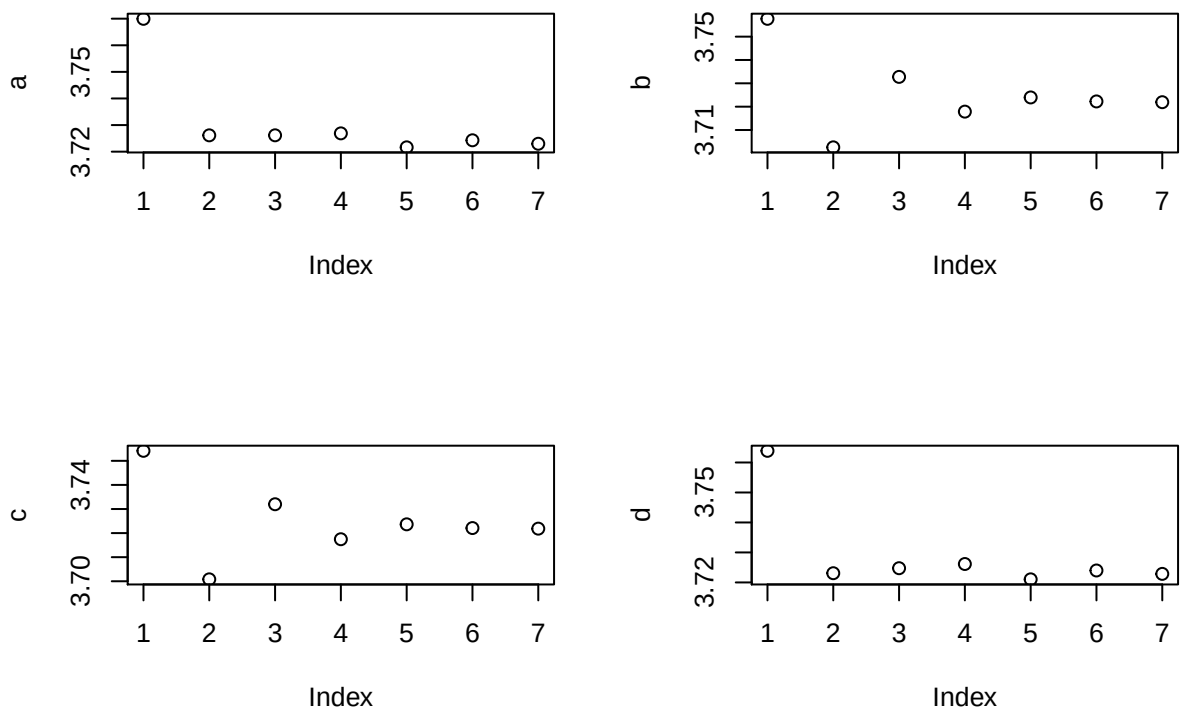
writeup

Sumeng Wang

February 6, 2019

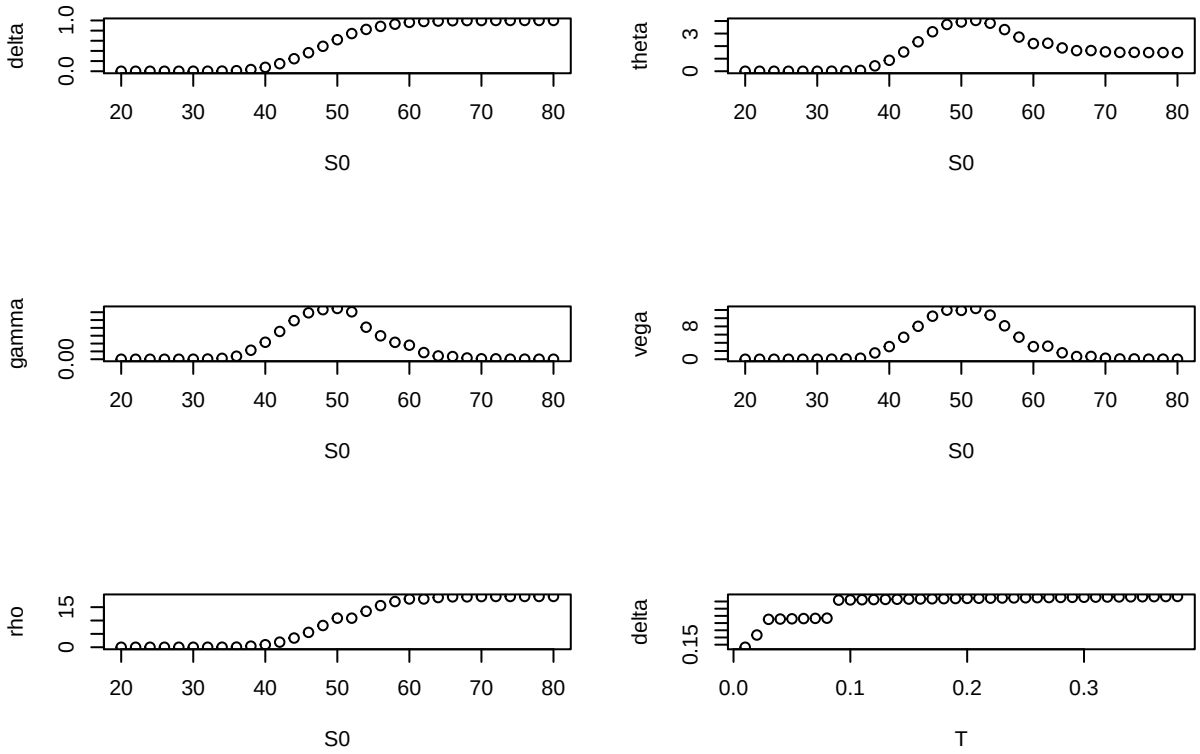
Question 1



Question 2

On Feb 6, 2019, the closing price for google is 1145.99, so the strike price will be $1150 \times 1.1 = 1265$. By getting the monthly return data for the past five years from CRSP, I got 0.202453 for the σ. Then the call option price I got is 56.3826, which is very close to the 54 from yahoo finance.
To get exactly 54, σ needs to be 0.197028.

