刘程华　计91　2018011687

Prob 1.　$H_0: p=0.5$　vs　$H_a: p>0.5$

$$p\text{-value} = \sum_{i=0}^{25} C_{100}^{i} \left(\frac{1}{2}\right)^{100} + \sum_{i=75}^{100} C_{100}^{i} \left(\frac{1}{2}\right)^{100} = 5.635\times10^{-7} < 0.001$$

有超过 99.9% 的把握 接受 $H_a$

Prob 2 (1)　$X \sim U(0,\theta)$

$$E(X)=\frac{\theta}{2},\quad Var(X)=\frac{\theta^2}{12}$$

由 CLT

$$\sqrt{n}\,\frac{\bar{X}-E(X)}{\sqrt{Var(X)}} = \sqrt{n}\,\frac{X-\frac{\theta}{2}}{\frac{\theta}{2\sqrt{3}}} \sim N(0,1) \qquad n\to+\infty$$

$$\sqrt{n}\left(X-\frac{\theta}{2}\right) \sim N\left(0,\frac{\theta^2}{12}\right) \qquad n\to+\infty$$

(2)　$H_0: \theta=20$, vs　$H_a: \theta\neq 20$

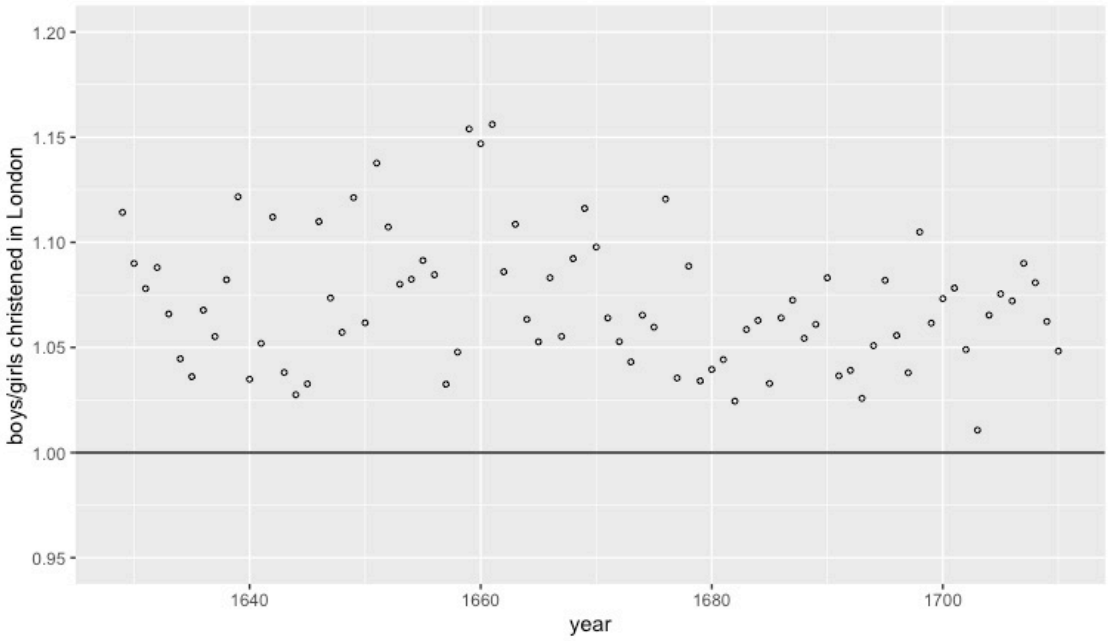
$H_0$ 下，$T=\sqrt{n}(\bar{X}-10) \sim N\left(0,\frac{(20)^2}{12}\right)=N\left(0,\frac{100}{3}\right)$

$$T'=\sqrt{n}\,\frac{(\bar{X}-10)}{\sqrt{\frac{100}{3}}} \sim N(0,1)$$ 题中 $T'=\frac{\sqrt{40}(8.5-10)}{\sqrt{\frac{100}{3}}} \approx -1.643 < 0$

