Project4

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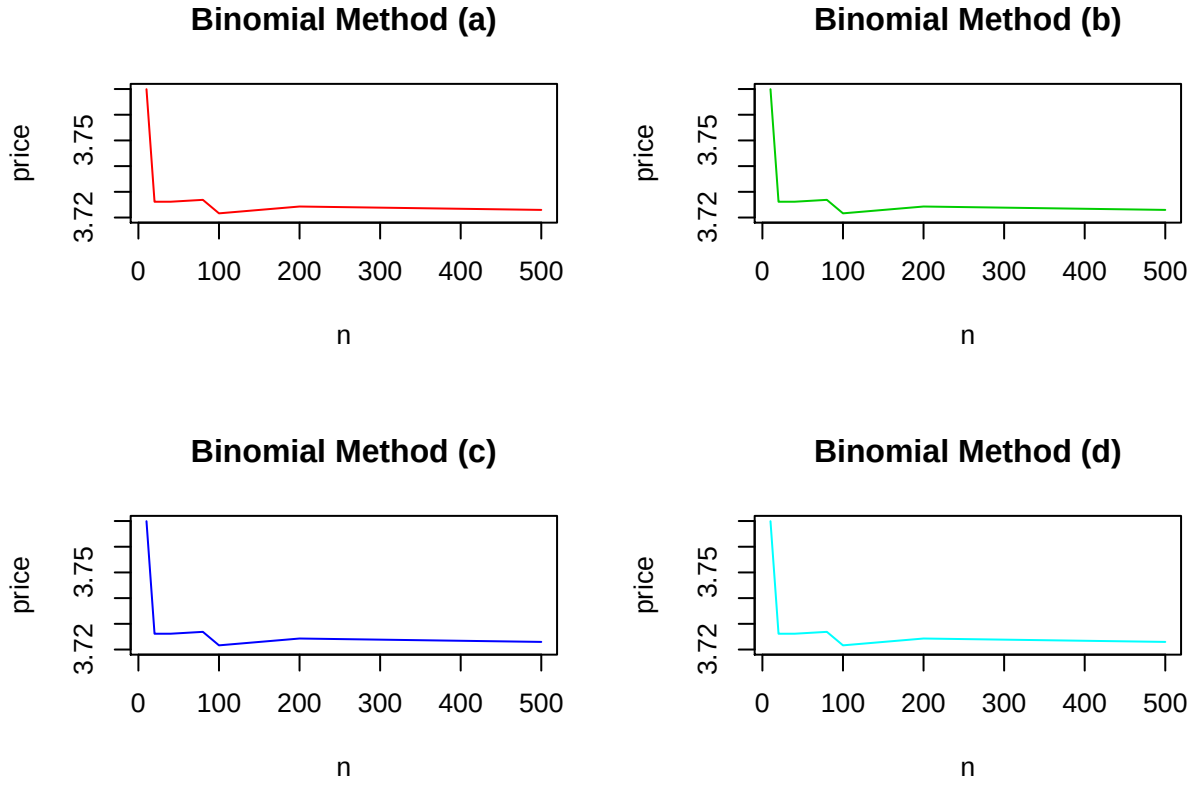
Problem 1

```
file_path = "/Users/huanyu/Desktop/ComputationalFinance/data/Project4/"
df = read.csv(paste0(file_path,"problem1.csv"),header = FALSE)
par(mfrow = c(2,2))
methods = c("(a)","(b)","(c)","(d)")
for (i in c(2:5)){
  plot(df[[1]],df[[2]],type='l',ylim = c(3.72,3.77), col = i, ylab = 'price', xlab = 'n', main = paste0
}
```