Question 3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1.0
20
30
40
50
60
70
80
S0
theta
0
3
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gamma
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vega
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8
S0
rho
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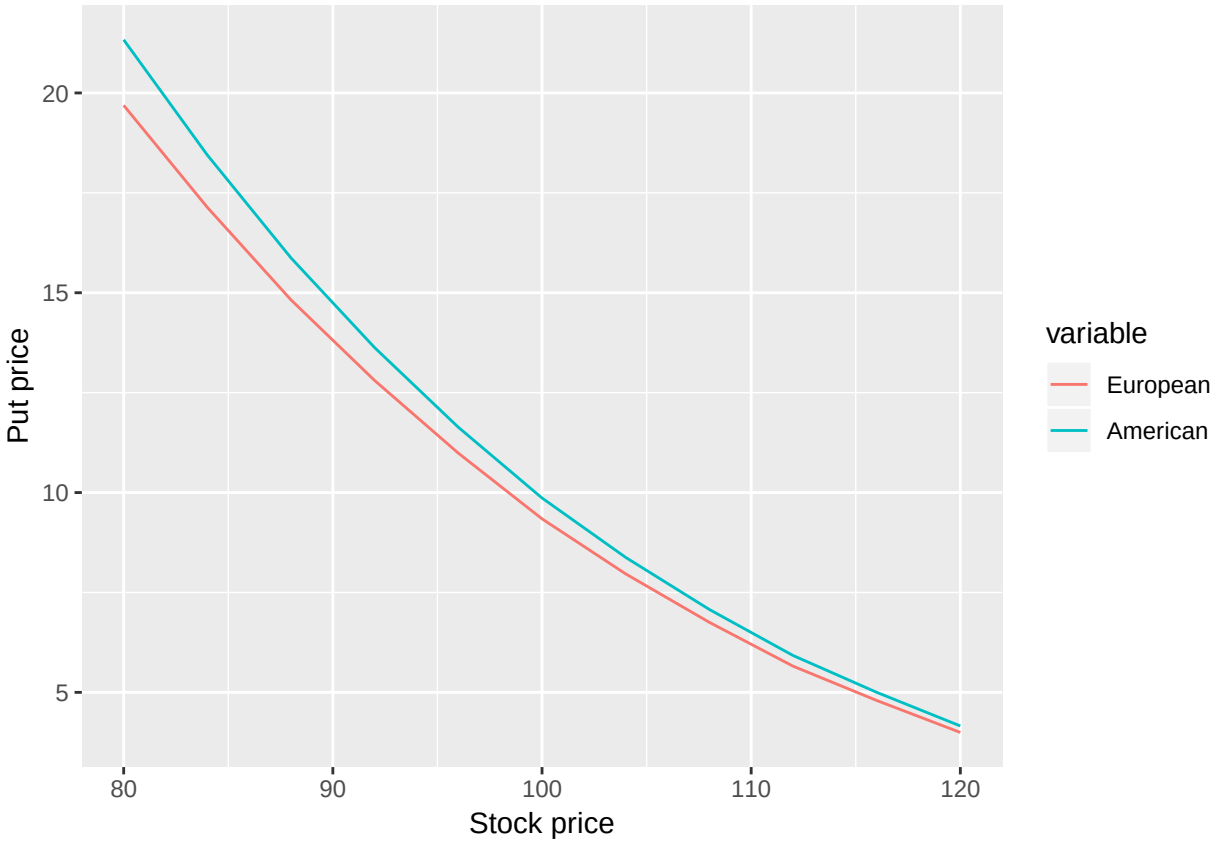
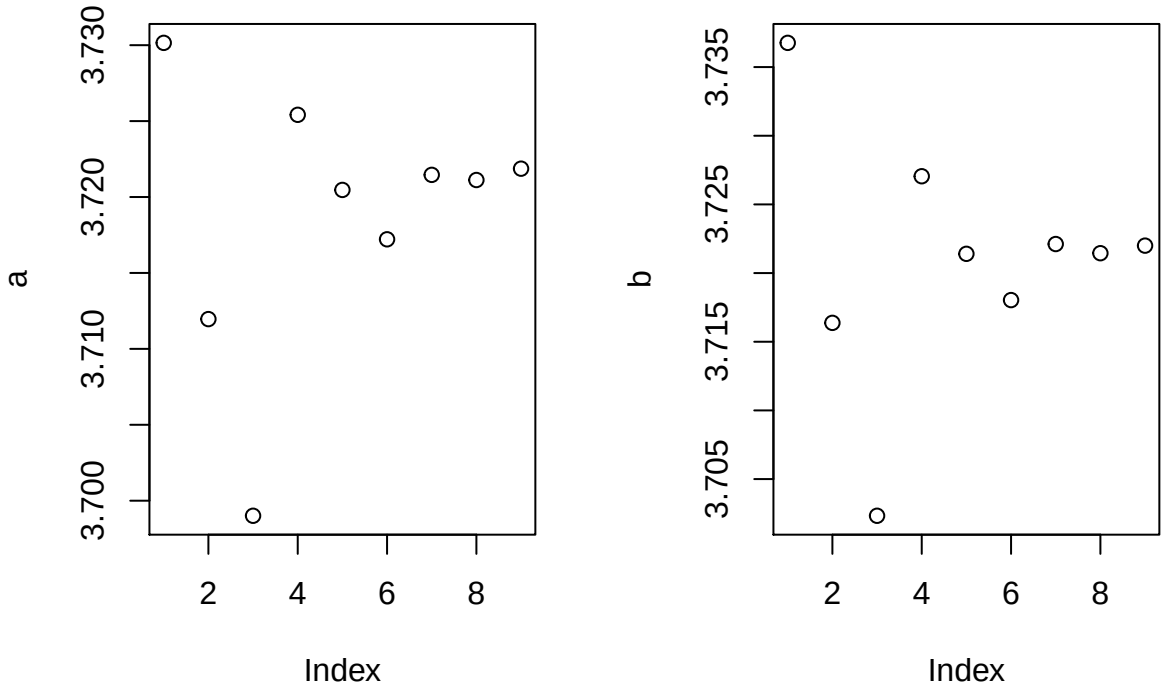
Question 4



As we can see from the figure above, since American option can be executed any time prior to the expiration date, it is more valuable than European option.

Question 5



Question 6

Say we take the parameters of Question 1, $S_0 = 32, K = 30, T = 0.5, r = 0.05, \sigma = 0.24$, and we take $n = 1000, b_1 = 2, b_2 = 5$, we will get the call option price 3.72051, which is very close to the true price.