Bayesian inference using JAGS

The outcome of the experiment(s) is x = (0, 1, 0, 1, 1, 1, 1). Generate 10000 samples from the posterior distribution assuming a flat prior. Plot the results as a histogram

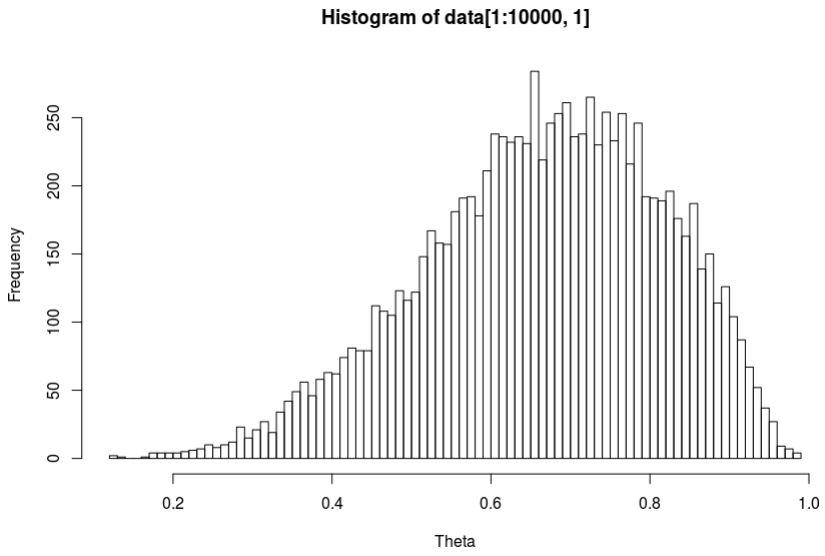

Figure 0.1 – Histogram of prior distribution

Use the samples to calculate the mean and standard deviation based on the sample.

Mean	SD
0.664995	0.150223

Beta distribution as an alternative to the uniform prior. If your opinion is, that the prior has a mean at about 0.5 and a standard deviation of about 0.15, what are the

$\mu = \frac{\alpha}{\alpha+\beta}$, $\sigma^2 = \frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

If $\mu = 0.5 \; and \; \sigma = 0.15 \; \rightarrow \alpha = 5.055 \; and \; \beta = 5.055$

Generate again 10000 samples from the posterior, plot the histogram. Calculate the mean and standard deviation of the posterior in this case.

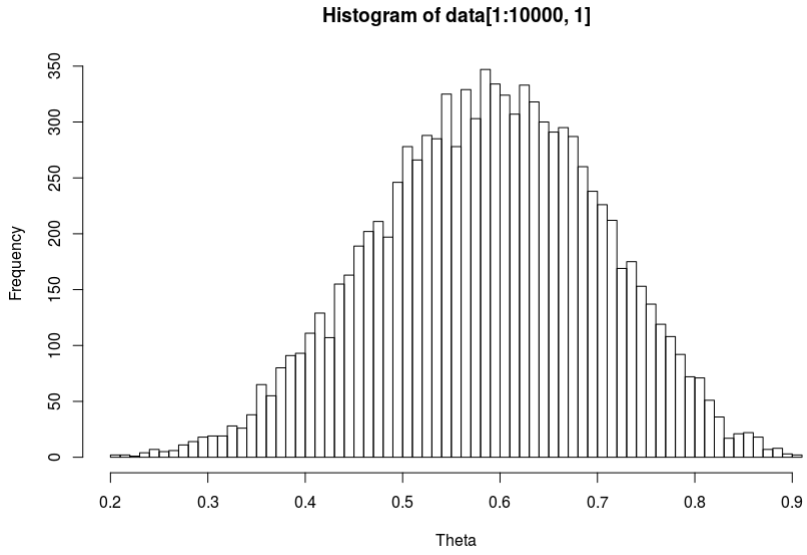

Figure 0.2 – Histogram of prior distribution

Mean	SD
0.587156	0.115461

Bayesian inference for the Poisson distribution using JAGS

One way to get an approximate a flat prior is to use a Uniform distribution starting from zero and up to a large value. Try this as a first approach.