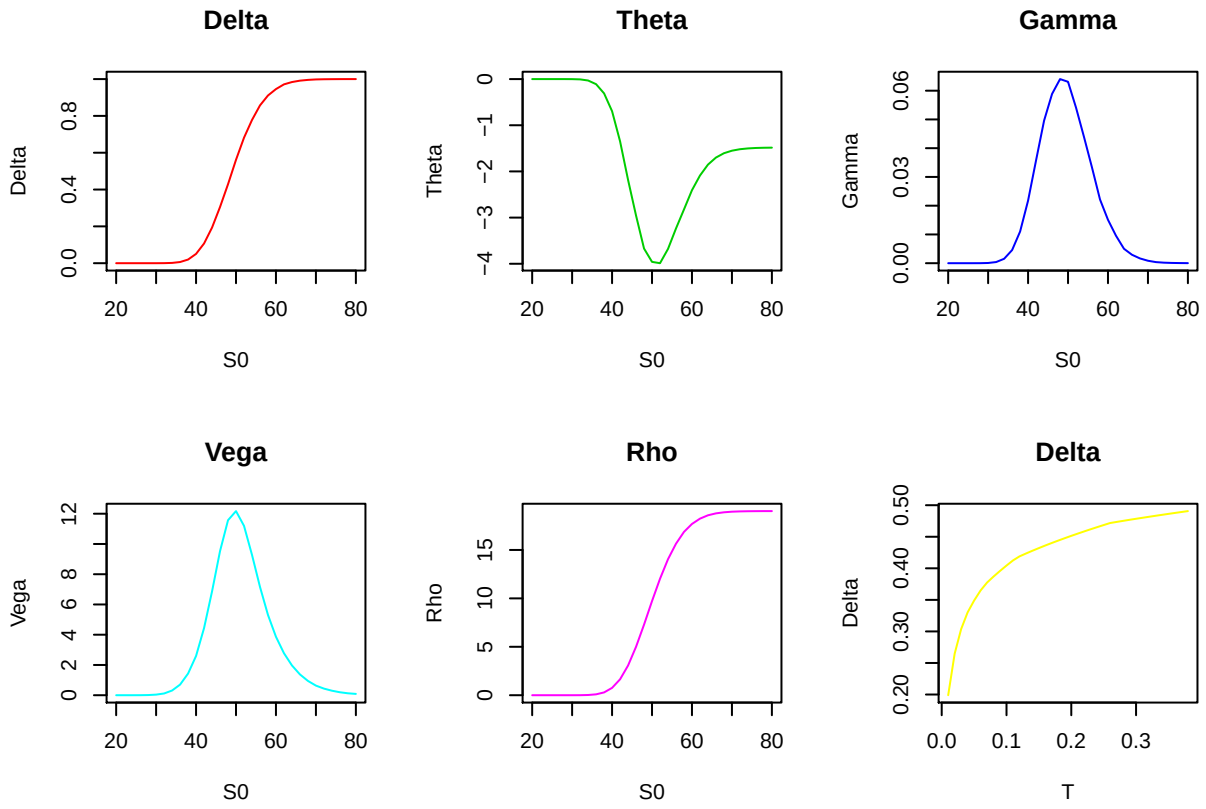
Problem 2

(a) I have chosen K = 1240. The volatility is 23.4% by using 60 months of historical stock price data on yahoo finance.
My estimated option price is 70.0693, and the price got from finance.yahoo is 72.91.

(b) The volatility that make my estimated price equal to market price is 24.4%.

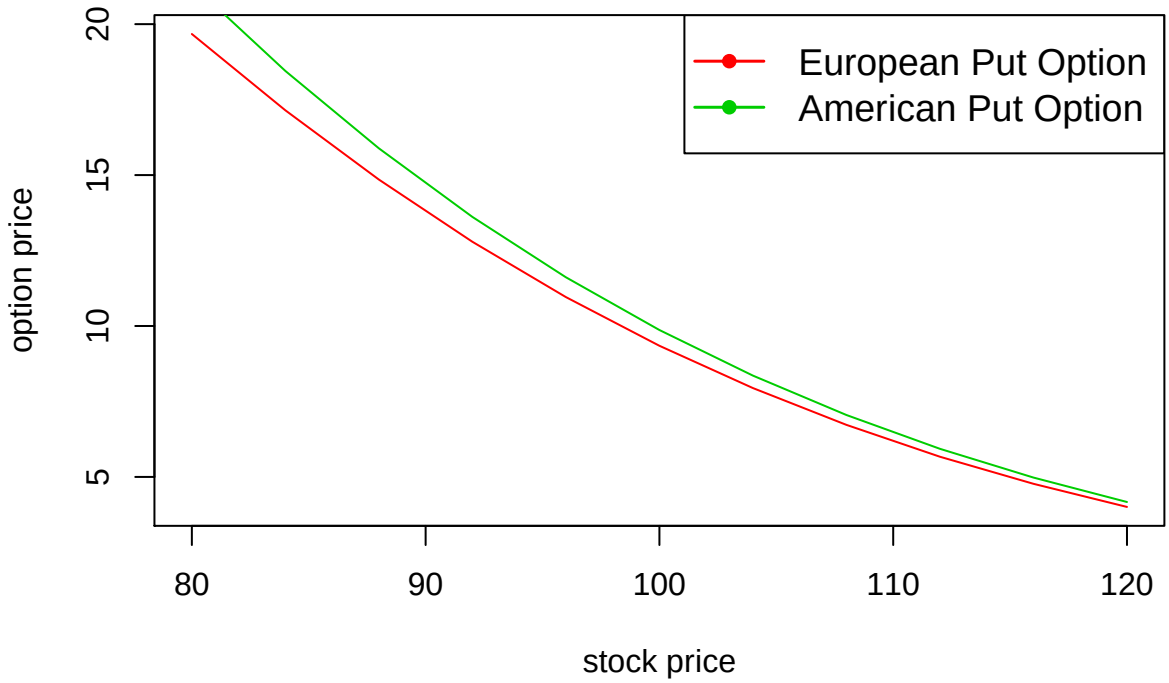
Problem 3

```
par(mfrow = c(2,3))
df3 = read.csv(paste0(file_path, "problem3.csv"), header = FALSE)
df3b = read.csv(paste0(file_path,"problem3b.csv"), header = FALSE)
greek = c("Delta","Theta","Gamma","Vega","Rho")
for (i in c(2:6)) {
  plot(df3[[1]],df3[[i]],type = 'l', col = i,xlab = "S0",ylab = greek[i - 1], main = greek[i - 1])
}
plot(df3b[[1]],df3b[[2]], type = 'l', col = 7, xlab = 'T', ylab = 'Delta', main = "Delta")
```



