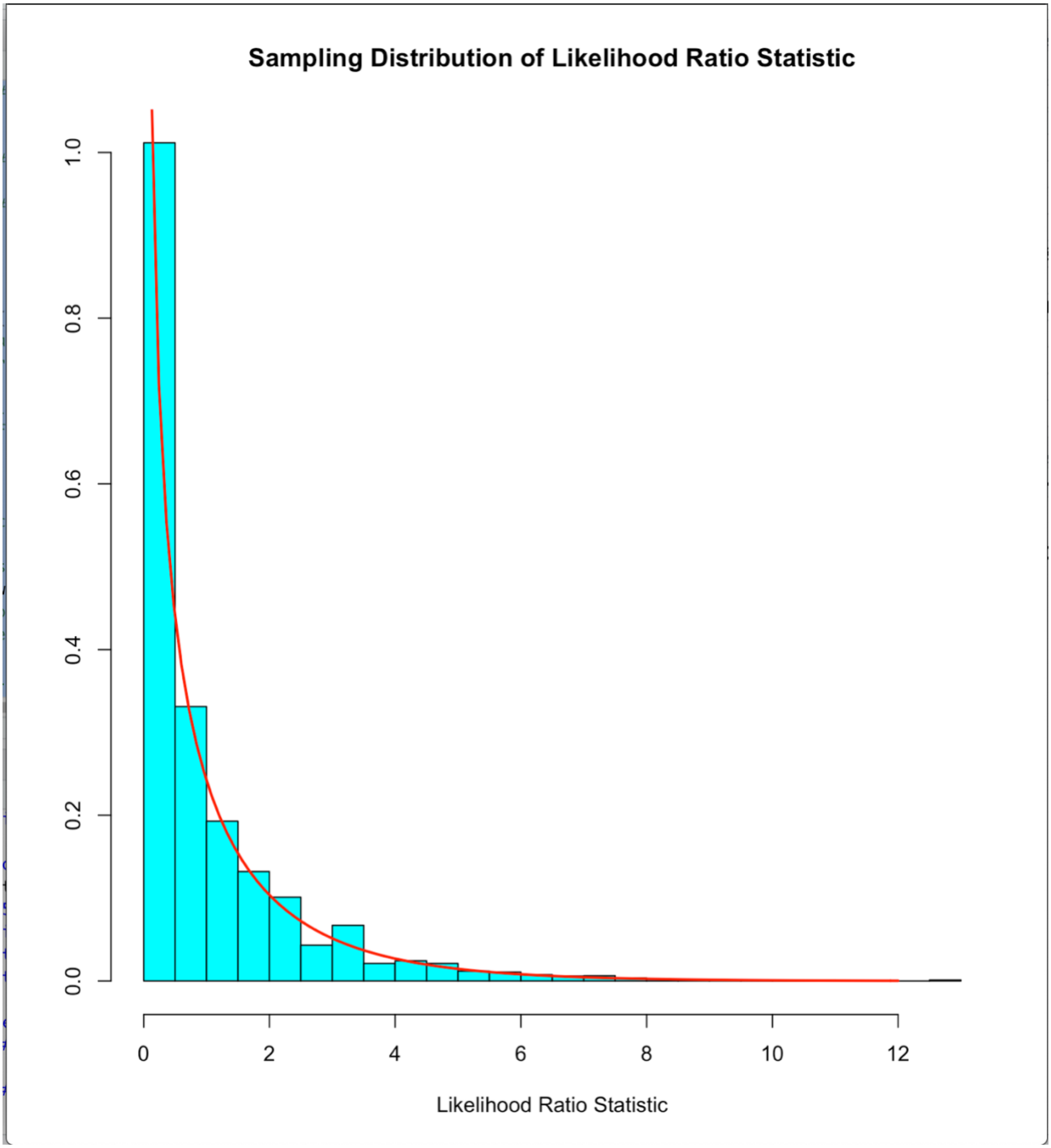

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How well does the Chi-squared(1) probability density function agree with the sampling distribution of the likelihood ratio statistic as approximated by the relative frequency histogram?

Chi-squared(1) probability density function agree really well with the sampling distribution of the likelihood ratio statistic as approximated by the relative frequency histogram

Compare the graphs for n=30 and n=100.

Graph for n = 100 has data more fit with the distribution than graph for n = 30, so graph for n = 100 indicates more similarity with the chi-squared(1) distribution

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