Financial Engineering Laboratory (MA 374)

Lab 02

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$$S(0) = 100; K = 100; T = 1; M = 100; r = 8\%; \sigma = 30\%.$$

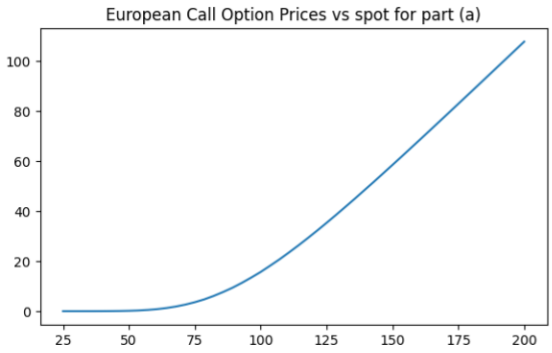
These are the default values used otherwise, mentioned values are used. Initial prices of put and call options were computed using the following configurations:

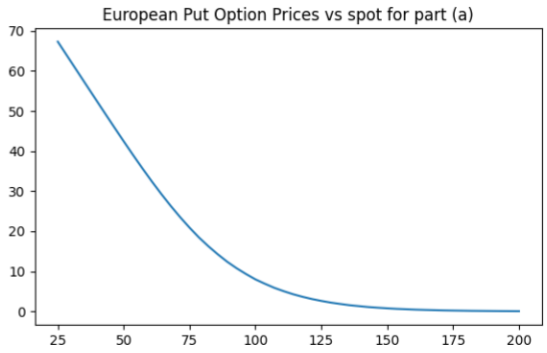
(a) Set 1 : $u = e^{\sigma\sqrt{\Delta t}}$; $d = e^{-\sigma\sqrt{\Delta t}}$.

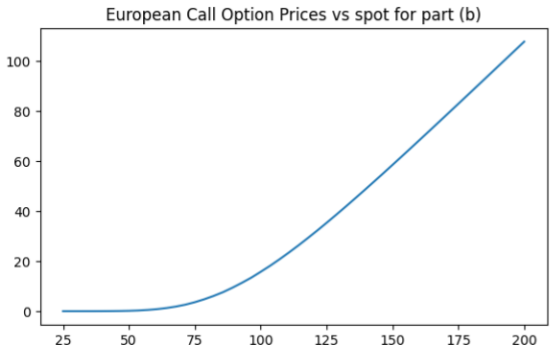
(b) Set 2 : $u = e^{\sigma\sqrt{\Delta t}+\left(r-\frac{1}{2}\sigma^2\right)\Delta t}$; $d = e^{-\sigma\sqrt{\Delta t}+\left(r-\frac{1}{2}\sigma^2\right)\Delta t}$.

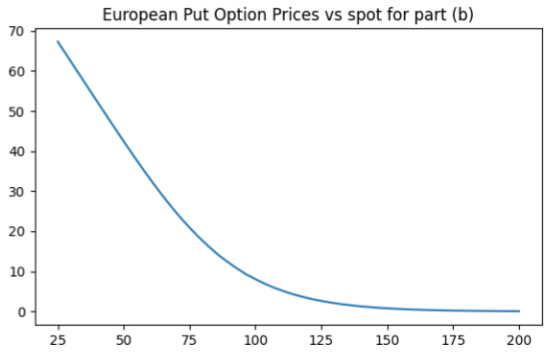
Q1: Sensitivity analysis of initial prices of European put and call options.

a) Varying spot price at T = 0.

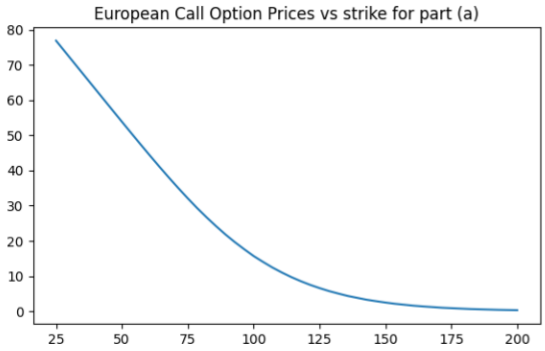


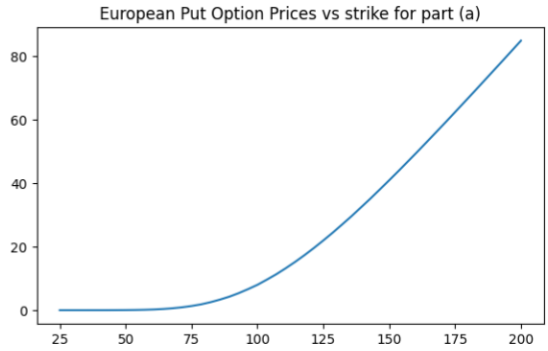


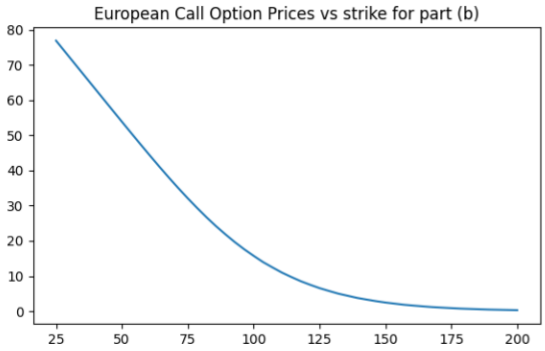


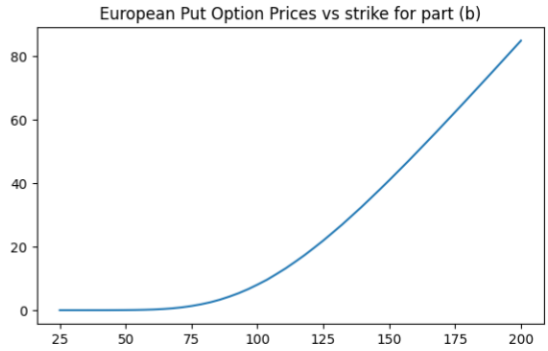


b) Varying strike price of the option.

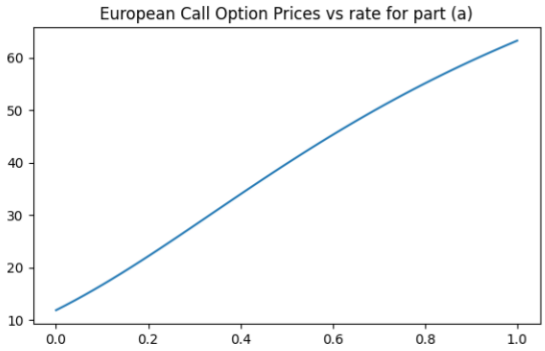


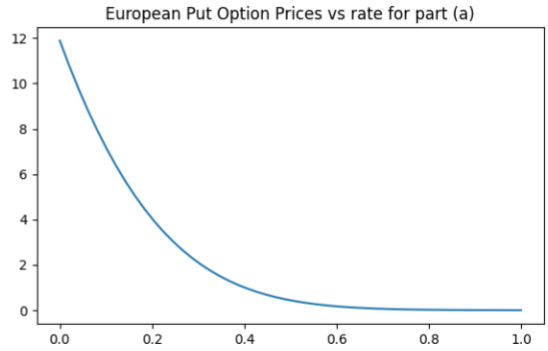


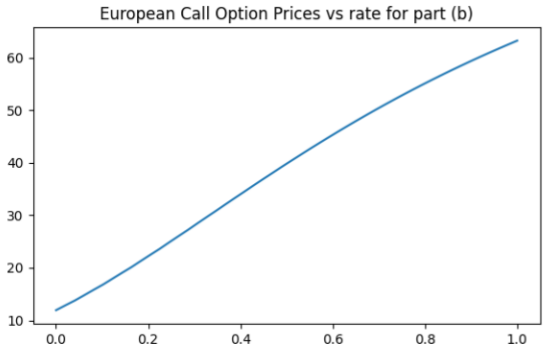


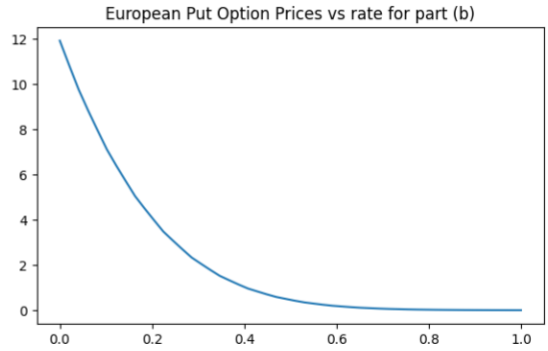


c) Varying interest rate over the life of the option.

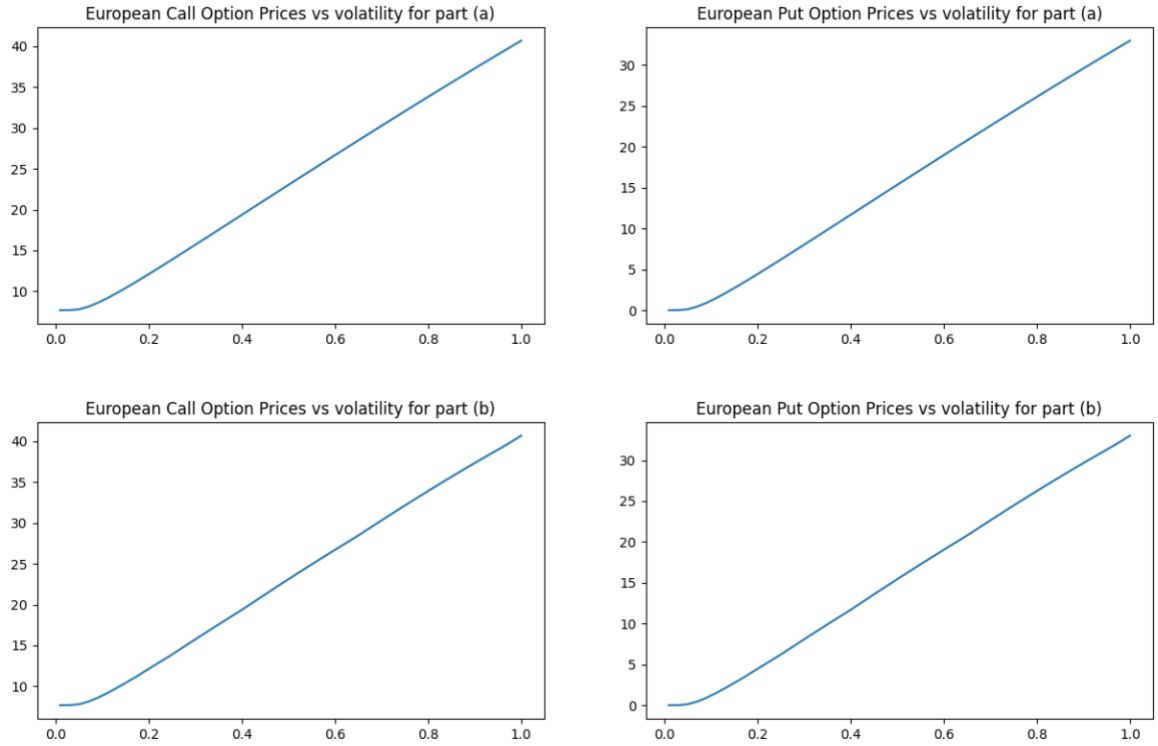






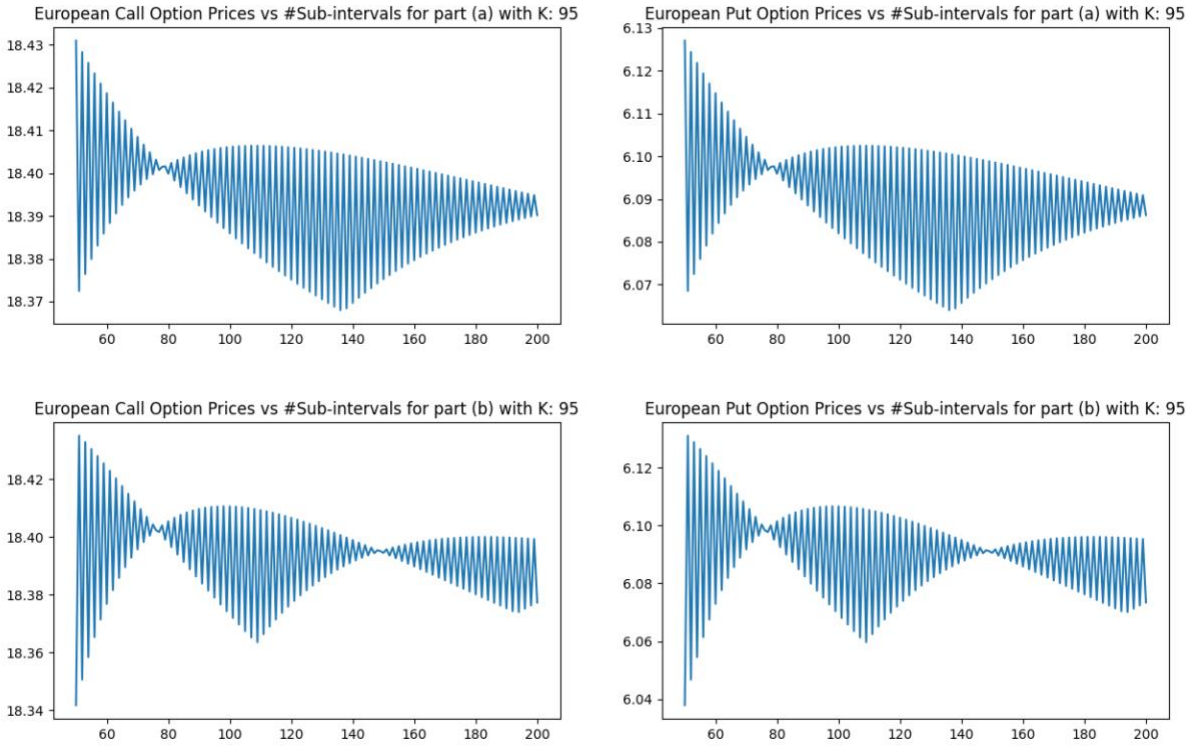


d) Varying volatility over the life of the option.

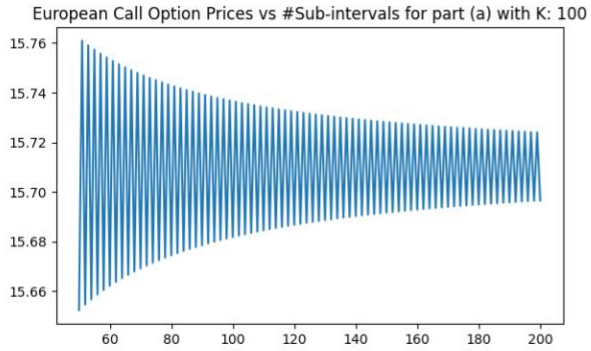


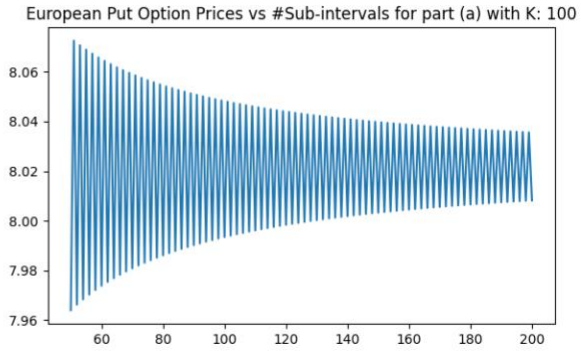
e) Varying number of sub-intervals in the time interval [0, T].

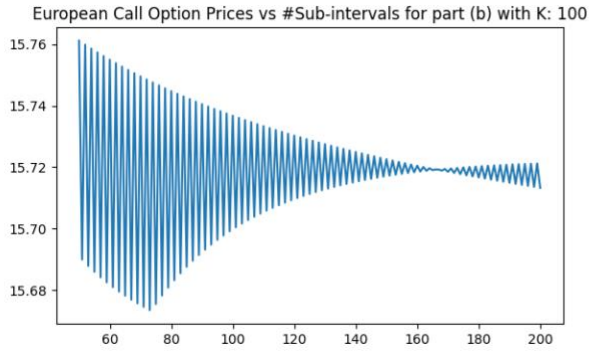
i) K: 95

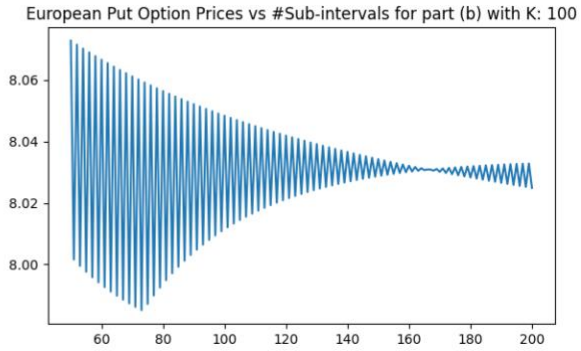


ii) K: 100

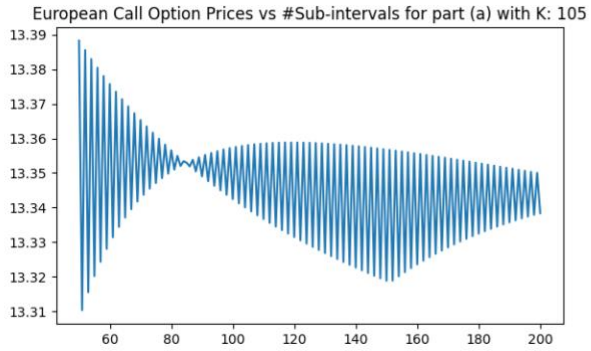


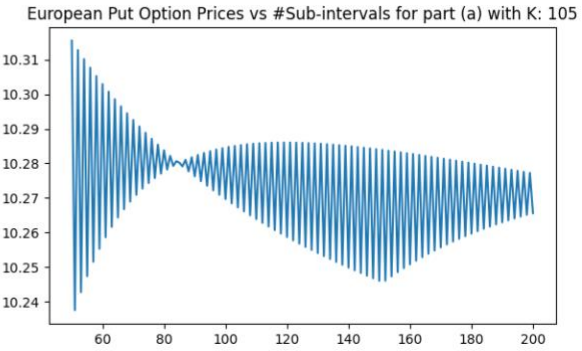


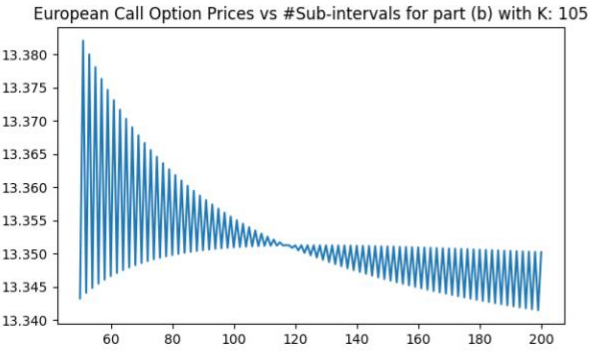


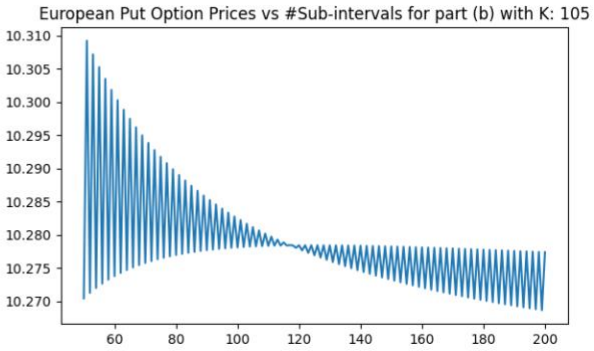


iii) K: 105



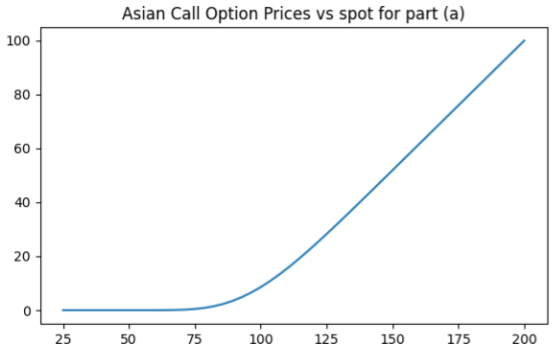


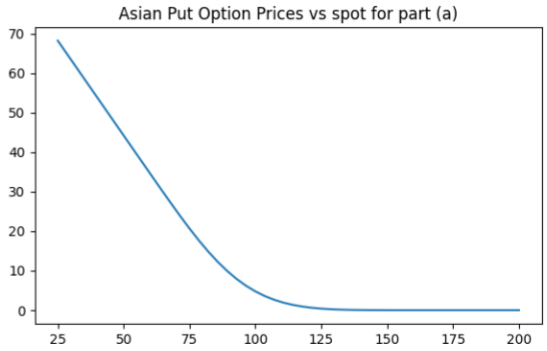


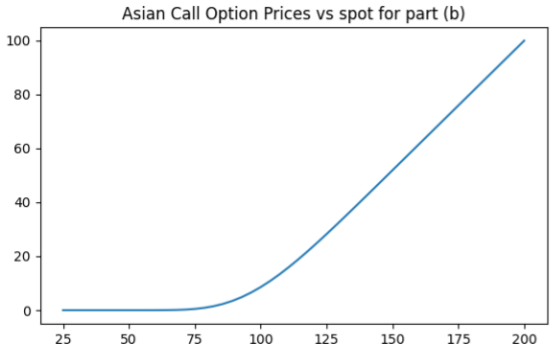


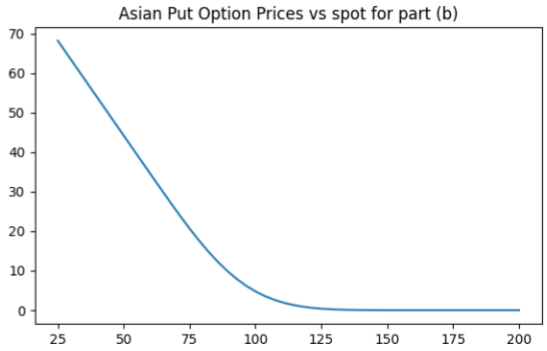
Q2: Sensitivity analysis of initial prices of Asian put and call options.

a) Varying spot price at T = 0.