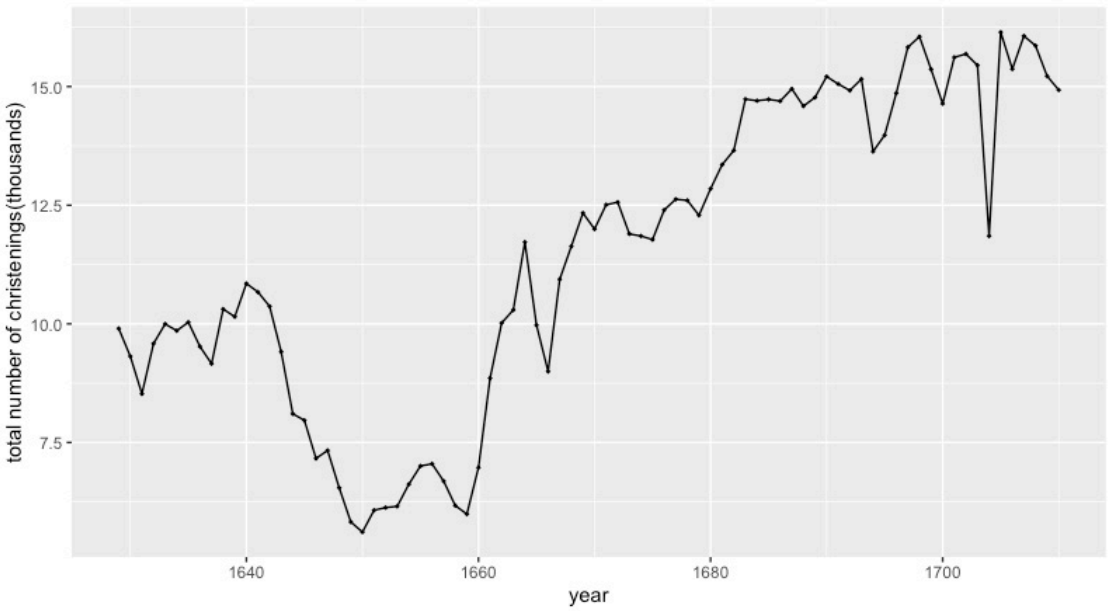
$p\text{-value} = 0.1003482 > 0.01 \quad (\alpha=0.01)$

因此 接受 $H_0$

Prob3


boys/girls christened in London
1.20
1.15
1.10
1.05
1.00
0.95
1640
1660
1680
1700
year


