Hypothesis testing

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Explaination for the conclusion

```
alpha_0.6_m <- function(m){
  1-pbinom(m-1,100,0.6)
}

##ggplot()+
  ##stat_function(fun = alpha_0.6_m)+
  ##xlim(1,100)

for (i in 1:100) {
  m <- 1
  if(alpha_0.6_m(m)>0.05){
    m <- i+1
  }
  if(alpha_0.6_m(m)<0.05){
    print(m)
    break
  }
}
```

```
## [1] 69
```

```
alpha_0.8_m <- function(m){
  1-pbinom(m-1,100,0.8)
}

##ggplot()+
  ##stat_function(fun = alpha_0.8_m)+
  ##xlim(1,100)

for (i in 1:100) {
  m <- 1
  if(alpha_0.8_m(m)>0.95){
    m <- i+1
  }
  if(alpha_0.8_m(m)<0.95){
    print(m-1)
    break
  }
}
```

```
## [1] 73
```

$\alpha(p) = \sum_{m \leq k \leq n} b(n, p, k)$ gives the probability of a type 1 error. First, we need to find the smallest value for m that thwarts a type 1 error. In this case, p equals to 0.6, because the null hypothesis is true. Then, we need to find the largest value for m that thwarts a type 2 error. In this case, p equals to 0.8 here(this value is chosen arbitrarily). We need to find the largest value of m which makes $\beta(p) < 0.05$.

Replication and Explanation for Figure 3.7

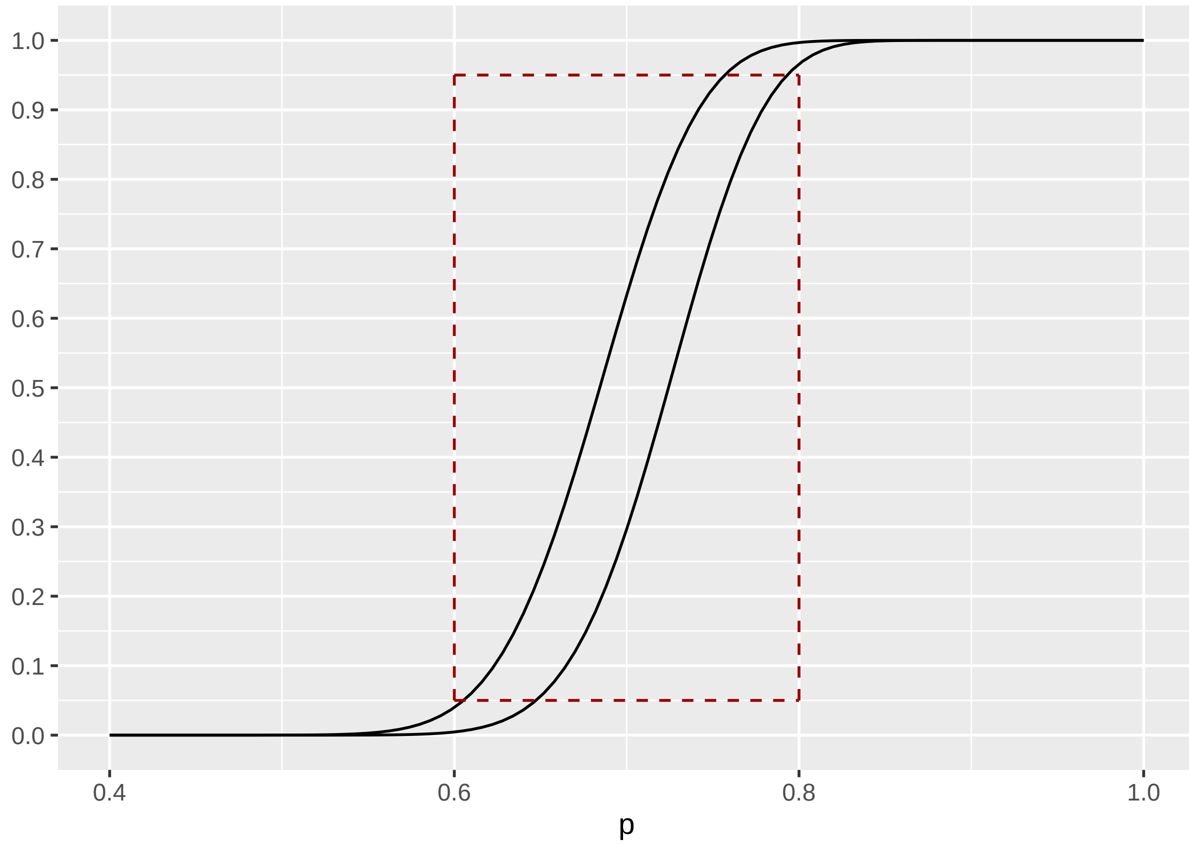
```r
# Replicate

# define function for m=69
alpha_p_69 <- function(p){
  1-pbinom(68,100,p)
}

# define function for m=73
alpha_p_73 <- function(p){
  1-pbinom(72,100,p)
}

# plot
ggplot()+
  stat_function(fun = alpha_p_69)+
  xlim(.4,1)+
  stat_function(fun = alpha_p_73)+
  xlim(.4,1)+
  scale_y_continuous(breaks=seq(0, 1, 0.1))+
  geom_segment(aes(x=.6,xend=.8,y=.95,yend=.95),colour="#990000", linetype="dashed")+
  geom_segment(aes(x=.6,xend=.8,y=.05,yend=.05),colour="#990000", linetype="dashed")+
  geom_segment(aes(x=.6,xend=.6,y=.05,yend=.95),colour="#990000", linetype="dashed")+
  geom_segment(aes(x=.8,xend=.8,y=.05,yend=.95),colour="#990000", linetype="dashed")+
  xlab("p")+
  ylab(" ")
```

```
## Scale for 'x' is already present. Adding another scale for 'x', which will
## replace the existing scale.
```



As the figure declares, as m increases, the graph of α moves to the right. This means when m increases, it makes a type 1 error less likely.