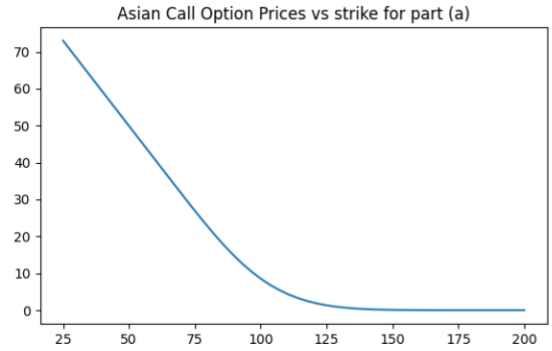


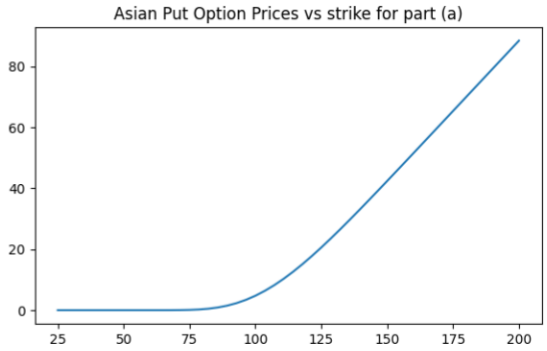


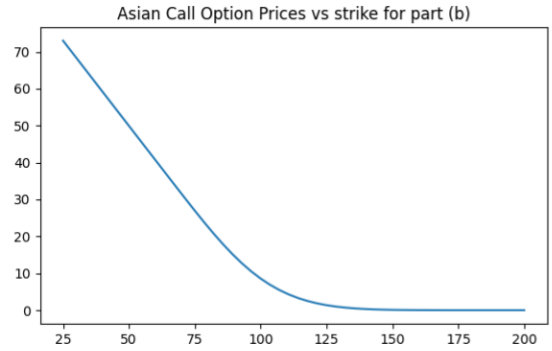


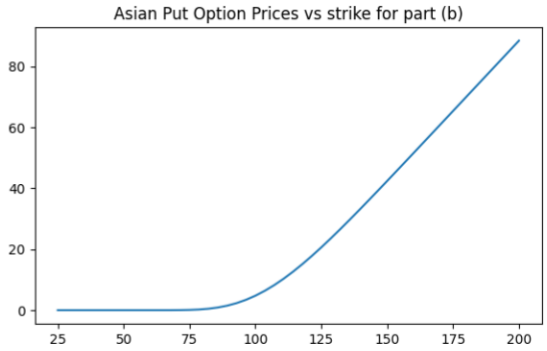


b) Varying strike price of the option.

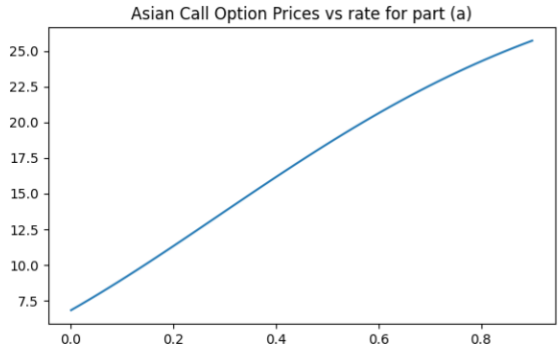


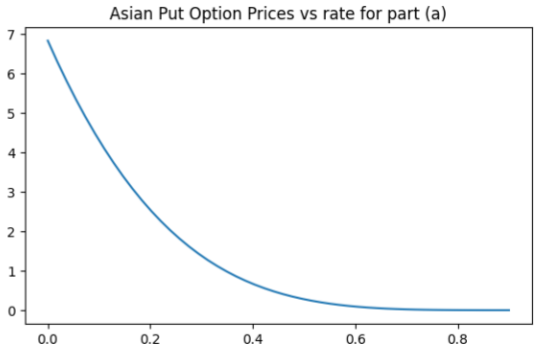


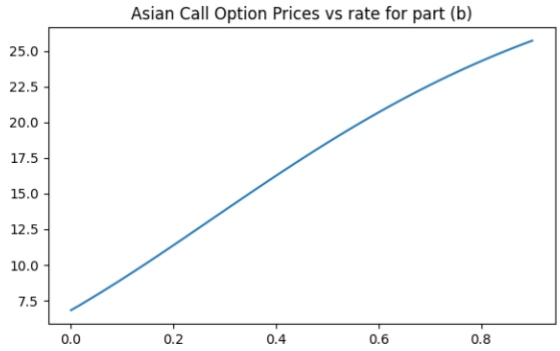


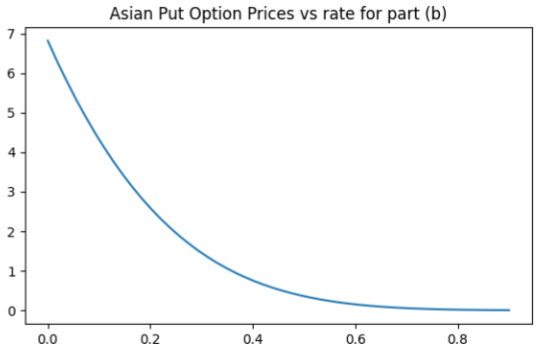


c) Varying interest rate over the life of the option.

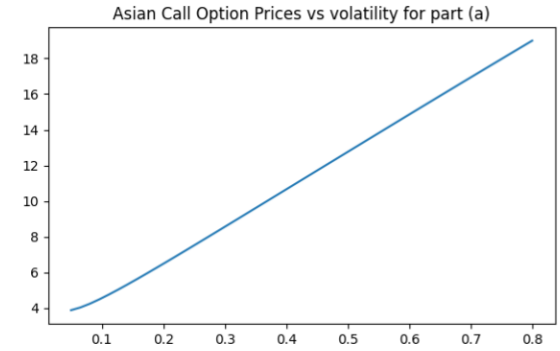


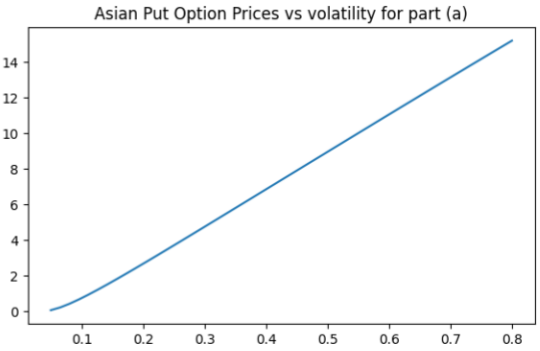


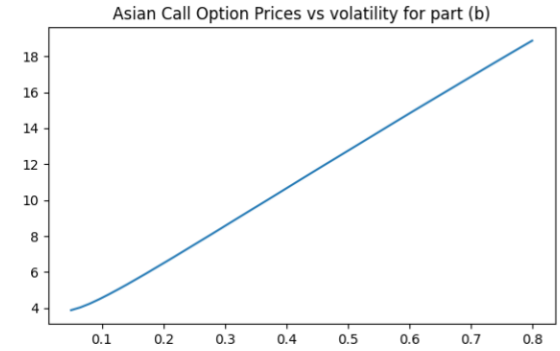


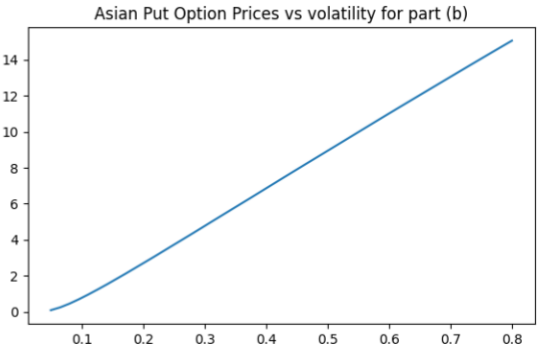


d) Varying volatility over the life of the option.



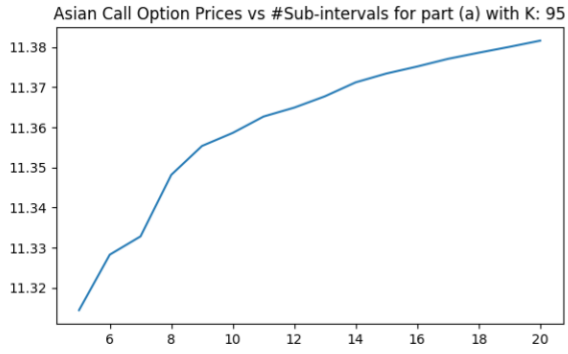


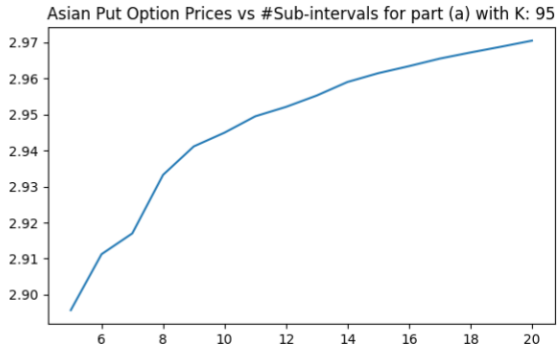


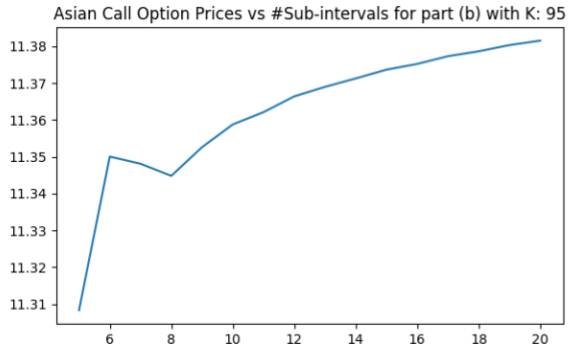


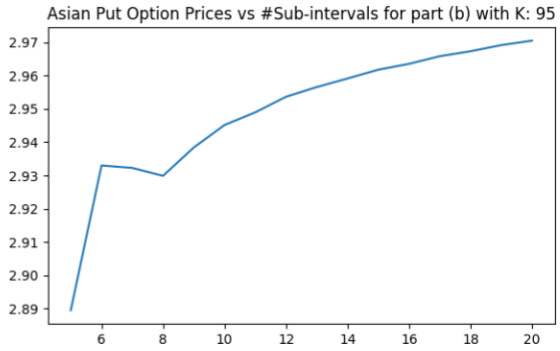
e) Varying number of sub-intervals in the time interval [0, T].

i) K: 95

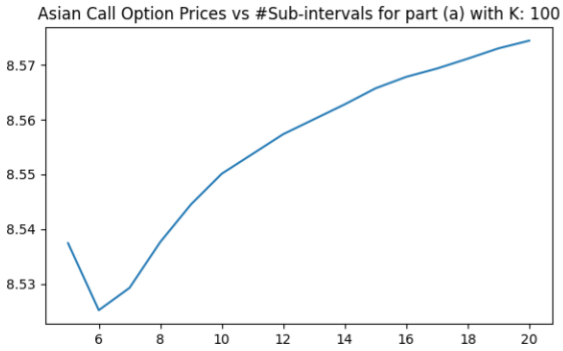


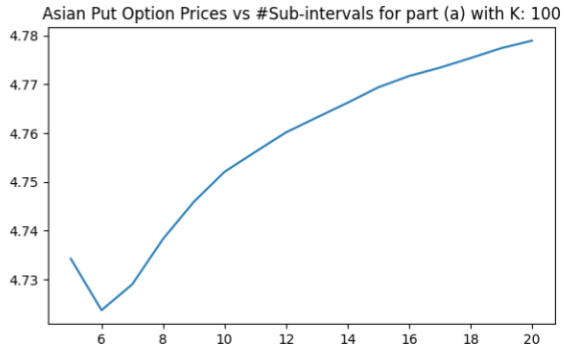


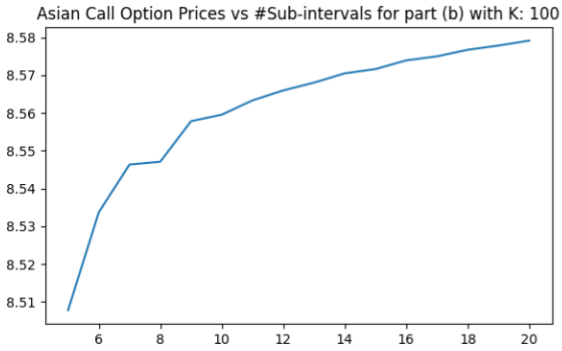


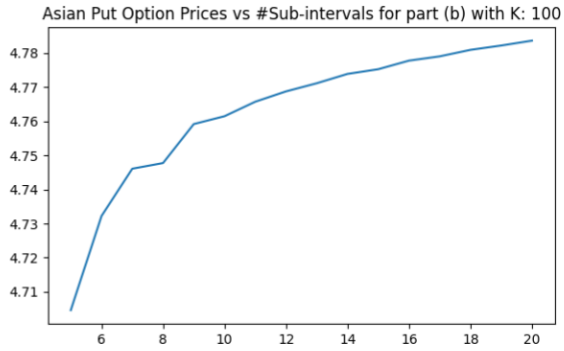


ii) K: 100

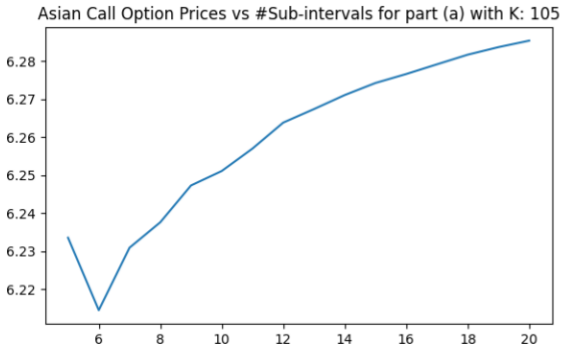


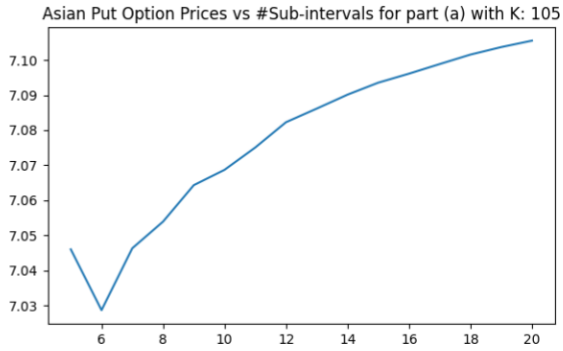


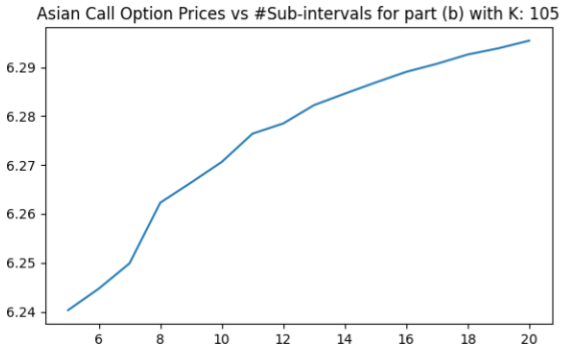


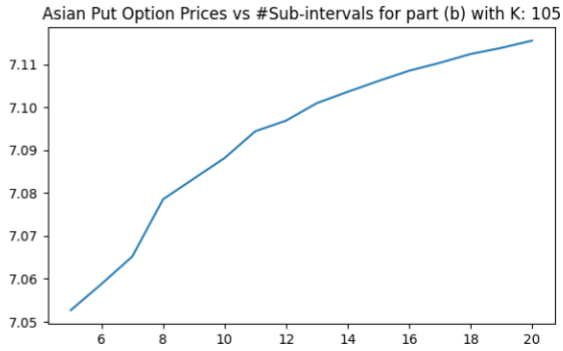


iii) K: 105


Asian Call Option Prices vs #Sub-intervals for part (a) with K: 105
6.28
6.27
6.26
6.25
6.24
6.23
6.22
6
8
10
12
14
16
18
20

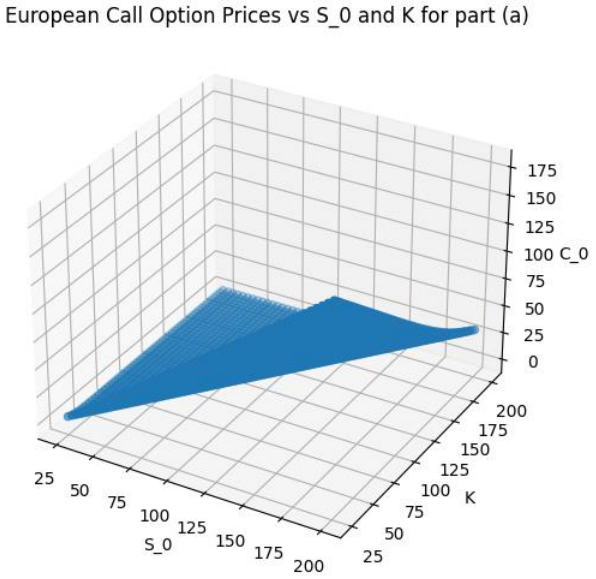

Asian Put Option Prices vs #Sub-intervals for part (a) with K: 105
7.10
7.09
7.08
7.07
7.06
7.05
7.04
7.03
6
8
10
12
14
16
18
20

