Homework 5.1

Drew Remmenga

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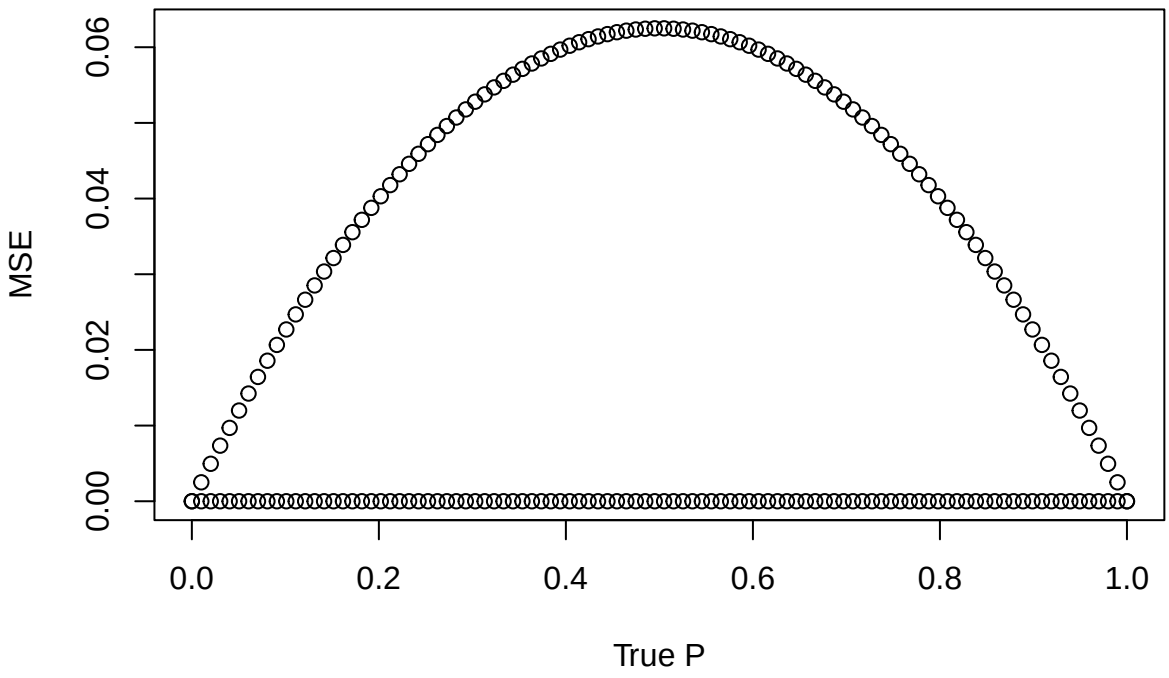
Exercise 6.2 (a) $E[X_1] = \mu$
$E[\frac{X_2+X_3}{2}] = \frac{2\mu}{2} = \mu$
$E[\hat{\mu_3}] = .1 * \mu + .2 * \mu + .3 * \mu + .4 * \mu = \mu$
$E[\bar{X}] = \frac{4*\mu}{4} = \mu$
(b) $Var[\hat{\mu_1}] = \sigma^2$
$Var[\hat{\mu_2}] = .5\sigma^2$
$Var[\hat{\mu_3}] = (.1^2 + .2^2 + .3^2 + .4^2) * \sigma^2$
$Var[\hat{\mu_3}] = .3\sigma^2$ $Var[\hat{\mu_4}] = \frac{4}{16} * \sigma^2 = \frac{\sigma^2}{4}$ This one has the smallest variance.
Exercise 6.5 (a) $E[\hat{p}_1] = p$ unbiased.
$E[\hat{p}_2] = .5$ unbiased
(b) $Var[\hat{p}_1] = \frac{p(1-p)}{n}$
$Var[\hat{p}_2] = 0$ this one has the lower variance
(c) $MSE[\hat{p}_1] = 0^2 + \frac{p(1-p)}{n}$
$MSE[\hat{p}_2] = 0^2 + 0$

```
p=seq(from = 0,to = 1,length.out=100)
msep1=p*(1-p)/4
msep2=matrix(0,1,100)
plot(p,msep1,xlab="True P",ylab="MSE")
points(p,msep2)
```



Exercise 6.8

```
p=.43
n=611
error = sqrt(p*(1-p)/n)
error
```

```
## [1] 0.02002862
```