Math 159
Nonparametric Analysis
Spring 2010
Jo Hardin
R handout: Binomial

This handout gives instructions on how to use the binomial distribution in R. You should get used to using R to find probabilities (in addition to being comfortable using the tables in your book).

- To find binomial probabilities in R:

```
> pbinom(q, size, prob)     # gives P(X≤q)
> 1 - pbinom(q, size, prob) # gives P(X>q)
> dbinom(q, size, prob)     # gives P(X=q)
> qbinom(p, size, prob)     # gives the cutoff for a given probability, p
                              where size = n and prob = p.
```

  Note: (1) because the binomial is a discrete distribution, you need to be careful with $\leq$ versus $<$. (2) You can find probabilities associated with other distributions using similar code: see the help files for `pnorm`, `pt`.

- To plot a power curve for a binomial test, you use the relevant binomial probabilities:

```
> probseq <- seq(0,1,.01)
> plot(probseq, 1 - pbinom(12-1,20,probseq),
       type="l", xlab="true p", ylab="power",ylim=c(0,1))
> lines(probseq, 1 - pbinom(13-1,20,probseq),lty=2)
> lines(probseq, 1 - pbinom(14-1,20,probseq),lty=3)
> lines(probseq, 1 - pbinom(15-1,20,probseq),lty=4)
> legend("bottomright", paste("CR: T >= ",12:15 ), lty=1:4)
```

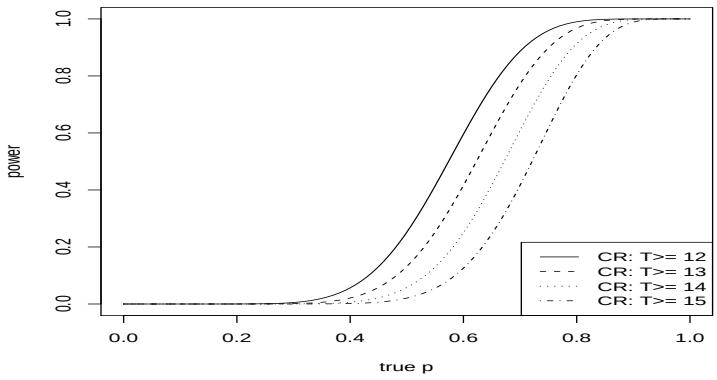

Figure 1: [CR = critical region] The plot shows two things. (1) The higher the true proportion, the more power you will have to reject the null hypothesis. (2) The lower the critical value (i.e., the bigger the critical region) the higher the power. Note that changing the critical region to be more powerful comes with a trade-off of large type I error rates.