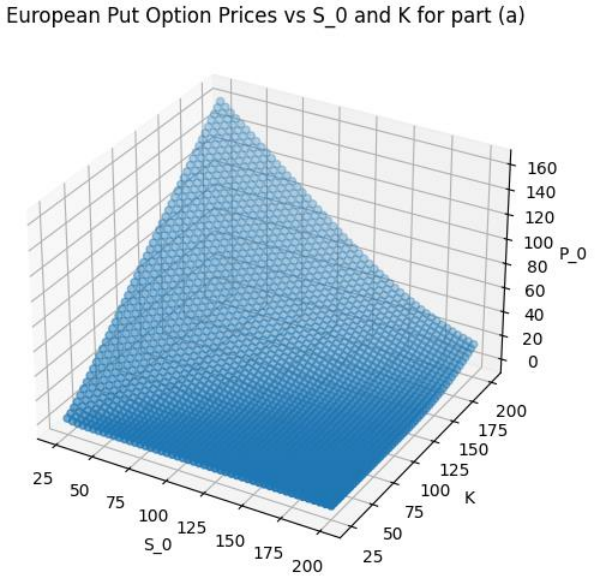

Asian Call Option Prices vs #Sub-intervals for part (b) with K: 105
6.29
6.28
6.27
6.26
6.25
6.24
6
8
10
12
14
16
18
20

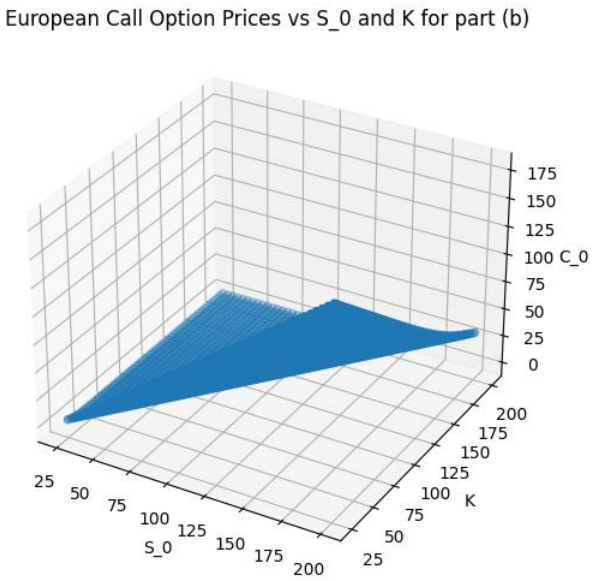

Asian Put Option Prices vs #Sub-intervals for part (b) with K: 105
7.11
7.10
7.09
7.08
7.07
7.06
7.05
6
8
10
12
14
16
18
20

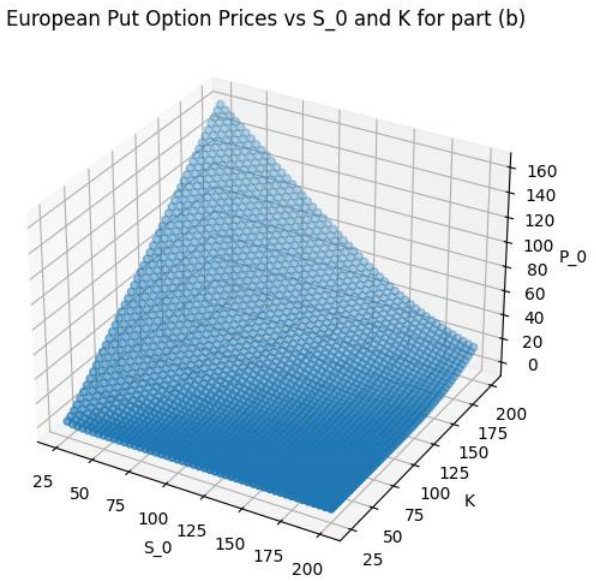
3-D plots describing sensitivities of European call and put options.

1) European option price vs Spot – Strike

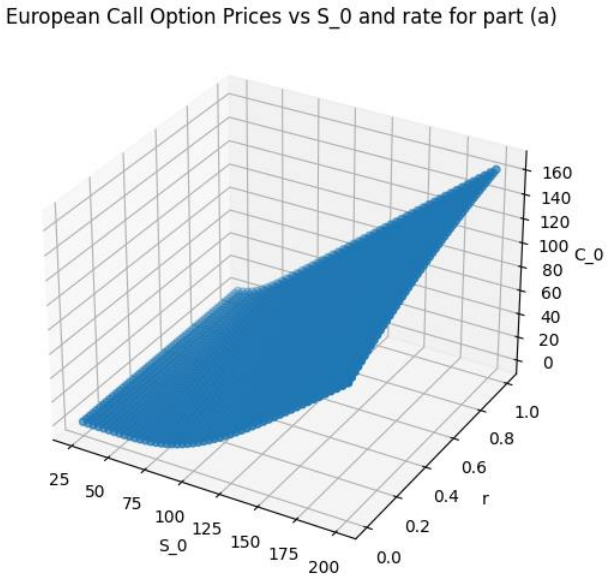


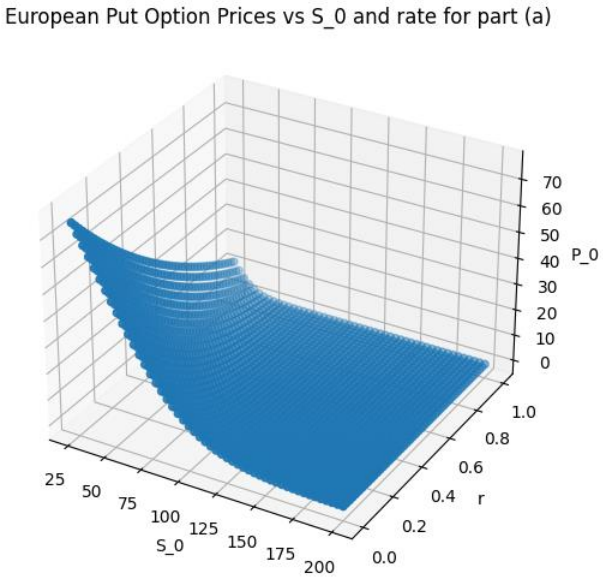


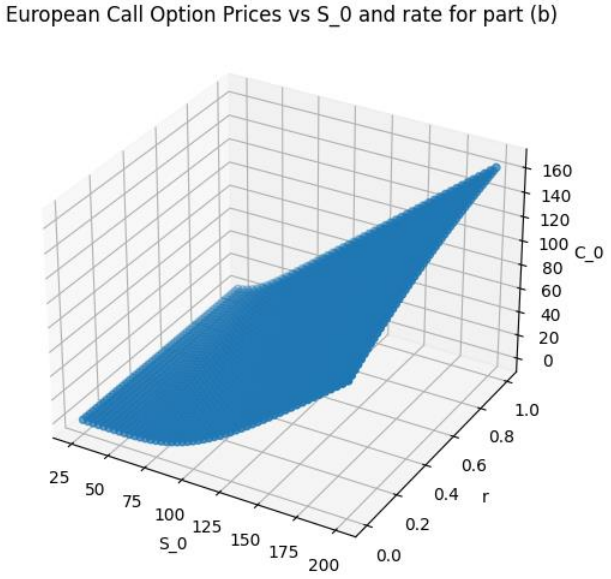


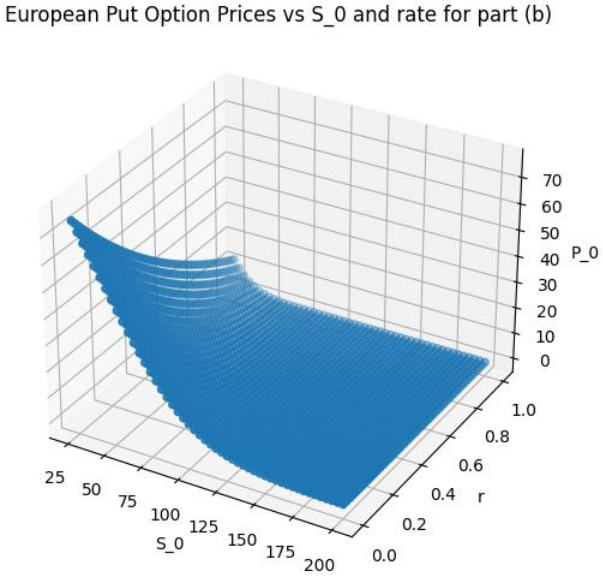


2) European option price vs Spot – Rate

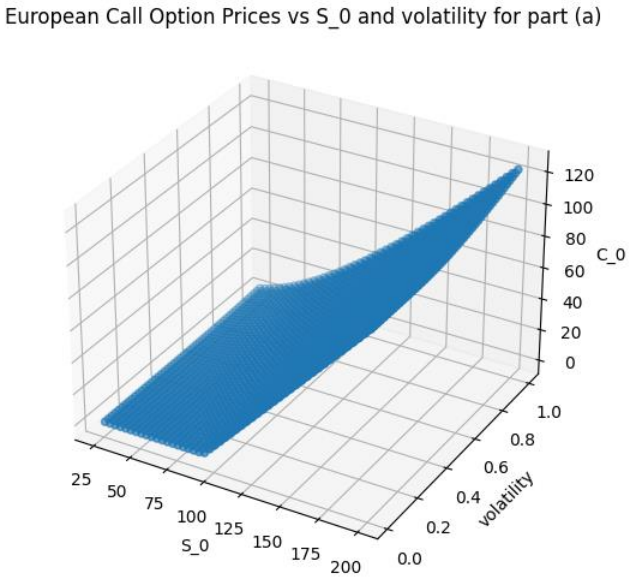


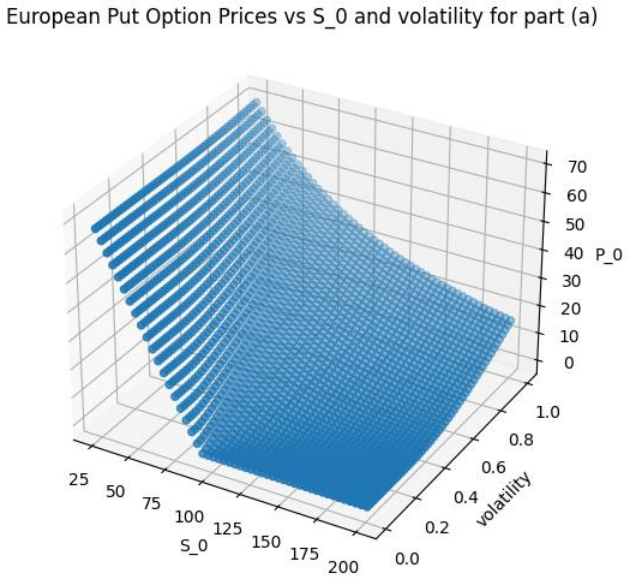


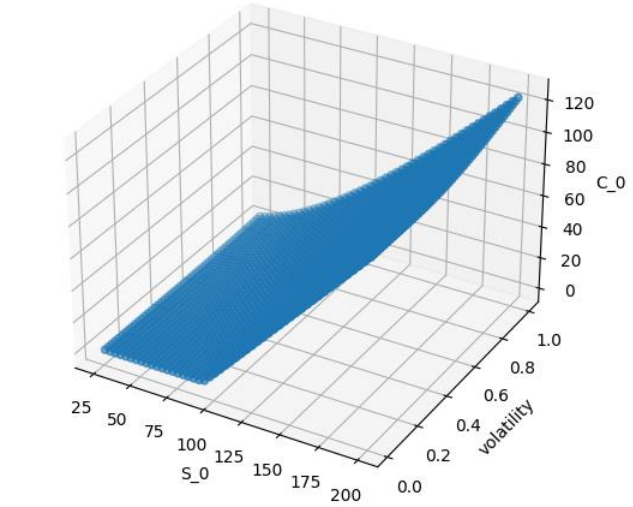


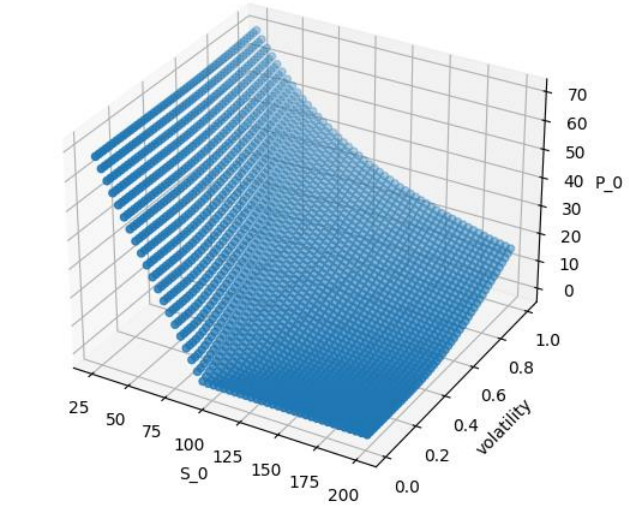


3) European option price vs Spot – Volatility

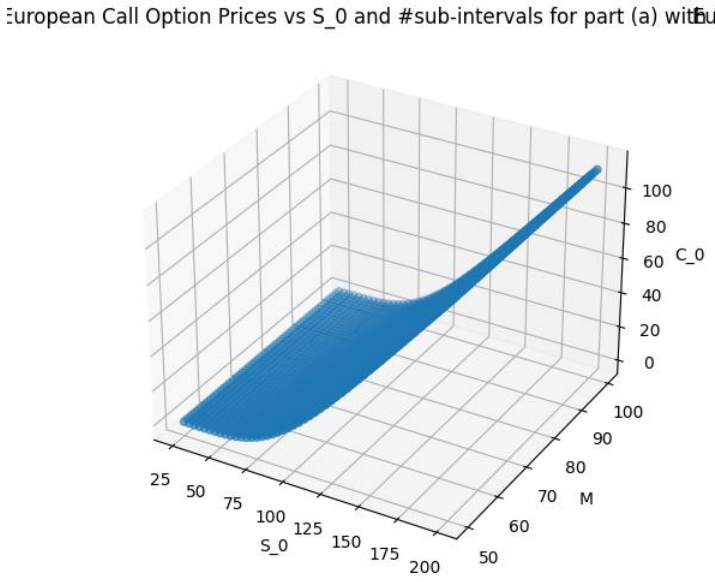


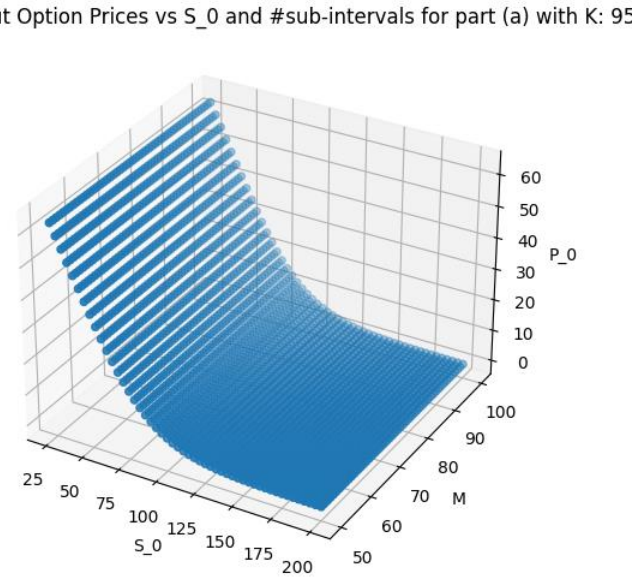


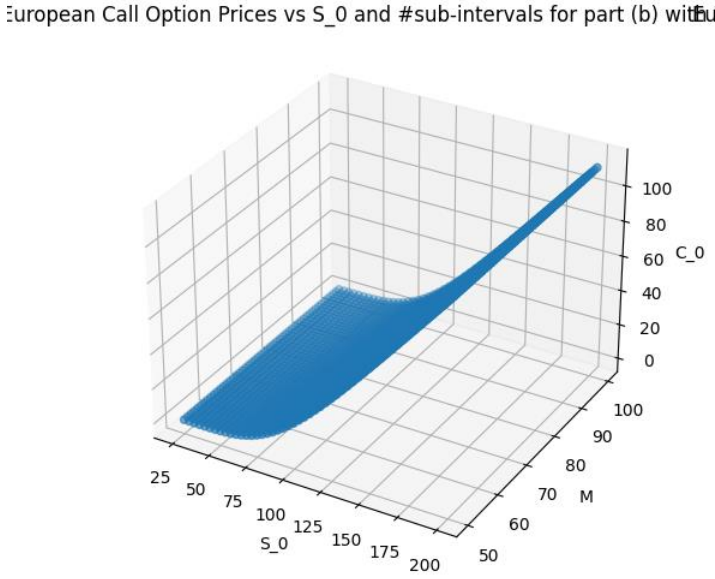


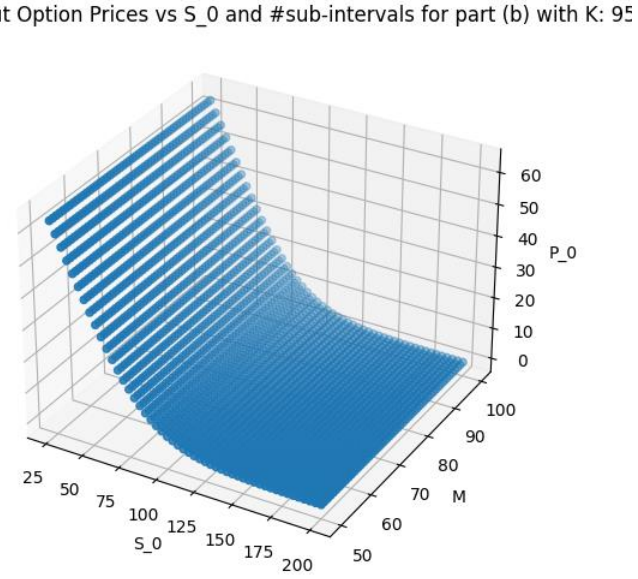


4) European option price vs Spot - # sub-intervals with strike: 95



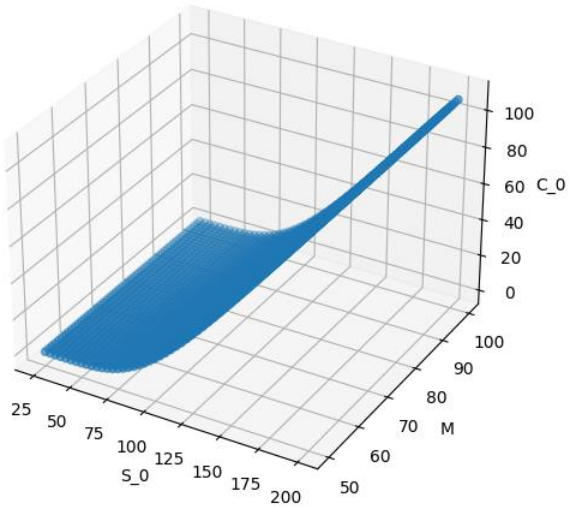




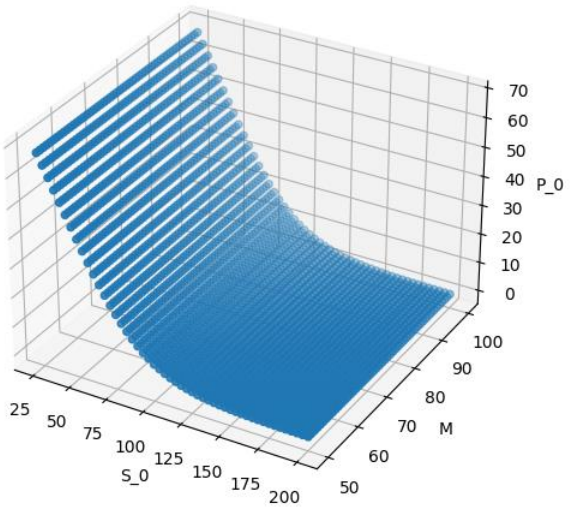


5) European option price vs Spot - # sub-intervals with strike: 100

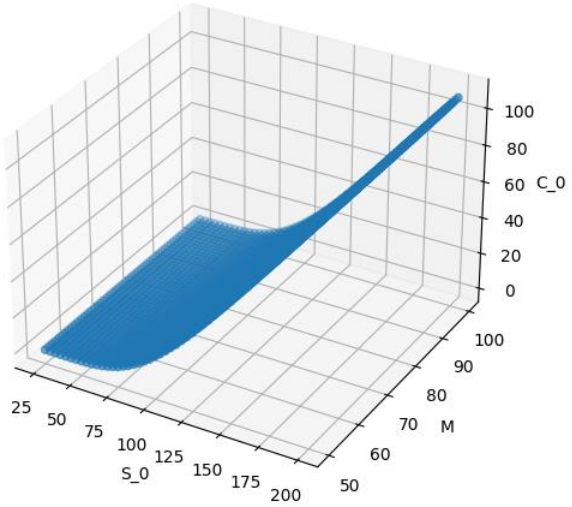
uropean Call Option Prices vs S_0 and #sub-intervals for part (a) with K: 100