number of christening(thousands)
8
6
4
1640
1660
1680
1700
year
type
boys
girls



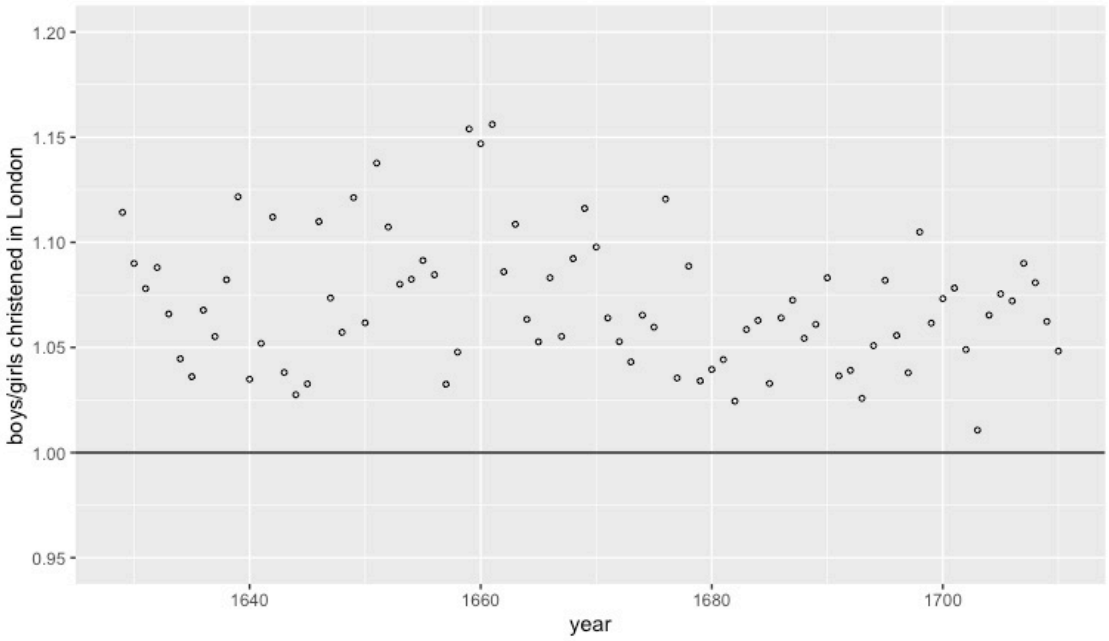

```
require(HistData)
data(Arbuthnot)
b_g=Arbuthnot[,2]/Arbuthnot[,3]
year=Arbuthnot[,1]
library(ggplot2)
sd=cbind(year,b_g)
sd=as.data.frame(sd)
#1
ggplot( sd,aes(x=year, y=b_g)) +
geom_point(size=1,shape=21)+geom_hline(aes(yintercept=1))+
ylim(0.95,1.2)+ylab("boys/girls christened in London") +xlab("year")

#2

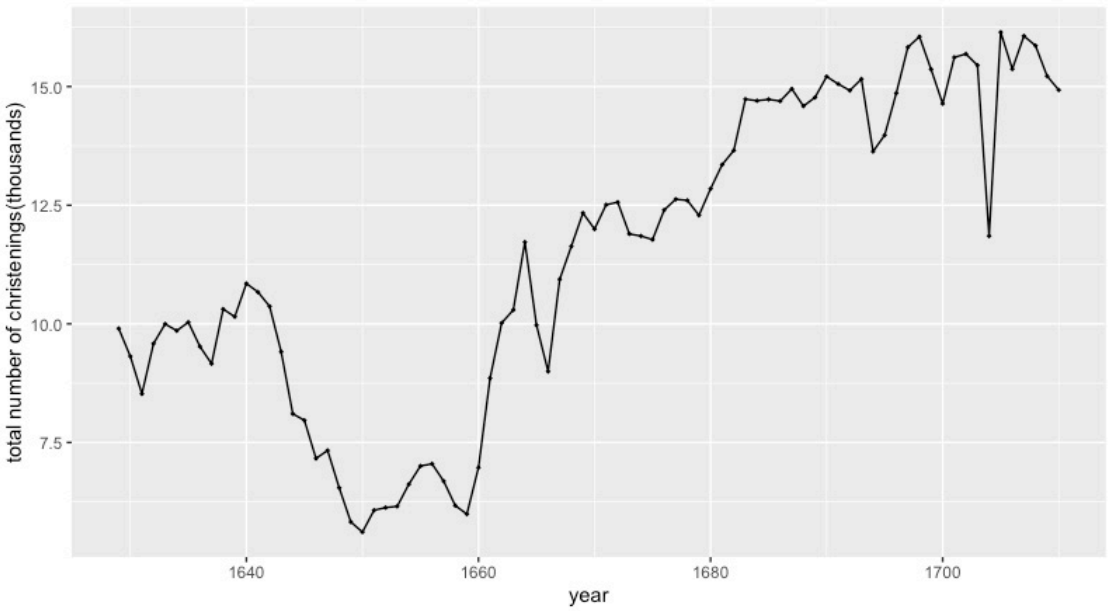
set.seed(1234)
year2 <- rep(1629:1710, times = 2)
type <- rep(c('boys','girls'),each=82)
value <- (c(Arbuthnot[,2],Arbuthnot[,3]))
df <- data.frame(year2 = year2, type = type, value = value/1000)
ggplot(data = df, mapping = aes(x = year2, y = value, colour = type)) +
geom_line()+ylab("number of christening(thousands)") +xlab("year")

#3
ggplot( Arbuthnot,aes(x=year, y=Total)) +
geom_point(size=1,shape=1)+geom_line()+ylab("total number of
christenings(thousands)") +xlab("year")
```

Prob3


boys/girls christened in London
1.20
1.15
1.10
1.05
1.00
0.95
1640
1660
1680
1700
year


value
8000
6000
4000
1640
1660
1680
1700
year2
type
boys
girls

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christenings(thousands)") +xlab("year")
```