MA677 Homework

Haoyu Wang

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Get Value

The null hypothesis is $H_0 : p = 0.6$; The alternative hypothesis is $H_1 : p > 0.6$

The type I error is: $\alpha(p) = \sum_m^n b(n, p, k)$

Thus, we have:

```
alpha <- rep(0, 100)
m1 <- rep(0, 100)
n <- 100
for (i in 0:40){
  m1[i] = 60 + i
  alpha[i] = pbinom(n,n,0.6) - pbinom(m1[i]-1,n,0.6)
}
typeIerror <- data.frame(cbind(m1, alpha))
m_min <- typeIerror[which(typeIerror$alpha < 0.05), 1]
m_min[1]
```

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

The type II error is:

$\beta(p) = 1 - \alpha(p) = \sum_m^n b(n, p, k)$

Thus, we have:

```
beta <- rep(0,100)
m2 <- rep(0,100)
for (i in 1:20) {
  m2[i] = 80 - i
  beta[i] = 1-(pbinom(n,n,0.8)-pbinom(m2[i]-1,n,0.8))
}
typeIIerror <- data.frame(cbind(m2, beta))
m_max <- typeIIerror[which(typeIIerror$beta < 0.05), 1]
m_max[1]
```

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

Get Plot

```
m_1 <- 69
m_2 <- 73
p <- seq(0.4, 1, 0.01)
curve1 <- cumsum(dbinom(m_1, n, p))
curve2 <- cumsum(dbinom(m_2, n, p))
```

```r
data <- data.frame(p, curve1, curve2)
ggplot(data) +
  geom_rect(aes(xmin = 0.6, xmax = 0.8, ymin = 0.05, ymax = 0.95), alpha = 0.1) +
  geom_line(aes(p, curve1), color = "pink") +
  geom_line(aes(p, curve2), color = "lightblue") +
  ggtitle("Power curve when m=69 and m=73") +
  xlab("Probability") +
  ylab("Power")
```