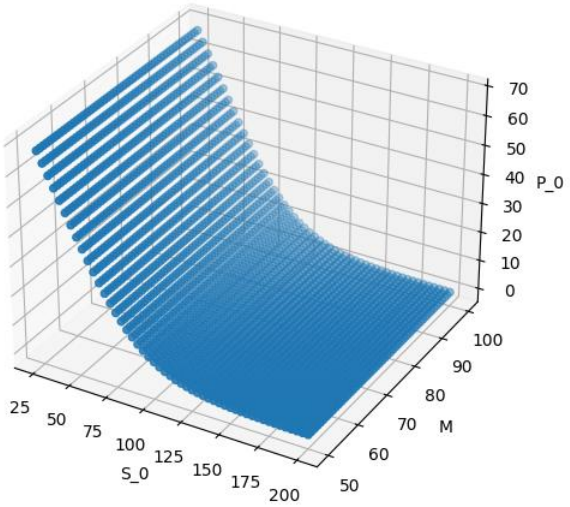
European Put Option Prices vs S_0 and #sub-intervals for part (a) with K: 10



uropean Call Option Prices vs S_0 and #sub-intervals for part (b) with K: 100

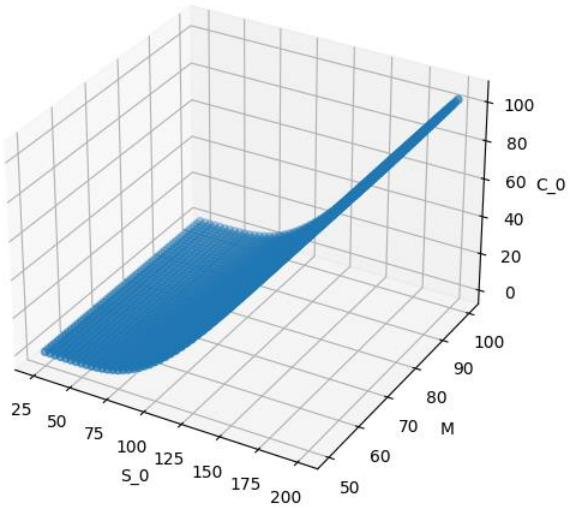


European Put Option Prices vs S_0 and #sub-intervals for part (b) with K: 10

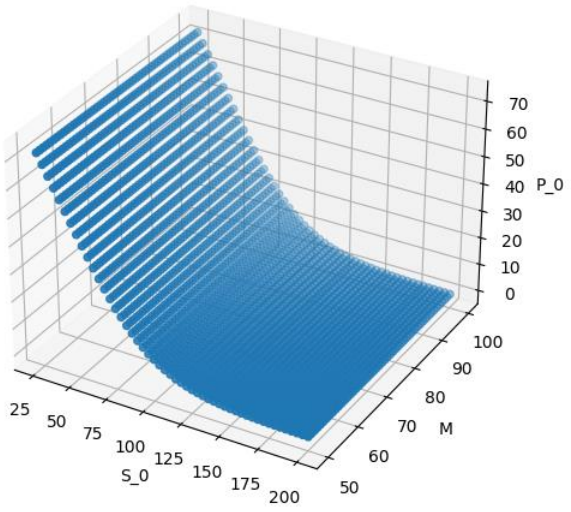


6) European option price vs Spot - # sub-intervals with strike: 105

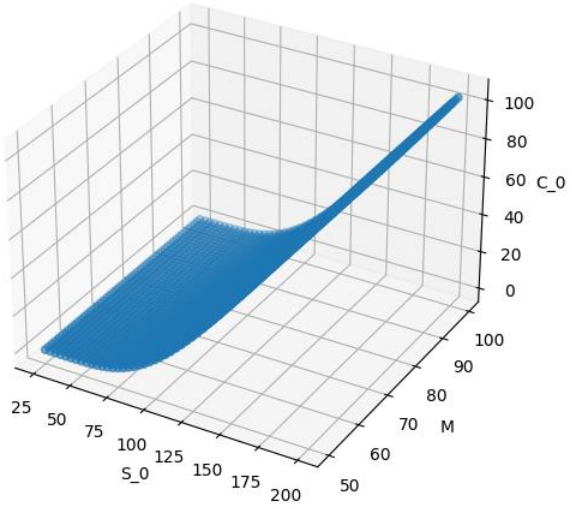
uropean Call Option Prices vs S_0 and #sub-intervals for part (a) with K: 105



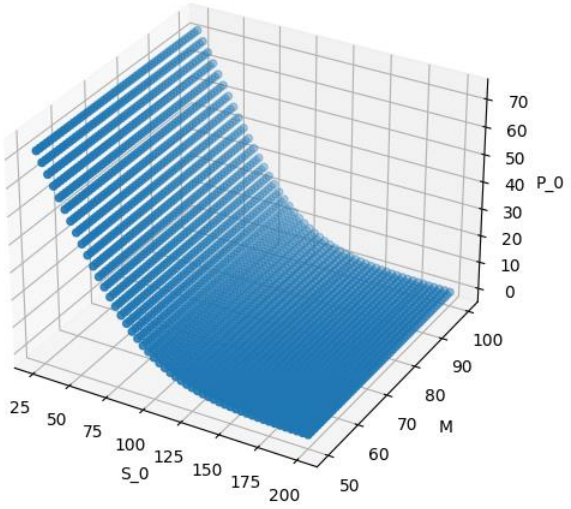
European Put Option Prices vs S_0 and #sub-intervals for part (a) with K: 10



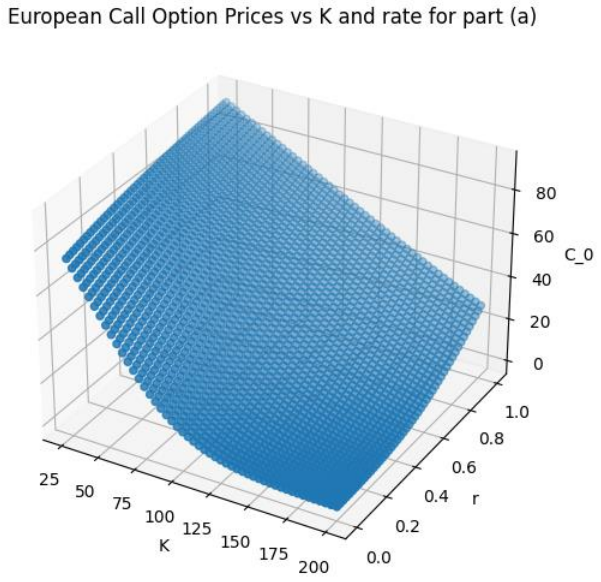
uropean Call Option Prices vs S_0 and #sub-intervals for part (b) with K: 105

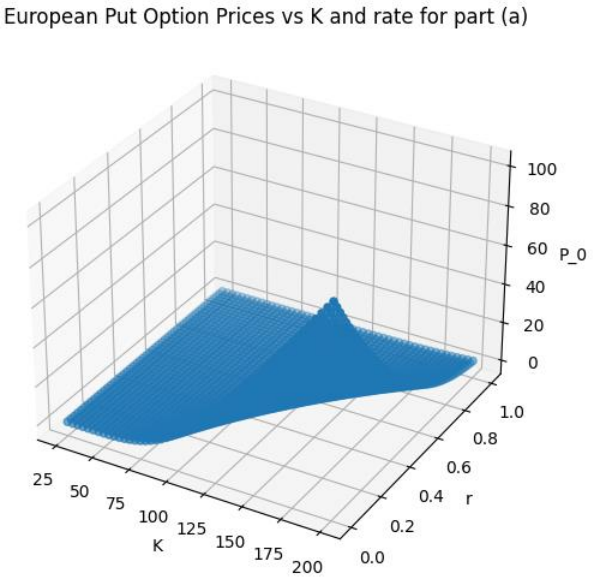


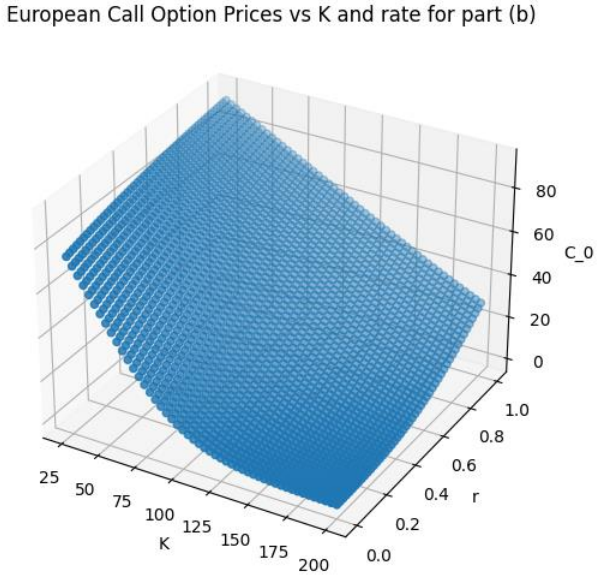
European Put Option Prices vs S_0 and #sub-intervals for part (b) with K: 10

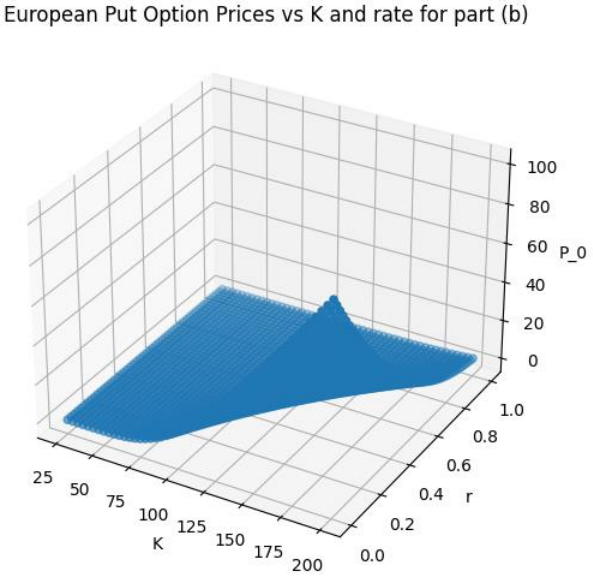


7) European option price vs Strike – Rate

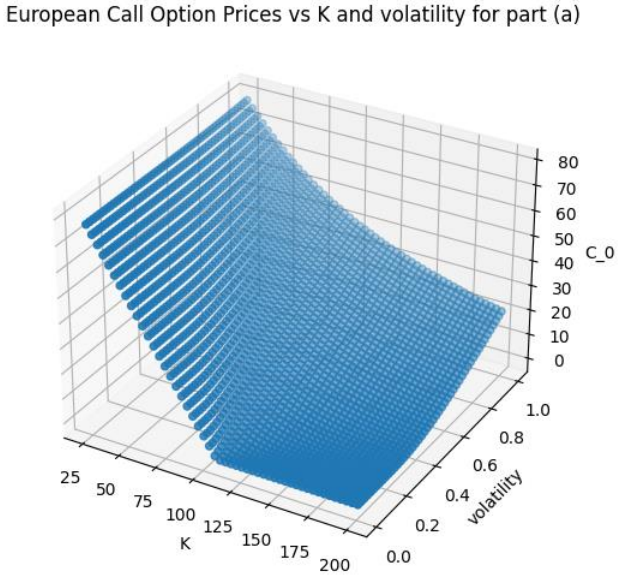


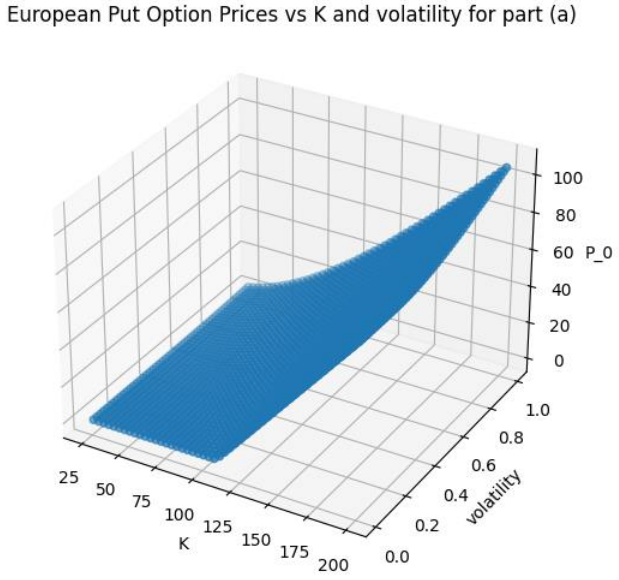


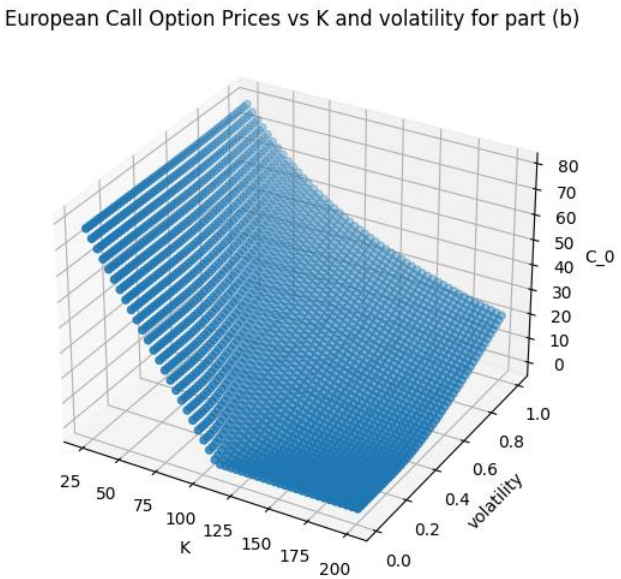


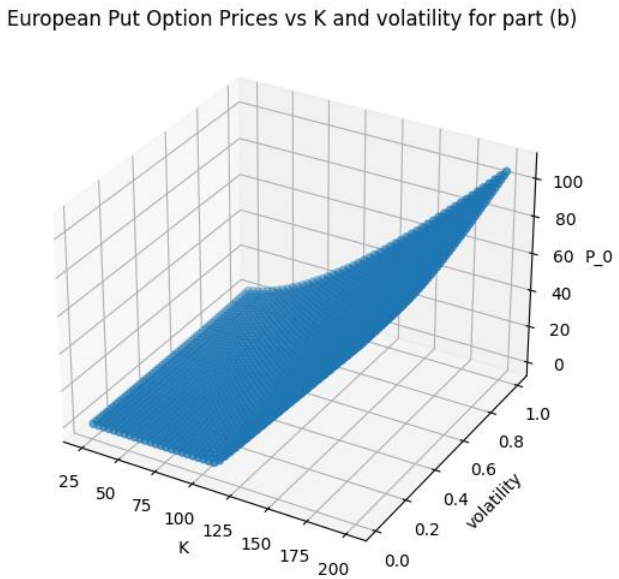


8) European option price vs Strike – Volatility



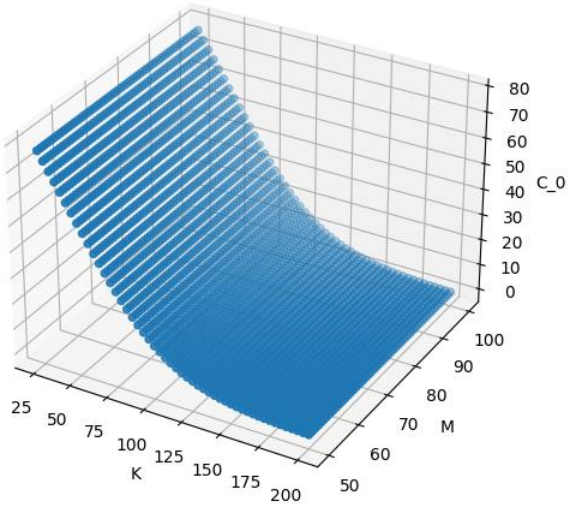




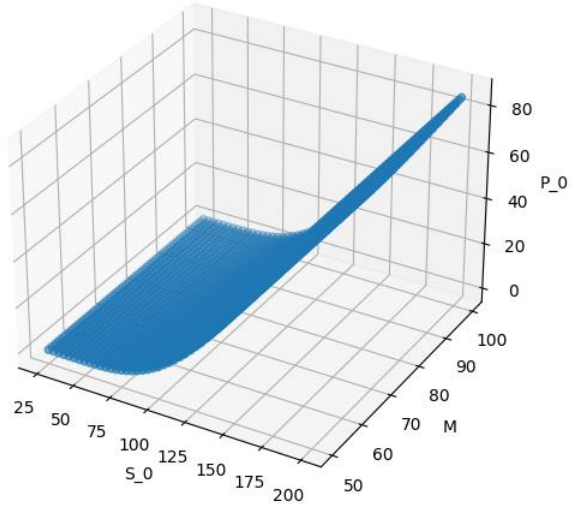


9) European option price vs Strike - # sub-intervals

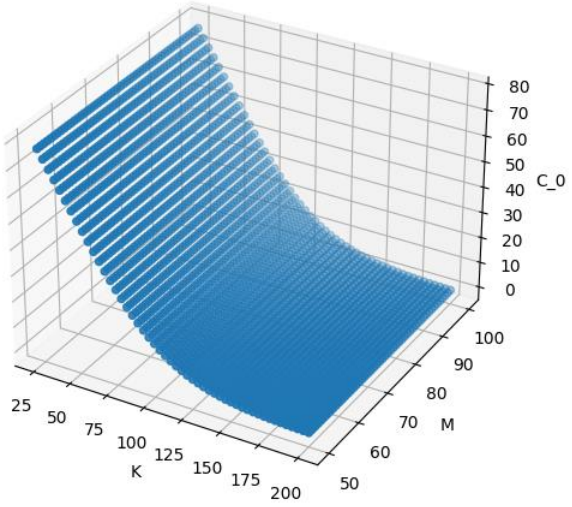
European Call Option Prices vs K and #sub-intervals for part (a)