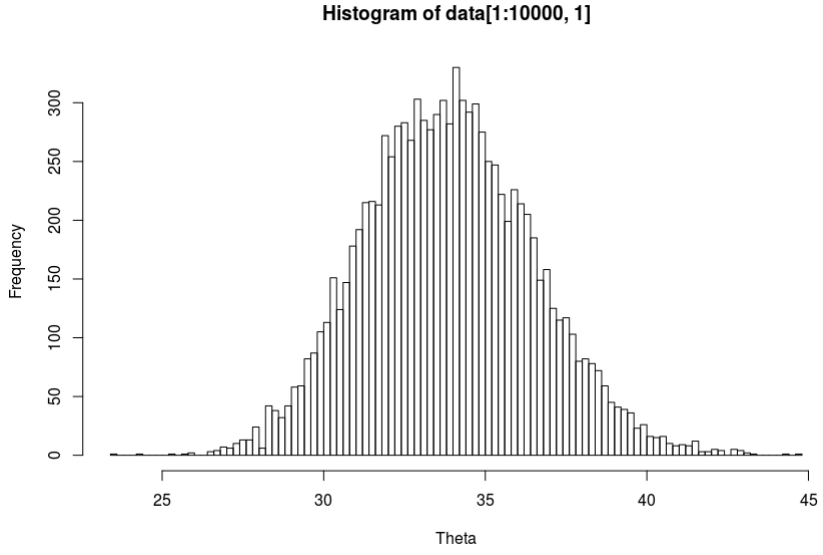

Figure 0.3 – Histogram of prior distribution

Mean	SD
34.01336	2.59620

Second approach one often uses a Gamma distribution as prior with a small value for the shape (0.0001) and the rate (0.0001)

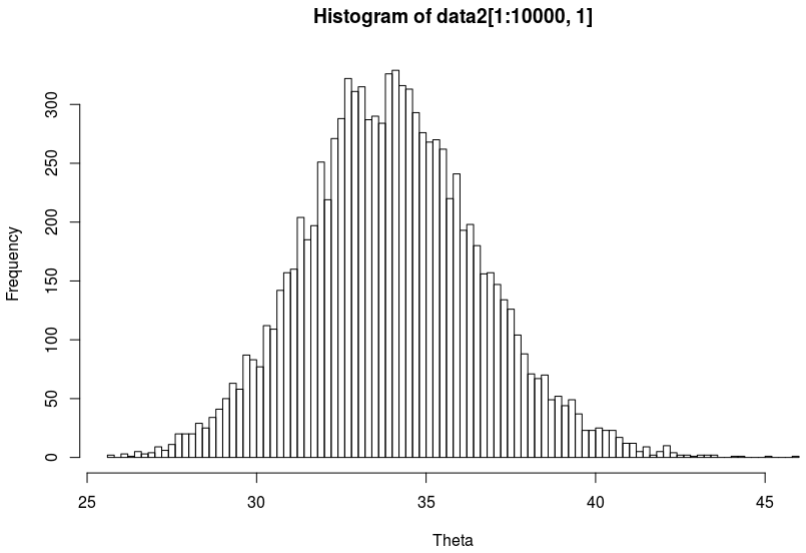

Figure 0.4 – Histogram of prior distribution

Mean	SD
33.86439	2.61595

Then sample from the posterior. Plot again the histogram. How do the results using the two priors differ?

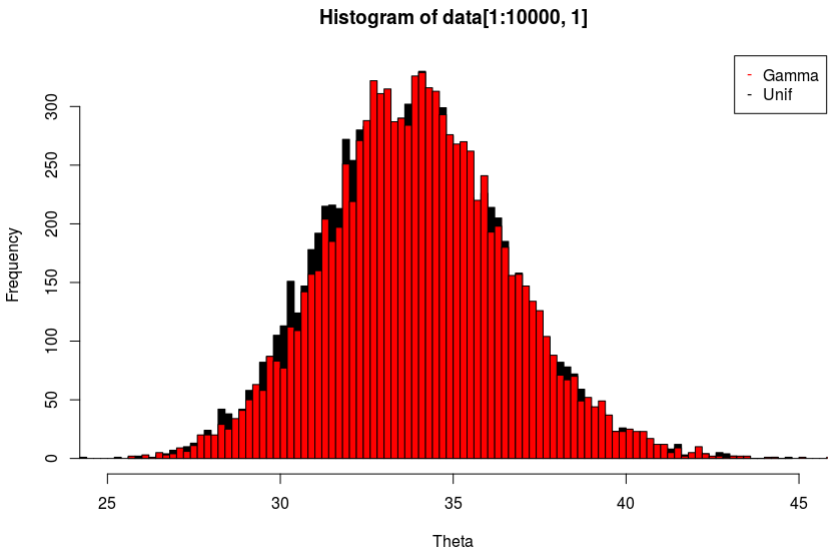

Figure 0.5 – Histogram of gamma (red) vs uniform (black) distribution