Code

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1/31/2020

```r
binom_sim<-function(p){
  #simulate 500 bin(100,p)
  sims<-rbinom (500, 100, p)
  p_hats<-sims/100

  #avg. of estimated p's
  avg_p_hats<-mean(p_hats)

  #empirical variance of the p_hat's
  emp_var<-var(p_hats)

  var_est<-p_hats*(1-p_hats)/100
  #avg. estimated variances of the p_hat's
  avg_var<-mean(var_est)

  #proportion of 95% CI's that contain true value of p
  CI<-matrix(0,500,2)
  CI[,1]<-t(t(p_hats-qnorm(.975)*sqrt(var_est)))
  CI[,2]<-t(t(p_hats+qnorm(.975)*sqrt(var_est)))
  true_CI_prop<-mean(p>=CI[,1]&p<=CI[,2])

  #avg. length of the 95% CI's
  avg_CI_length<-mean(CI[,2]-CI[,1])

  return(data.frame(c(avg_p_hats,emp_var,
             avg_var,true_CI_prop,
             avg_CI_length), row.names =
               c("avg_p_hats","emp_var",
             "avg_var","true_CI_prop",
             "avg_CI_length")))
}
final<-data.frame(binom_sim(0.1),binom_sim(0.2),binom_sim(0.3),
                  binom_sim(0.4),binom_sim(0.5))
colnames(final)<-c("p=0.1","p=0.2","p=0.3","p=0.4","p=0.5")

knitr::kable(final)
```