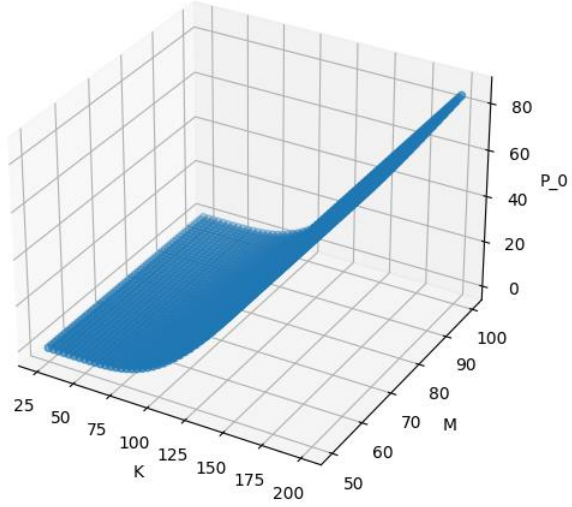
European Put Option Prices vs K and #sub-intervals for part (a)



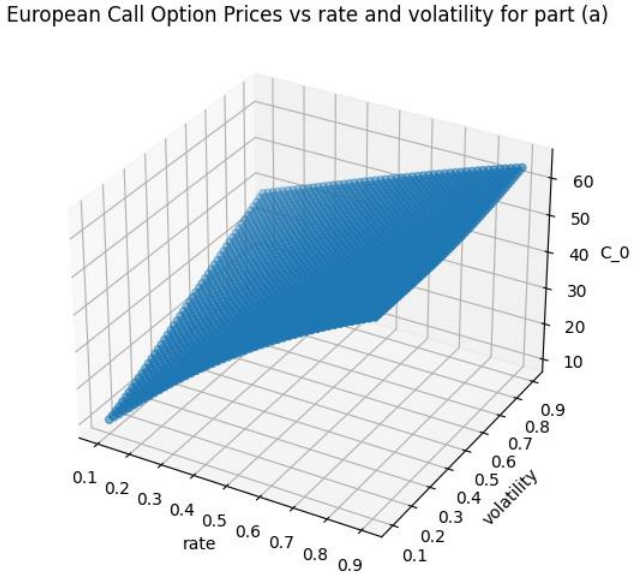
European Call Option Prices vs K and #sub-intervals for part (b)

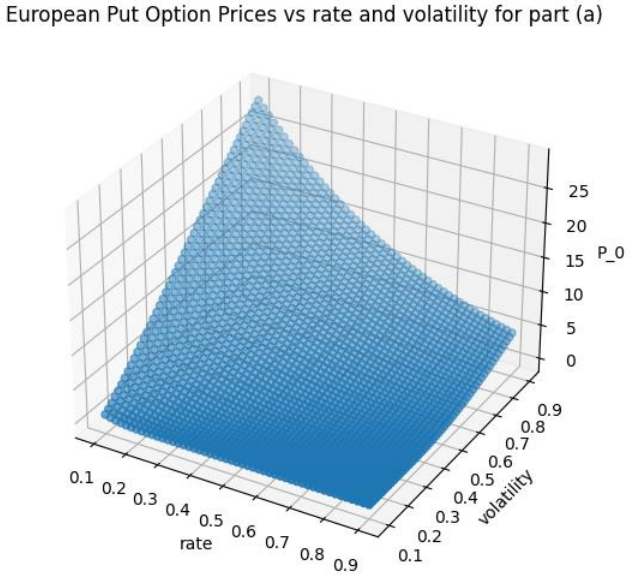


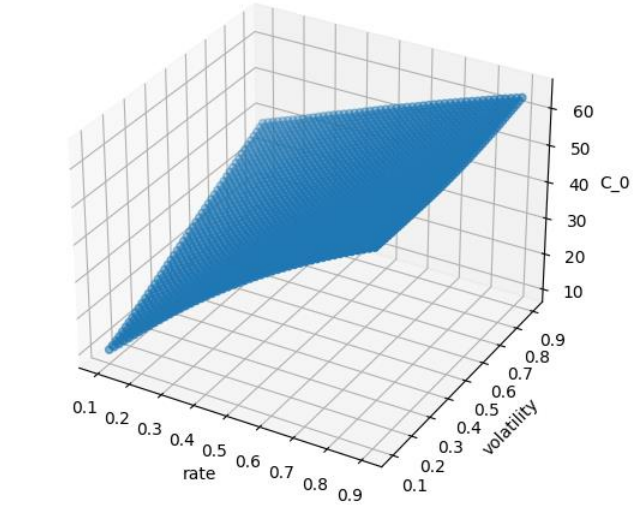
European Put Option Prices vs K and #sub-intervals for part (b)

