

## Assessment 4 Part V

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### Question

"Suppose you want to perform hypothesis testing on the coefficients of a linear model in a Bayesian analysis, e.g., you want to test for each coefficient... How could you do it with the tools we have presented in this course?"

### Answer

To test for individual significance of *each* coefficient, one would first prescribe a prior distribution for each parameter and derive the full conditional posterior. If the integral of conditional posterior can be derived analytically, one can also derive the credible interval analytically – and compare to the null hypothesis.

Where the integral is difficult to derive, one can utilise Monte Carlo simulation such as importance sampling to approximate. These methods allow us to approximate the  $\alpha$  and  $1-\alpha$  th quantiles through the law of large numbers. These quantiles define the credible interval used to test significance from the null hypothesis.

To test for *joint* significance of all  $\beta$  coefficients, first prescribe a joint prior distribution  $\pi(\beta|\sigma^2)$  and derive a (joint) conditional posterior (e.g.,  $\beta|\sigma^2$ ). One may then approximate the integral of the conditional posterior using MCMC methods such as Gibbs Sampling (if full conditionals are known) or Metropolis Hastings. Provided the chain has converged, the joint credible interval can then be calculated and tested against the null hypothesis.