Problem 4

```
df4 = read.csv(paste0(file_path,'problem4.csv'), header = FALSE)
plot(df4[[1]],df4[[2]],type='l', col = 2, xlab = 'stock price', ylab = 'option price')
lines(df4[[1]],df4[[3]],type='l',col = 3)
legend("topright", legend = c("European Put Option", "American Put Option"), col = c(2, 3), lwd = 1.5,
```



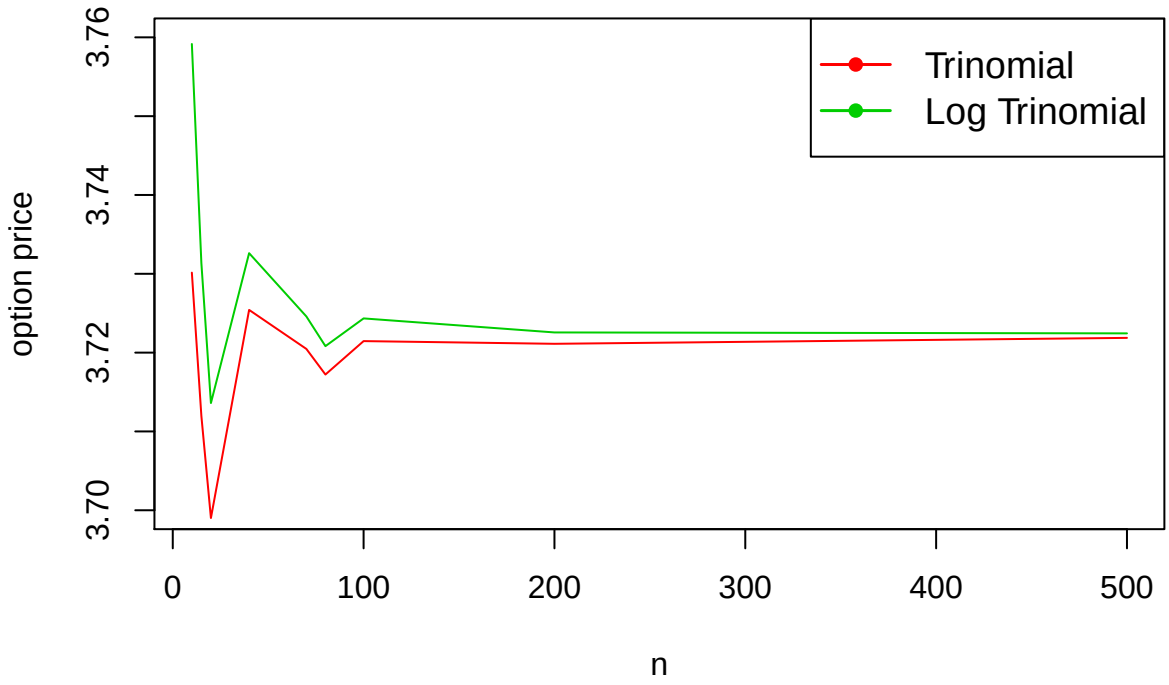
(1) Put option price decreases with the increase of stock price.

(2) European option price is less than American option price.

(3) With the increase of the stock price, the difference between European option price and American option price decreases.

Problem 5

```
df5 = read.csv(paste0(file_path,'problem5.csv'),header = FALSE)
plot(df5[[1]],df5[[2]],type='l',col = 2, ylim = c(3.7,3.76), xlab = 'n', ylab = 'option price')
lines(df5[[1]],df5[[3]],type = 'l',col = 3)
legend("topright", legend = c("Trinomial", "Log Trinomial"), col = c(2, 3), lwd = 1.5, cex = 1.2, pch =
```



Problem 6

I entered S0 = 32, K = 30, r = 0.05, Sigma = 0.24, T = 0.5, b1 = 2, b2 = 7
The value of the call option is 3.73219