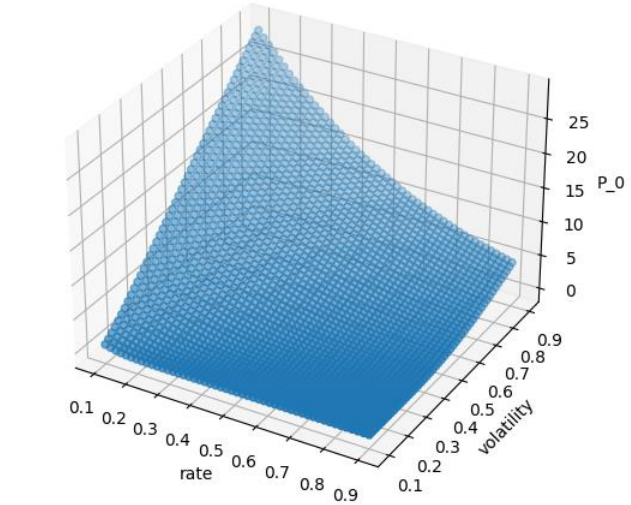


10) European option price vs Rate – Volatility

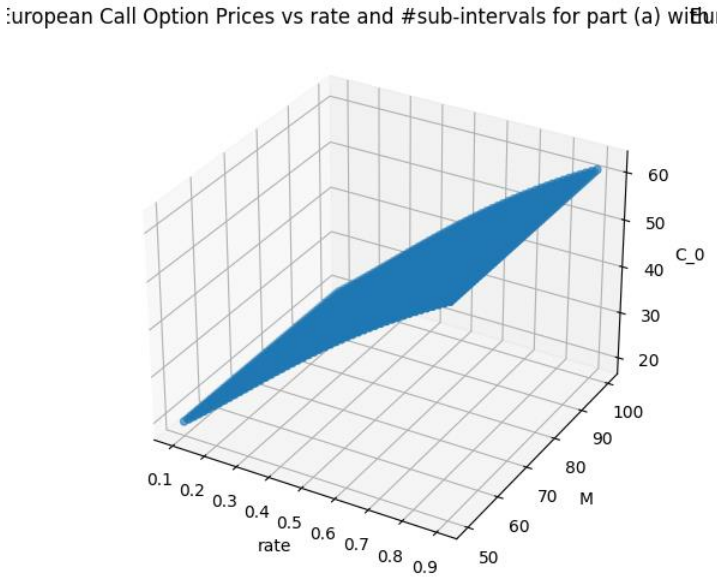


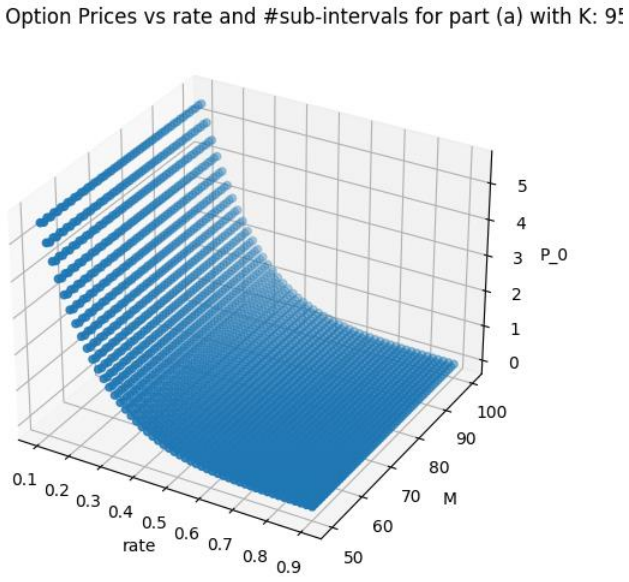


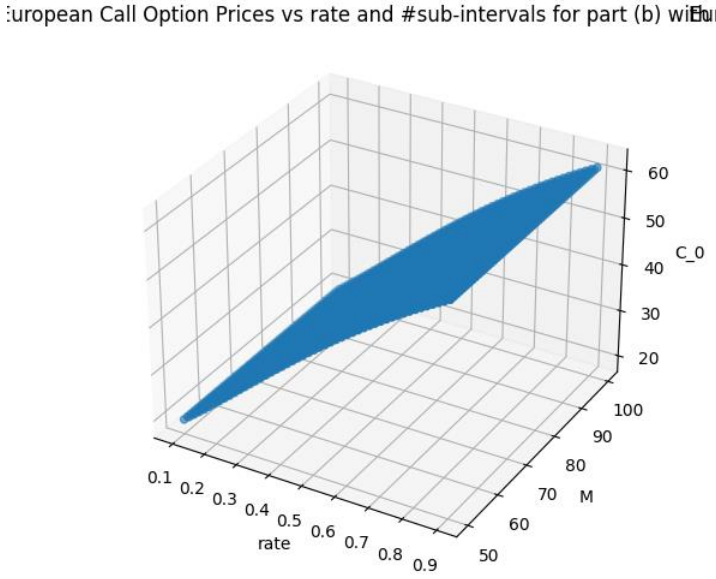


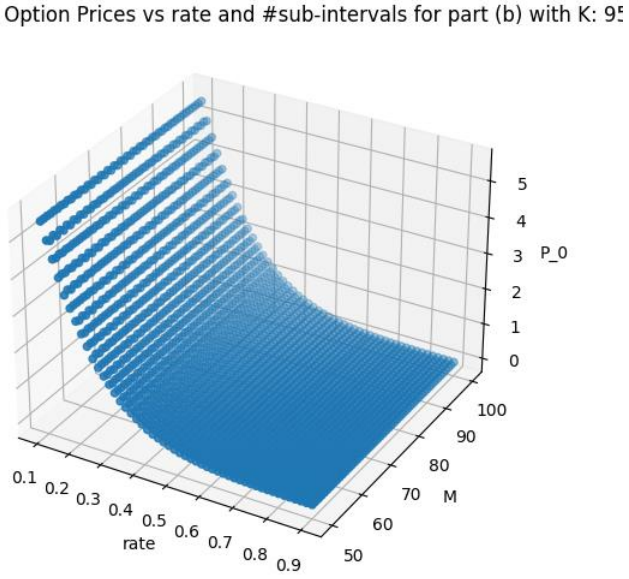


11) European option price vs Rate - # sub-intervals with strike: 95

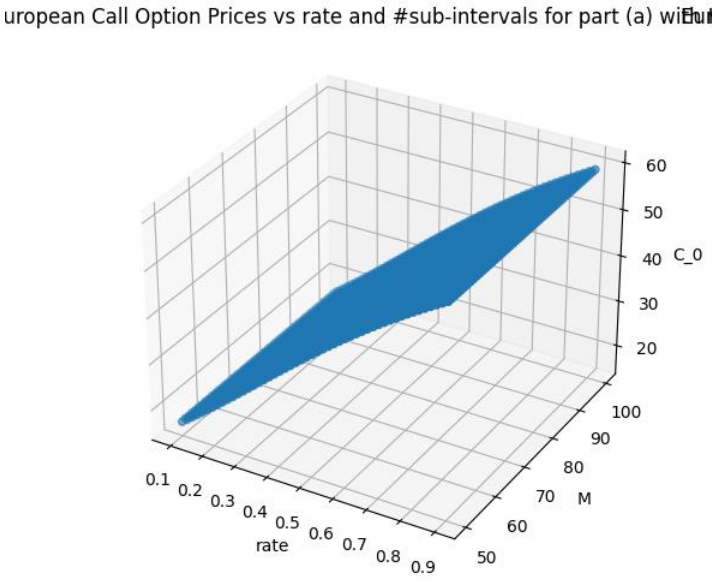


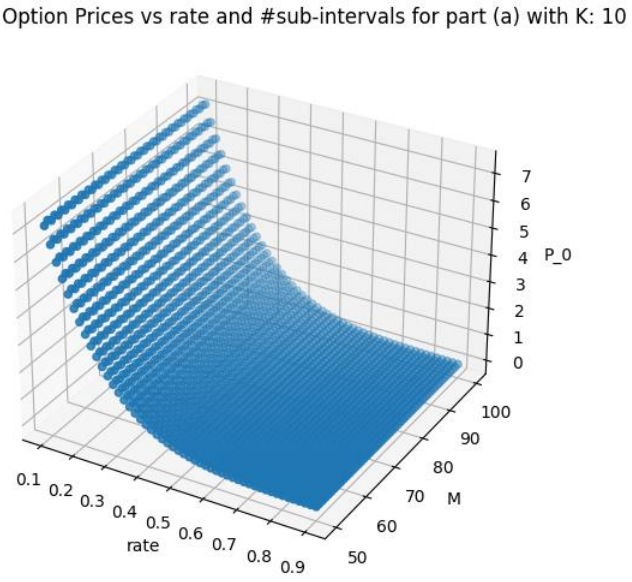


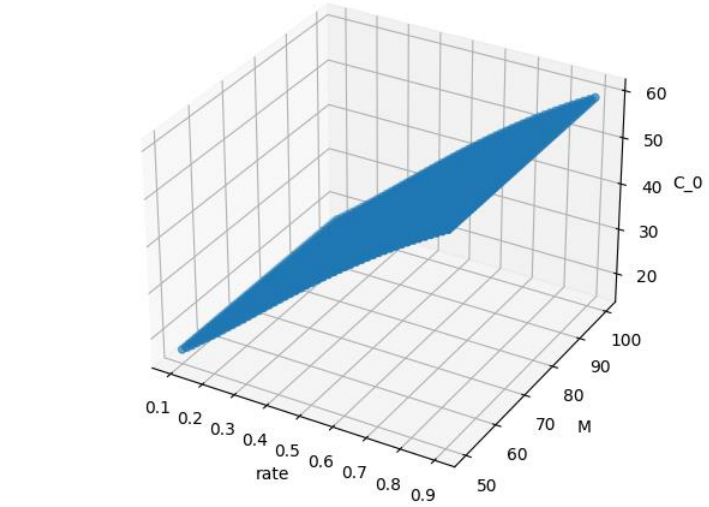


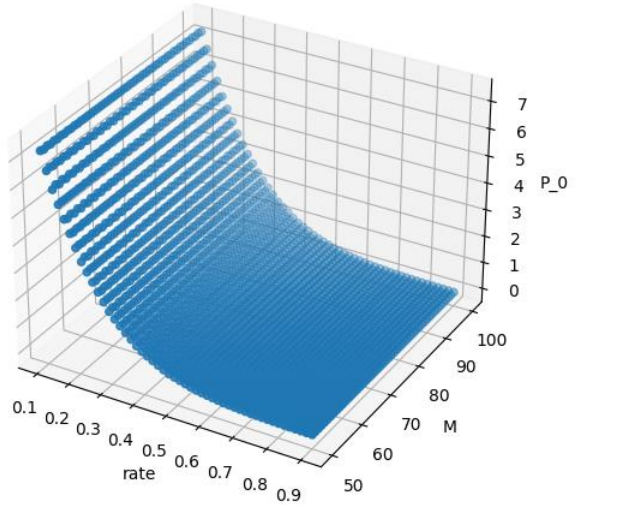


12) European option price vs Rate- # sub-intervals with strike: 100

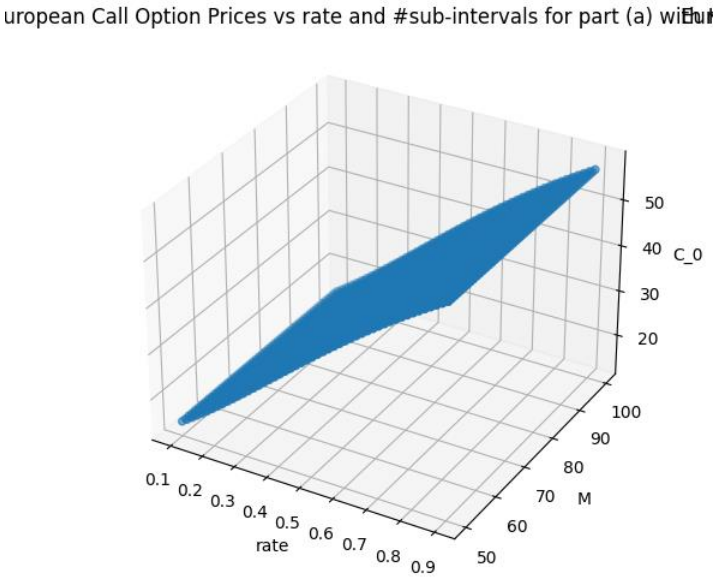


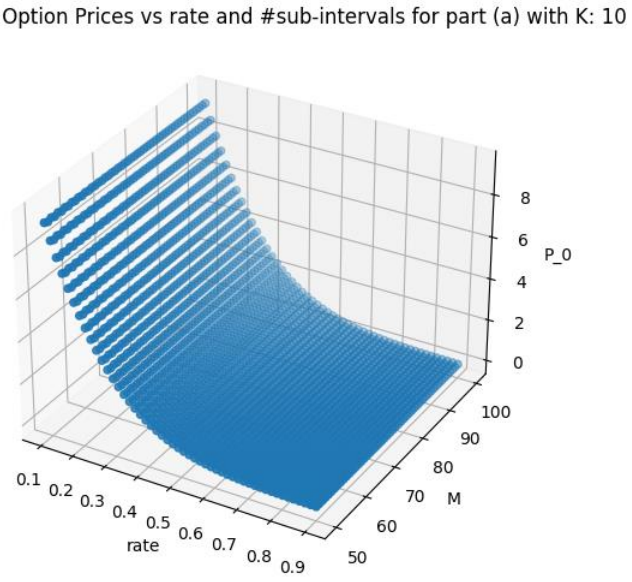


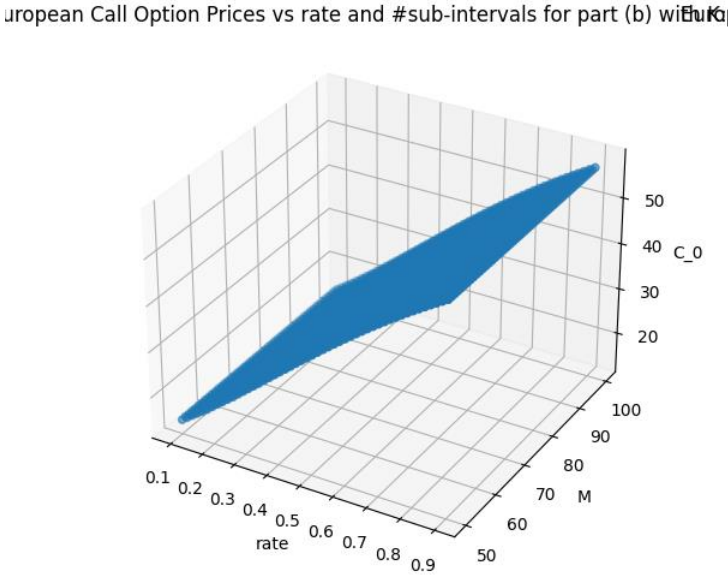


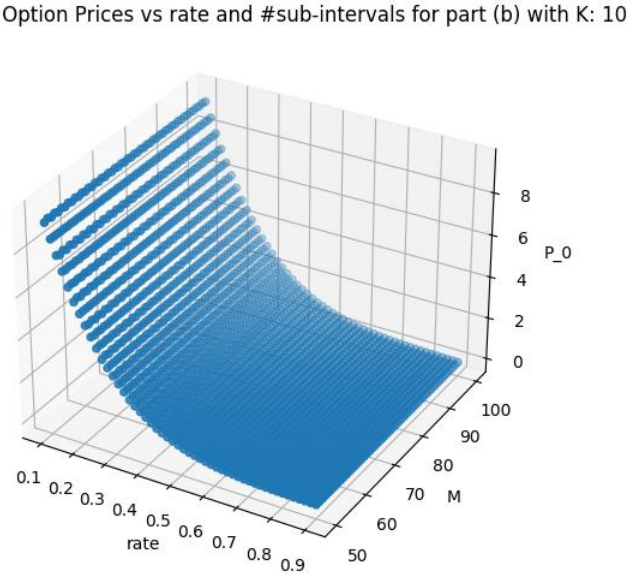


13) European option price vs Rate - # sub-intervals with strike: 105

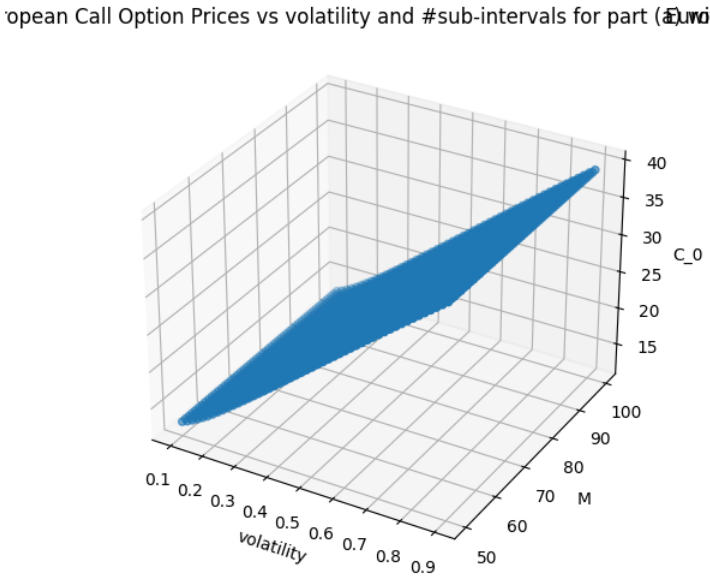


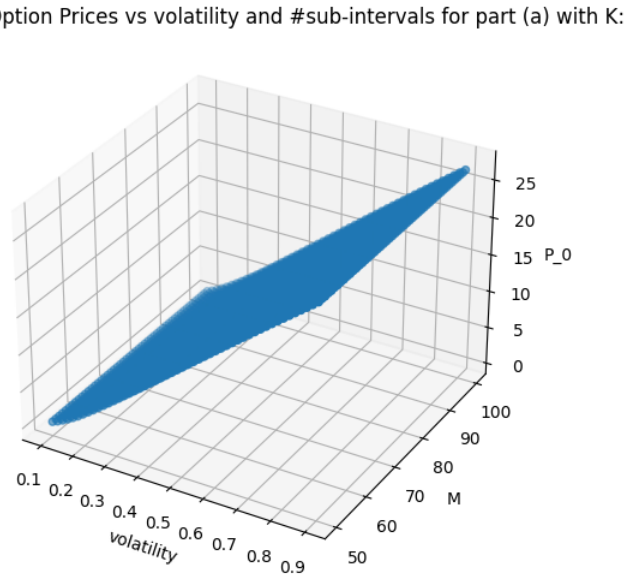


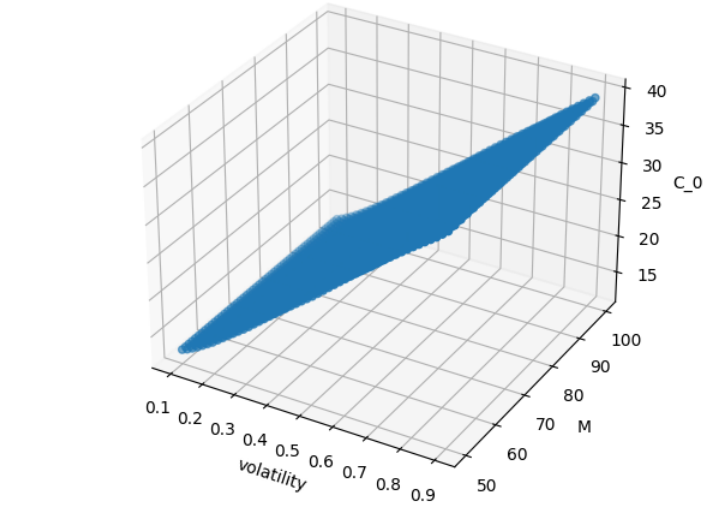


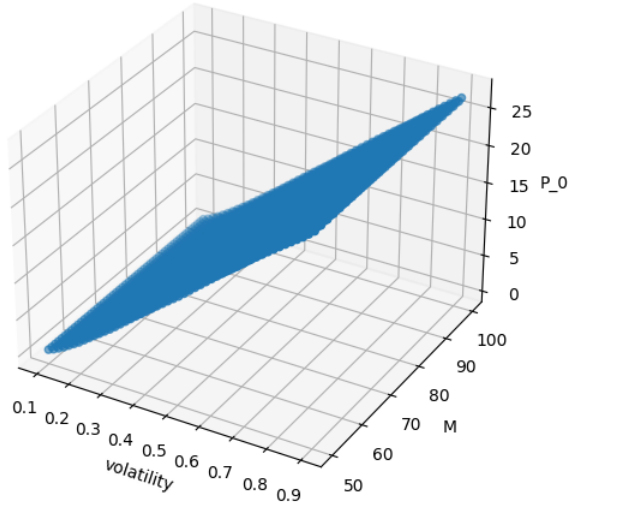


14) European option price vs Volatility - # sub-intervals with strike: 95

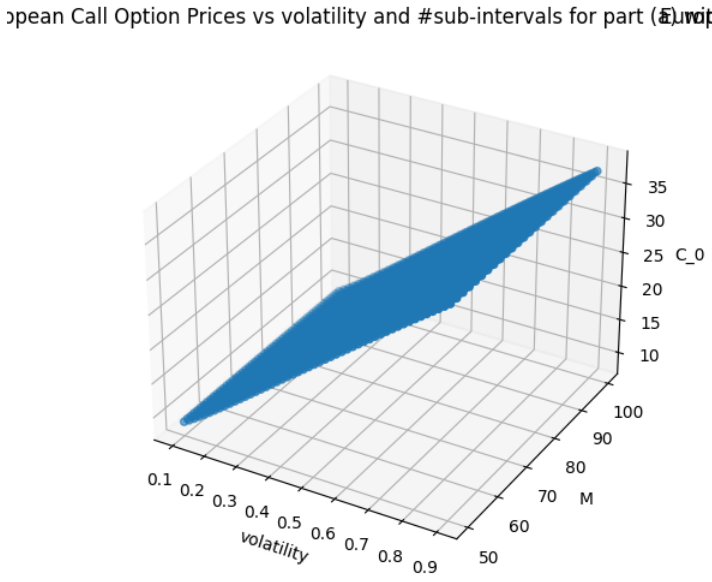


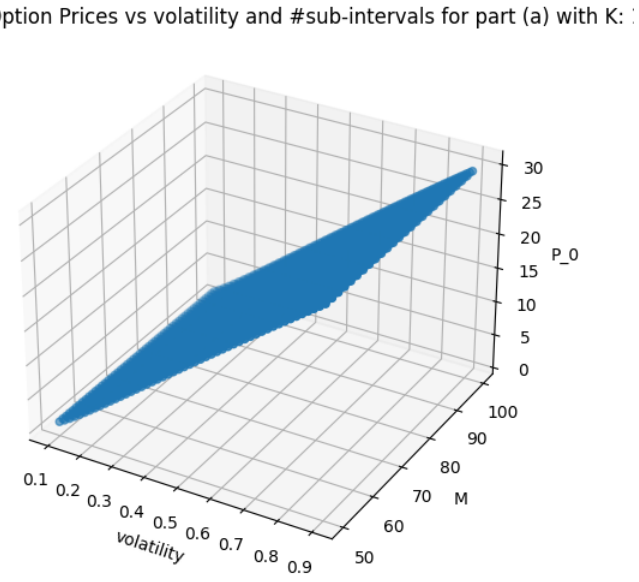


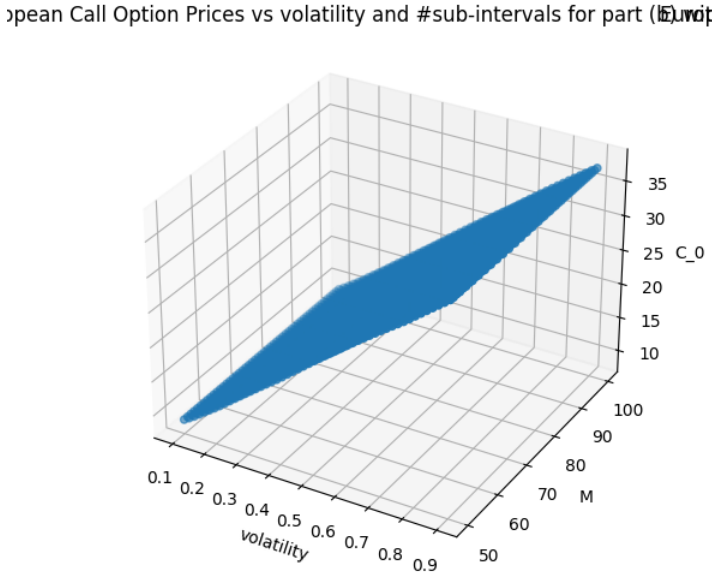


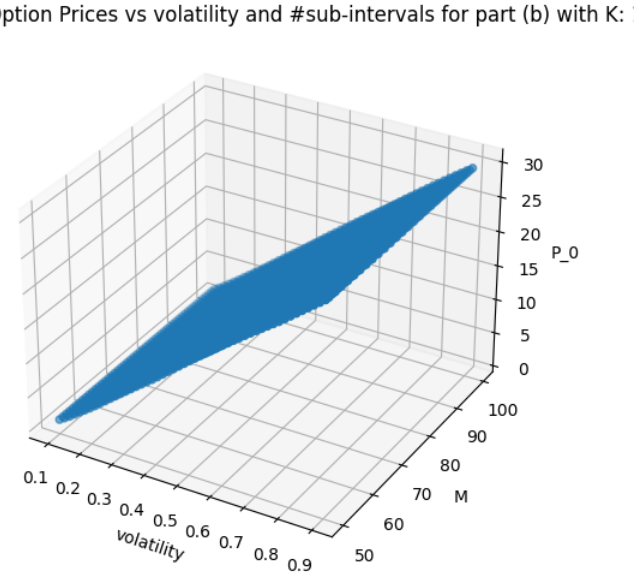


15) European option price vs Volatility - # sub-intervals with strike: 100

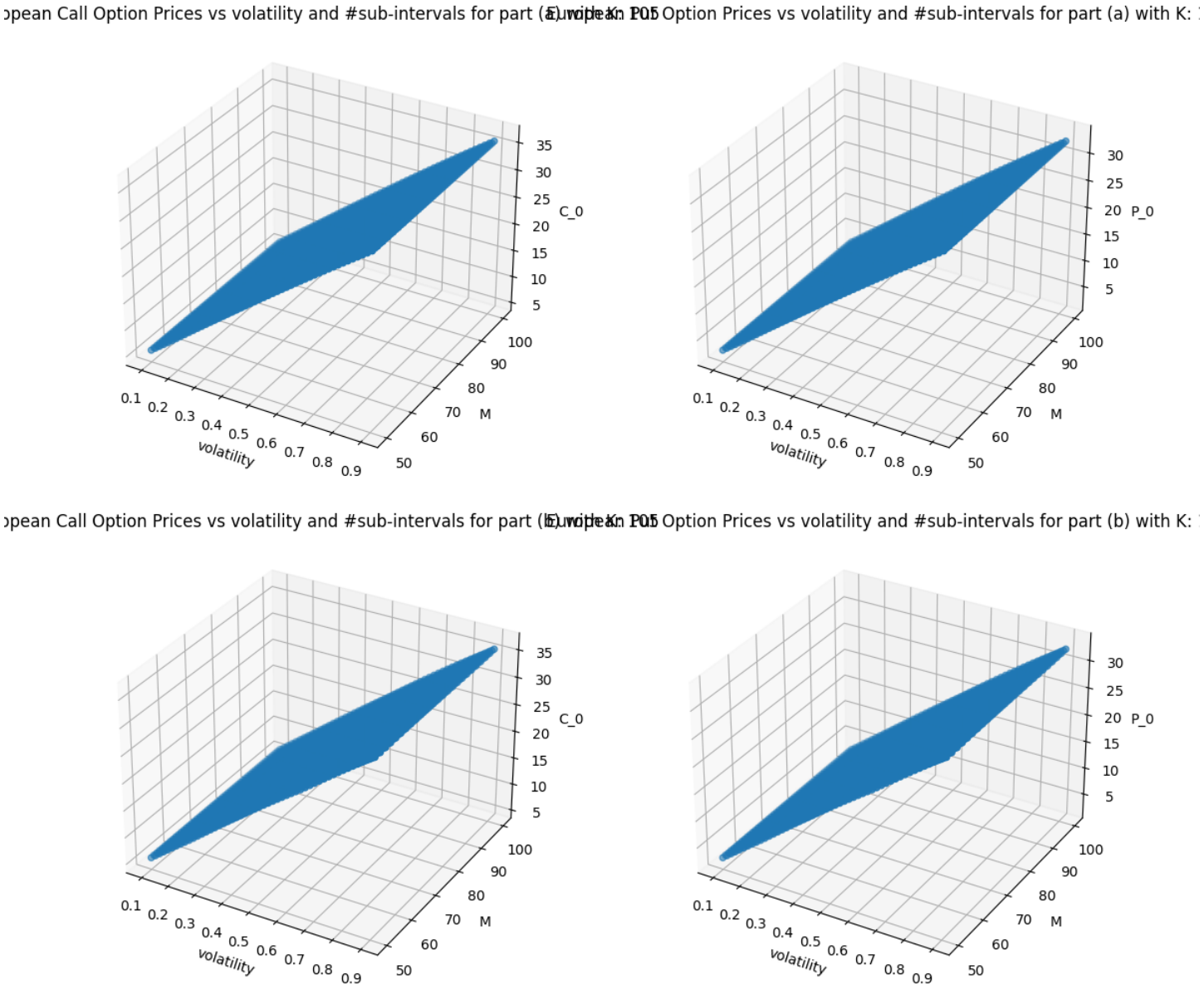






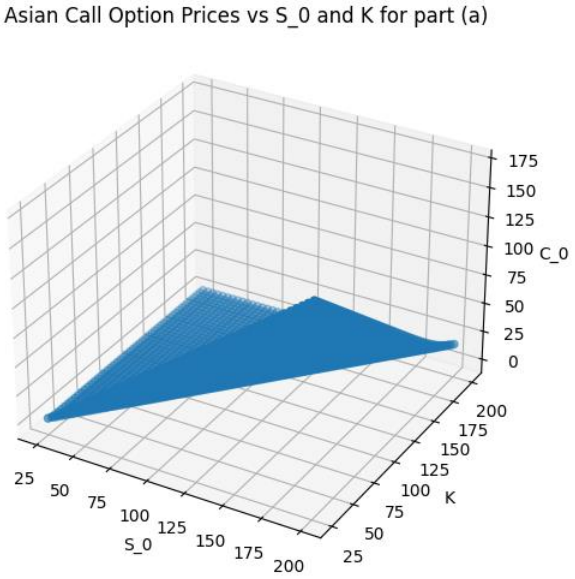


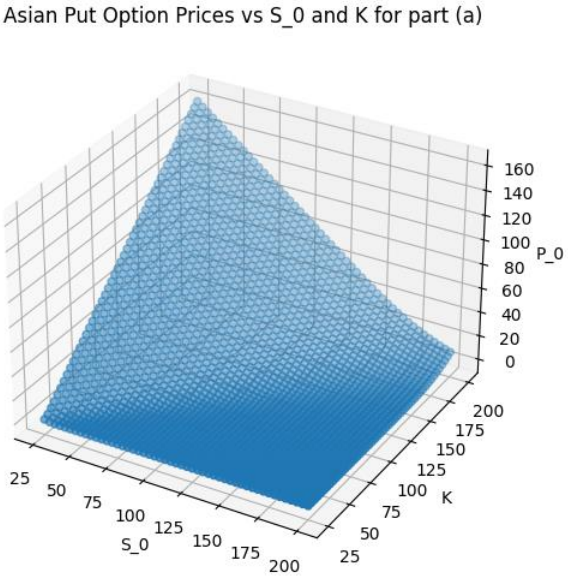
16) European option price vs Volatility - # sub-intervals with strike: 105

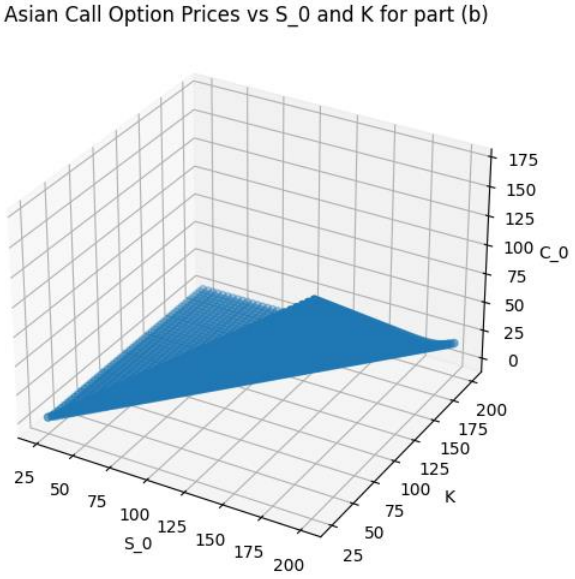


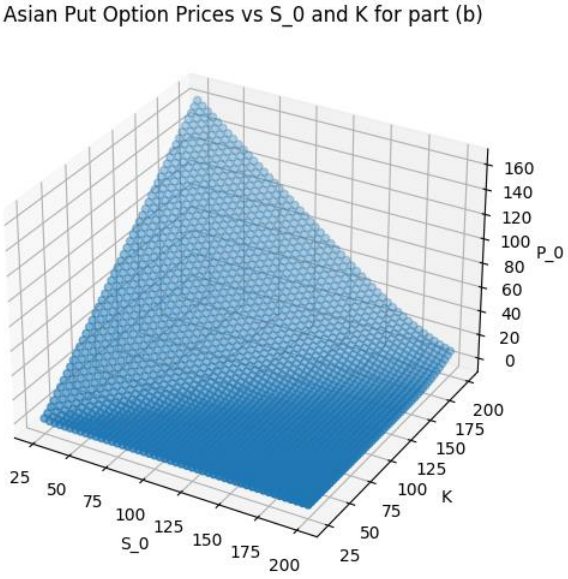
3-D plots describing sensitivities of Asian call and put options.

1) Asian option price vs Spot – Strike

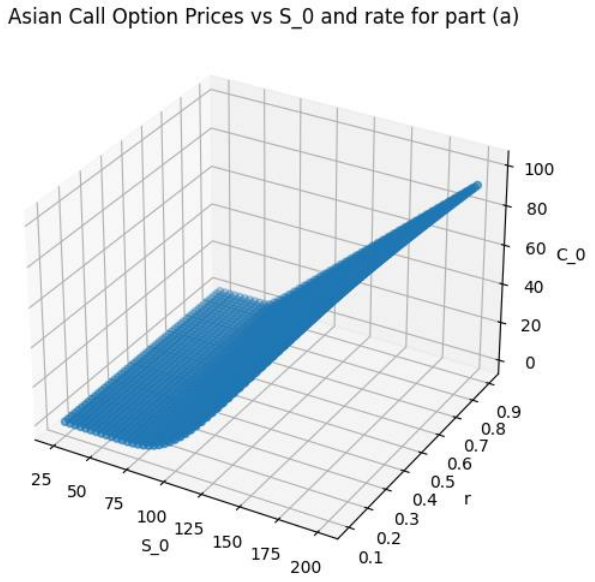


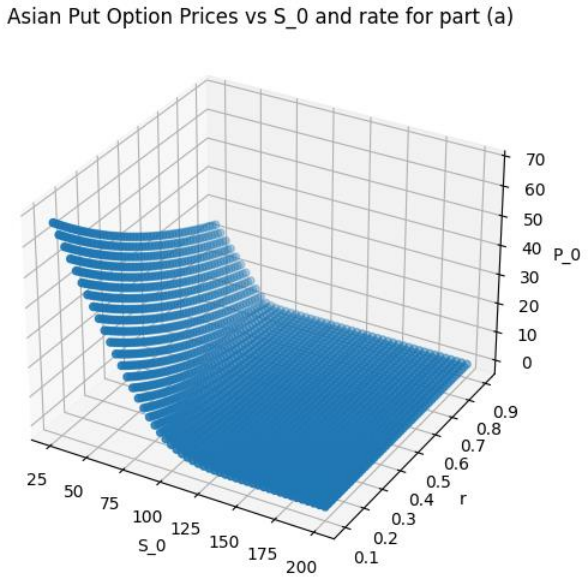


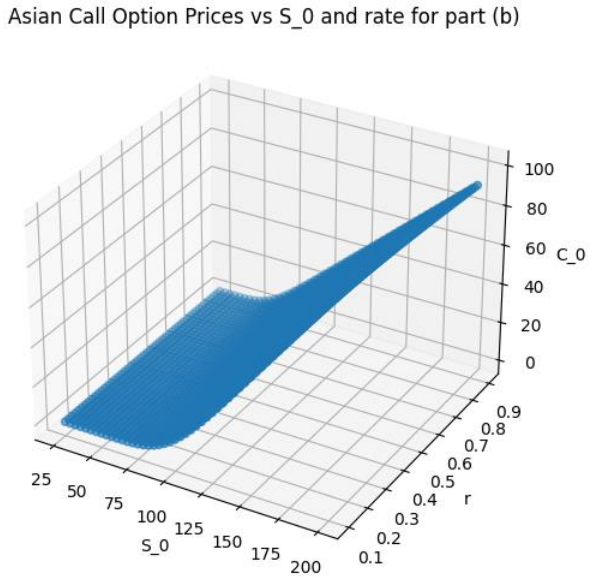


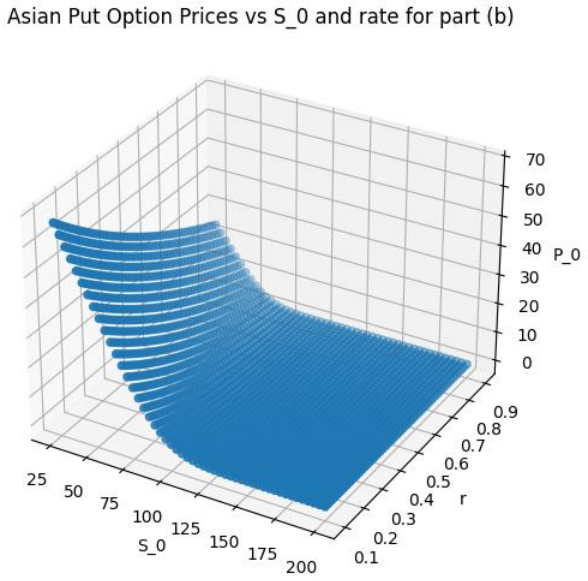


2) Asian option price vs Spot – Rate



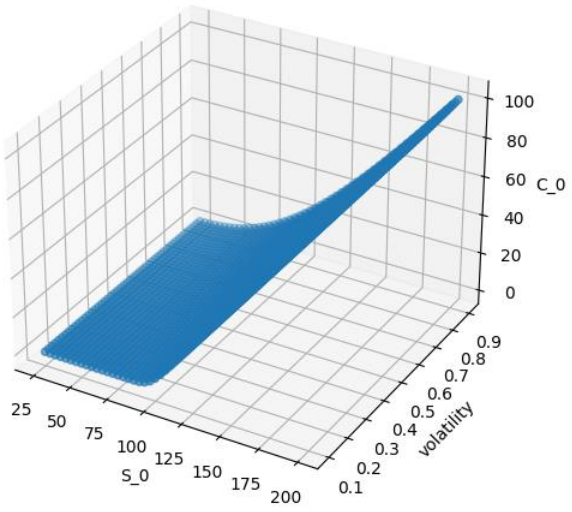




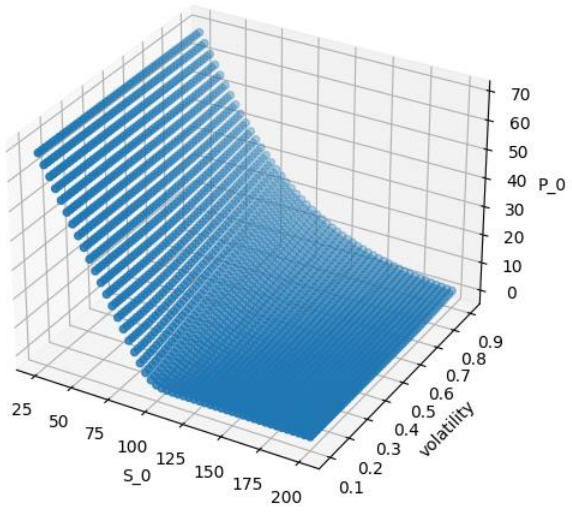


3) Asian option price vs Spot – Volatility

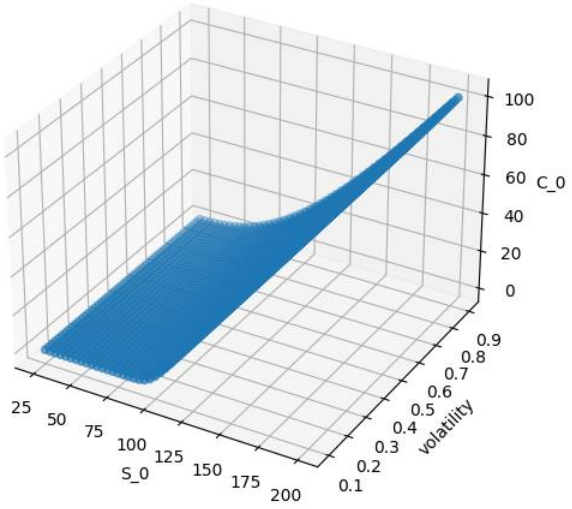
Asian Call Option Prices vs S_0 and volatility for part (a)



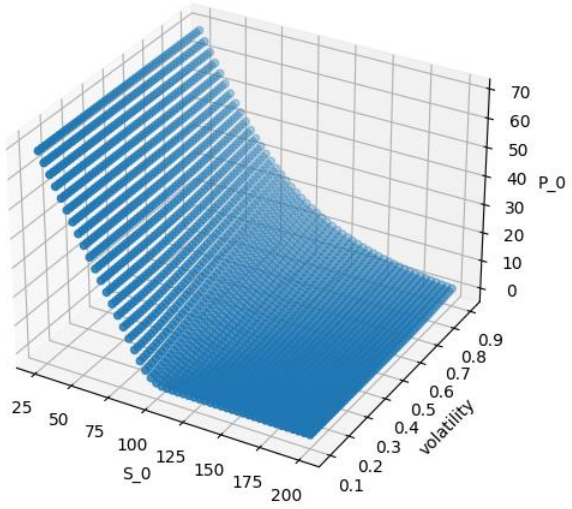
Asian Put Option Prices vs S_0 and volatility for part (a)



Asian Call Option Prices vs S_0 and volatility for part (b)

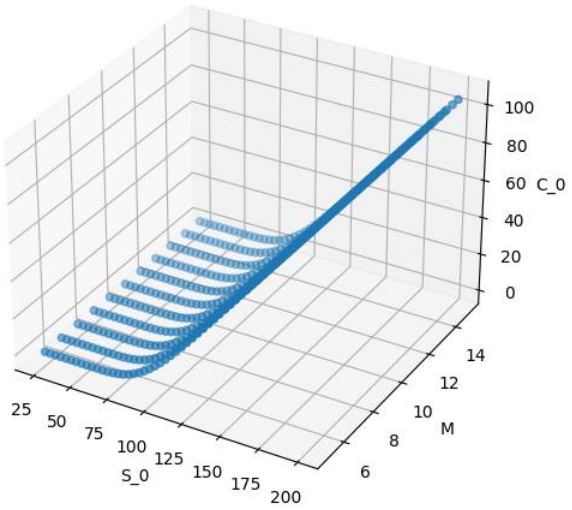


Asian Put Option Prices vs S_0 and volatility for part (b)

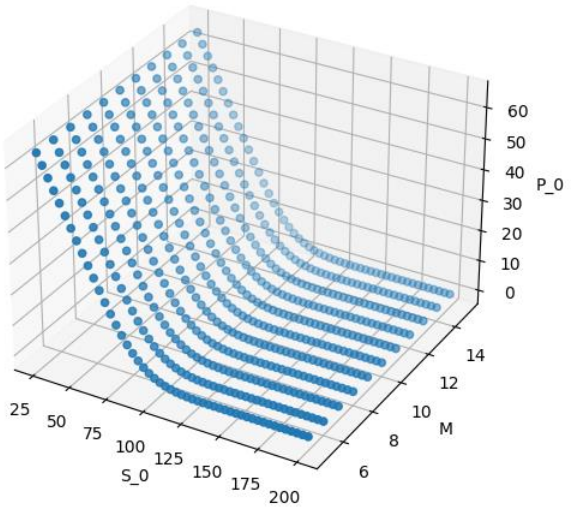


4) Asian option price vs Spot - # sub-intervals with strike: 95

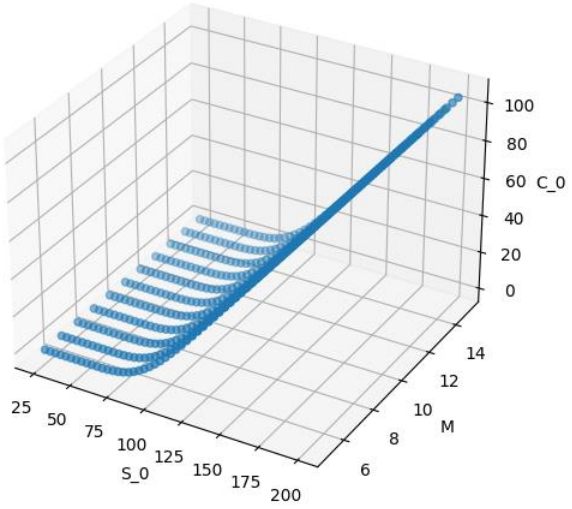
Asian Call Option Prices vs S_0 and #sub-intervals for part (a) with K: 95



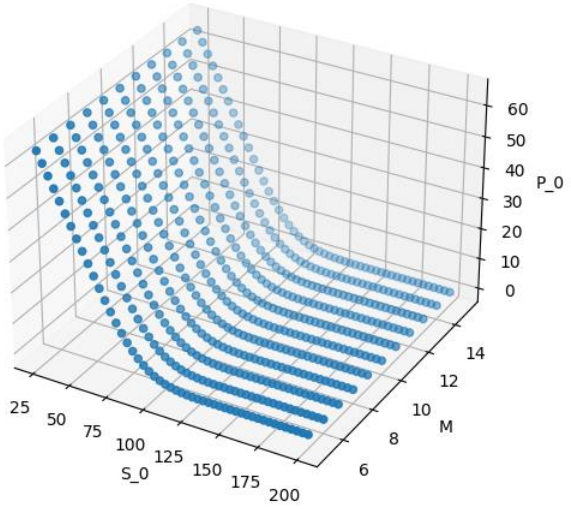
Asian Put Option Prices vs S_0 and #sub-intervals for part (a) with K: 95



Asian Call Option Prices vs S_0 and #sub-intervals for part (b) with K: 95

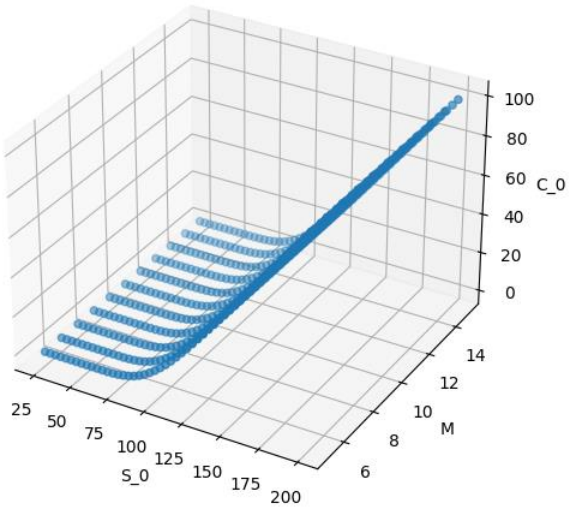


Asian Put Option Prices vs S_0 and #sub-intervals for part (b) with K: 95

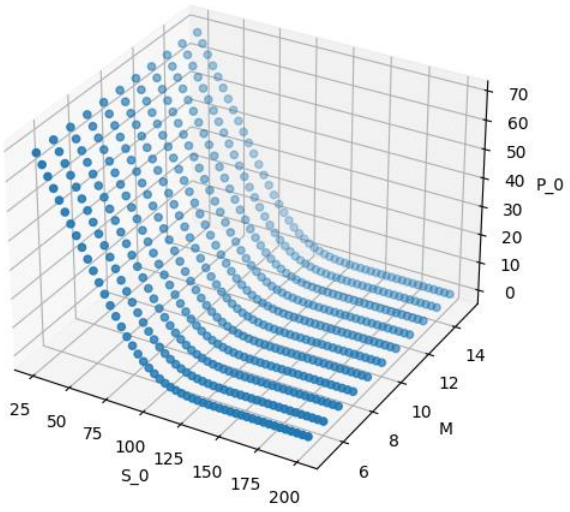


5) Asian option price vs Spot - # sub-intervals with strike: 100

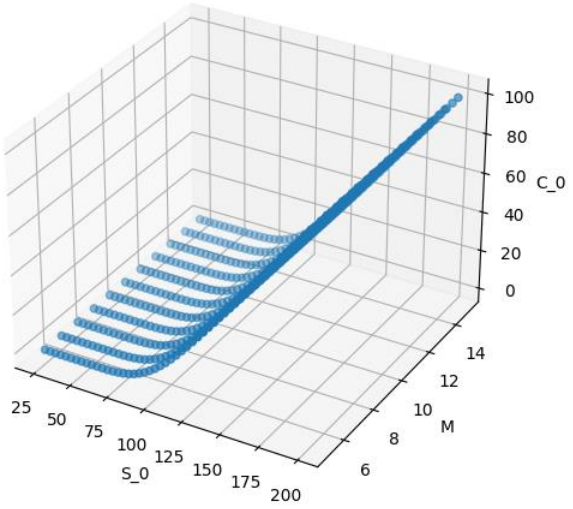
Asian Call Option Prices vs S_0 and #sub-intervals for part (a) with K: 100



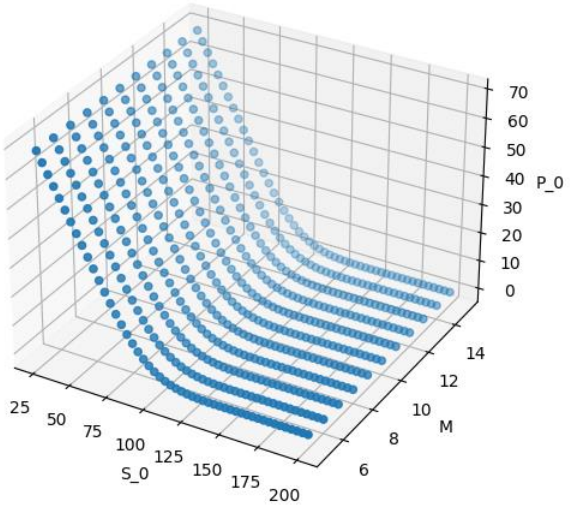
Asian Put Option Prices vs S_0 and #sub-intervals for part (a) with K: 100



Asian Call Option Prices vs S_0 and #sub-intervals for part (b) with K: 100

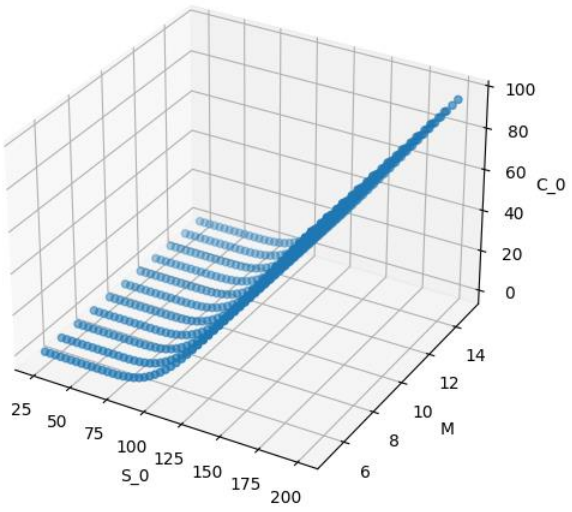


Asian Put Option Prices vs S_0 and #sub-intervals for part (b) with K: 100

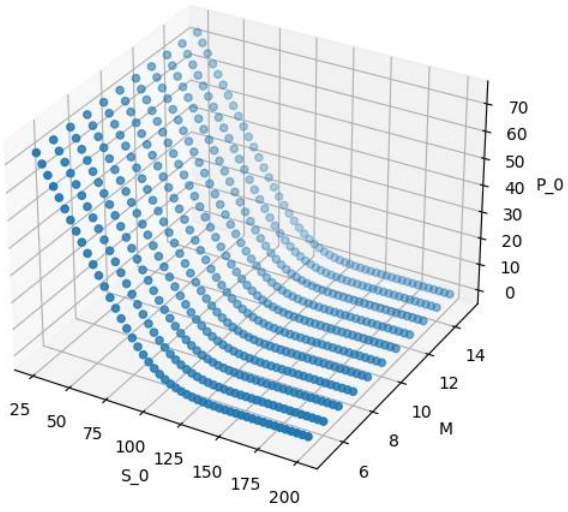


6) Asian option price vs Spot - # sub-intervals with strike: 105

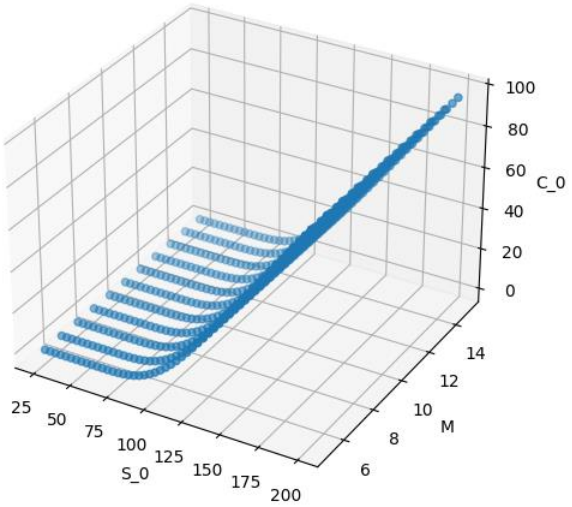
Asian Call Option Prices vs S_0 and #sub-intervals for part (a) with K: 105



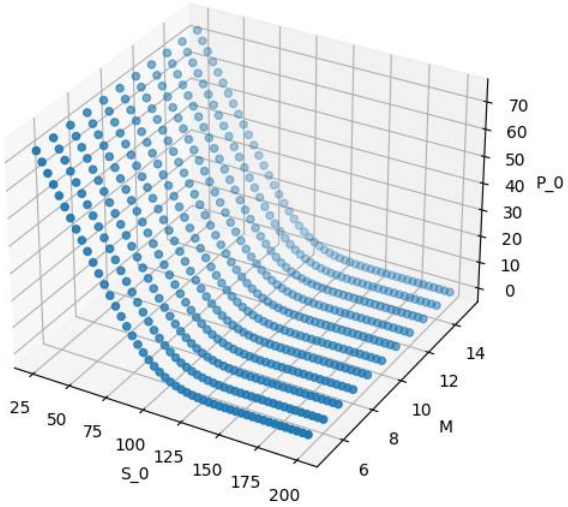
Asian Put Option Prices vs S_0 and #sub-intervals for part (a) with K: 105



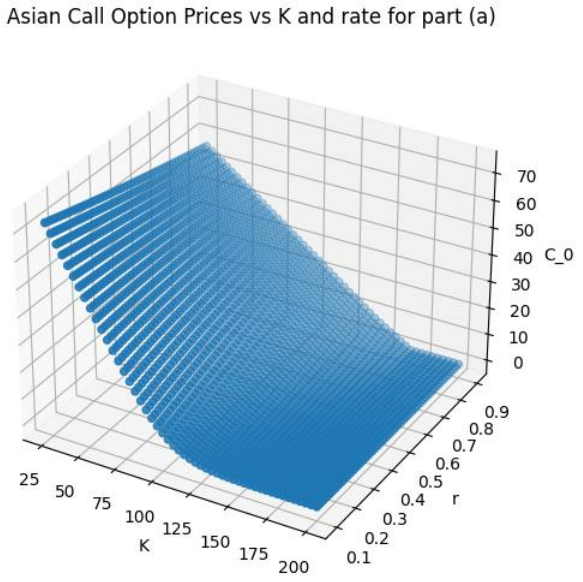
Asian Call Option Prices vs S_0 and #sub-intervals for part (b) with K: 105

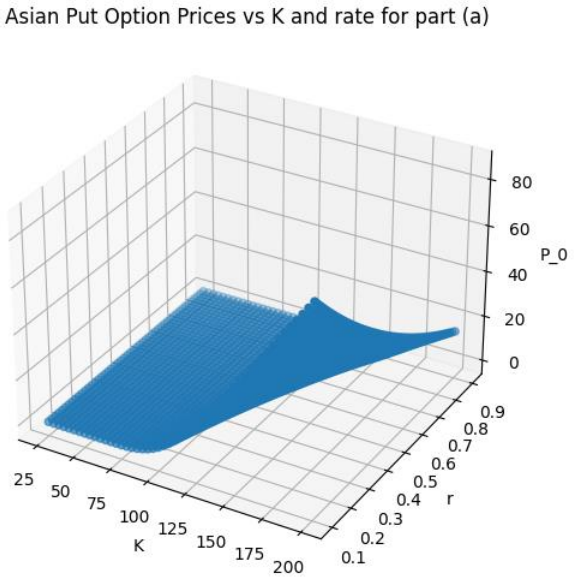


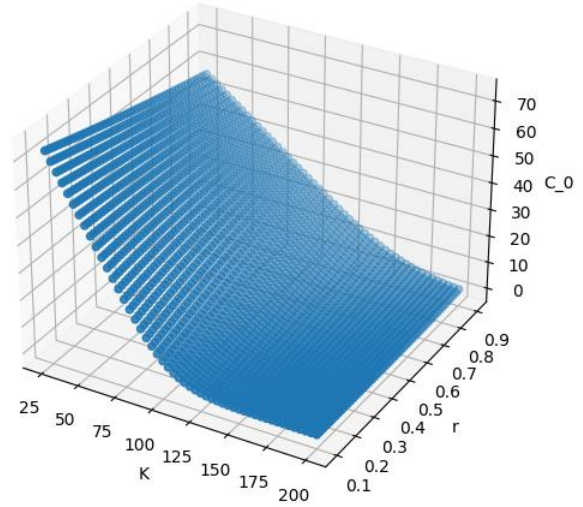
Asian Put Option Prices vs S_0 and #sub-intervals for part (b) with K: 105

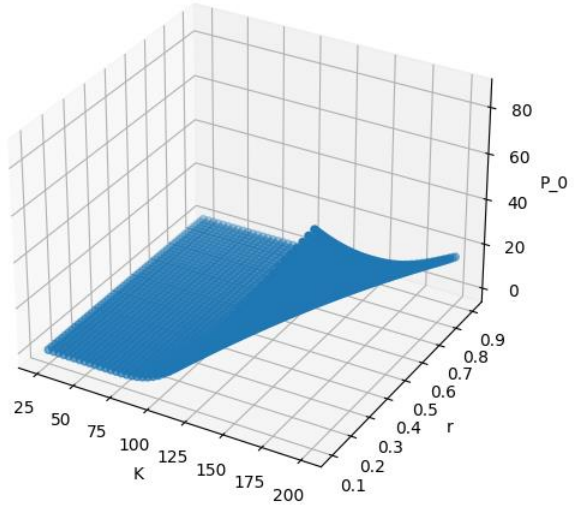


7) Asian option price vs Strike - Rate

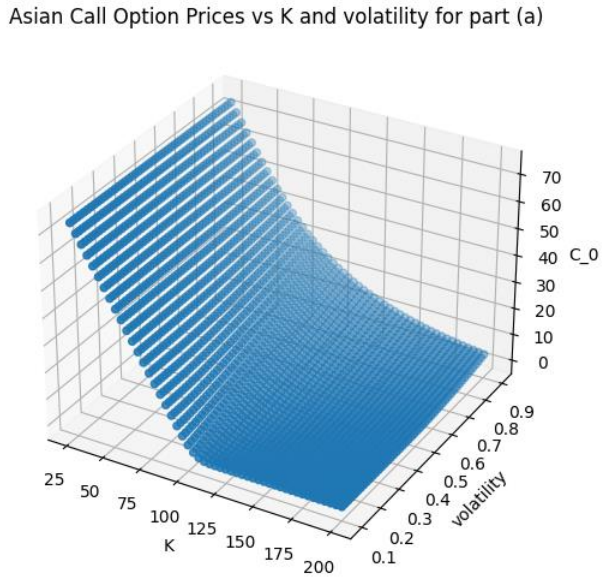


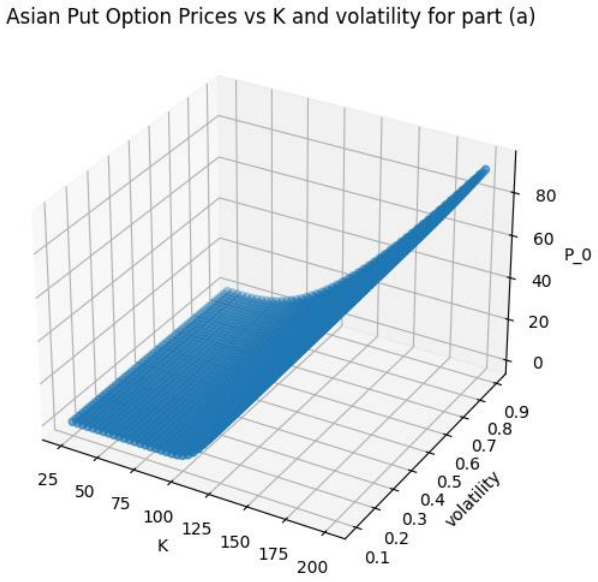


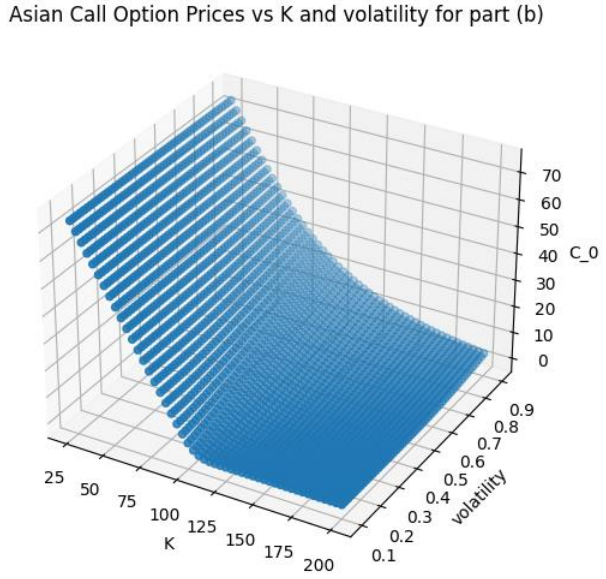


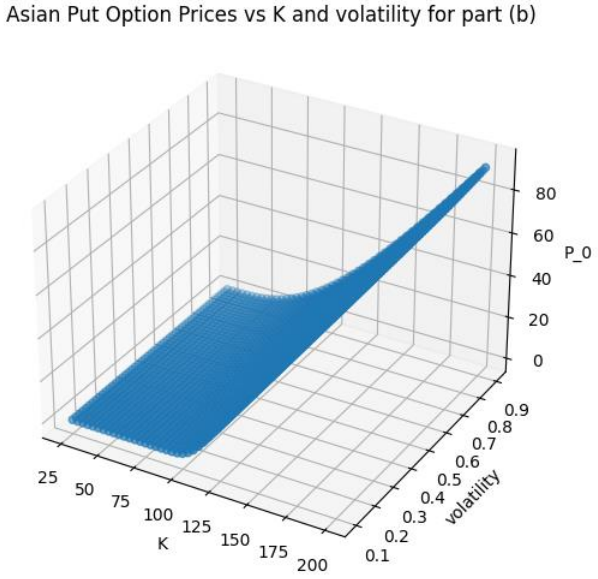


8) Asian option price vs Strike - Volatility



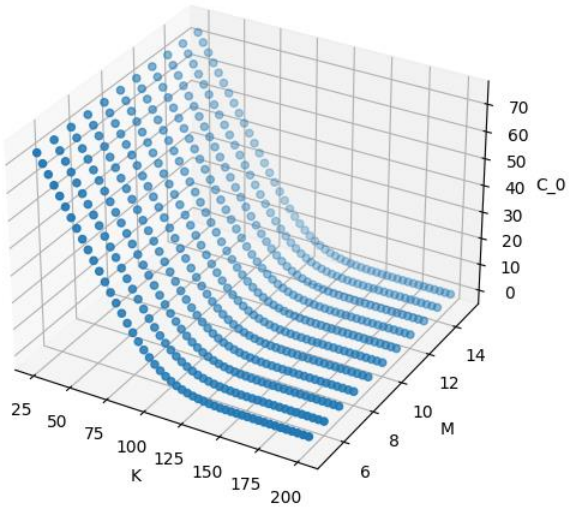




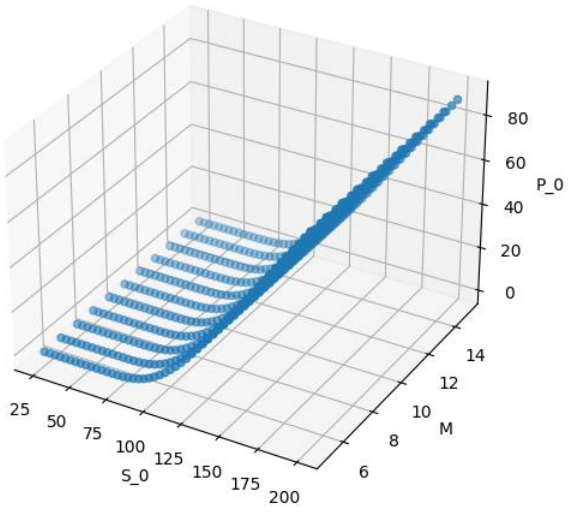


9) Asian option price vs Strike - # sub-intervals

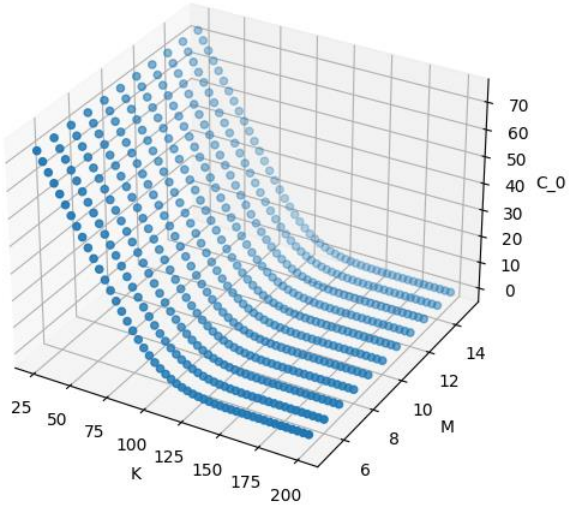
Asian Call Option Prices vs K and #sub-intervals for part (a)



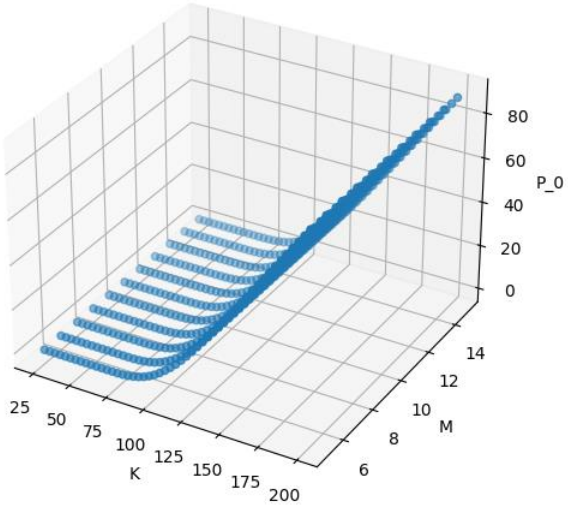
Asian Put Option Prices vs K and #sub-intervals for part (a)



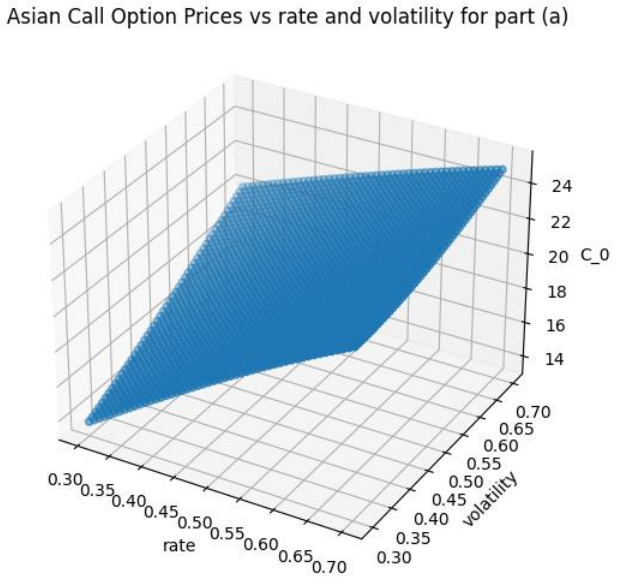
Asian Call Option Prices vs K and #sub-intervals for part (b)

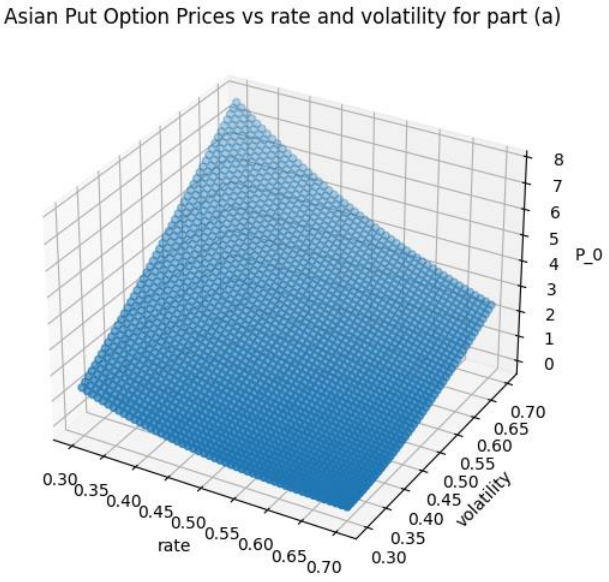


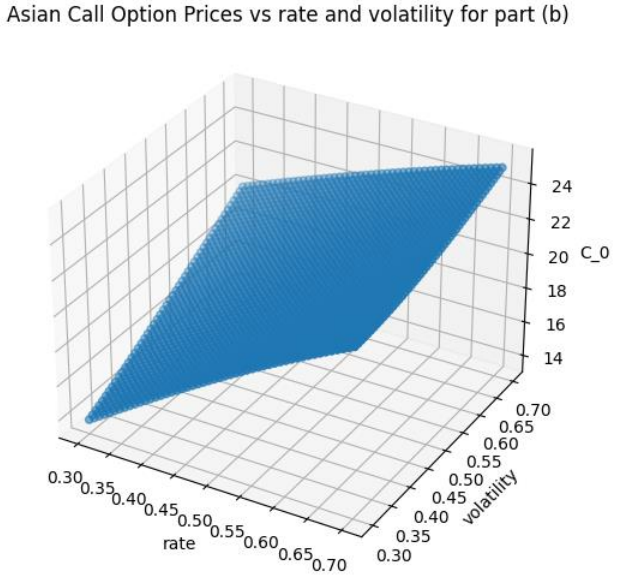
Asian Put Option Prices vs K and #sub-intervals for part (b)

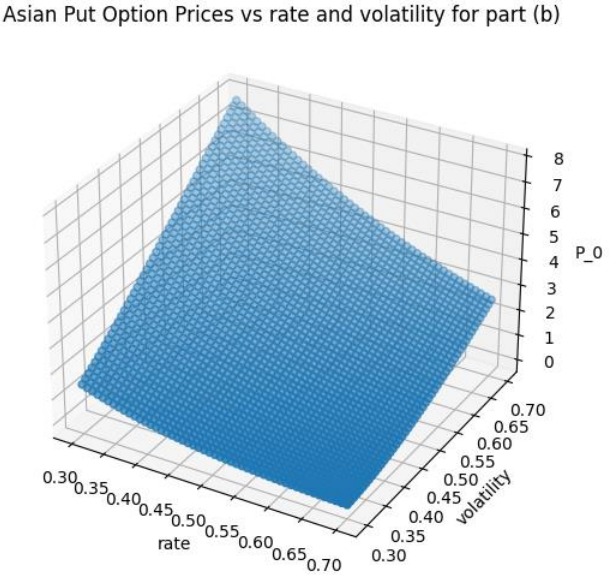


10) Asian option price vs Rate – Volatility



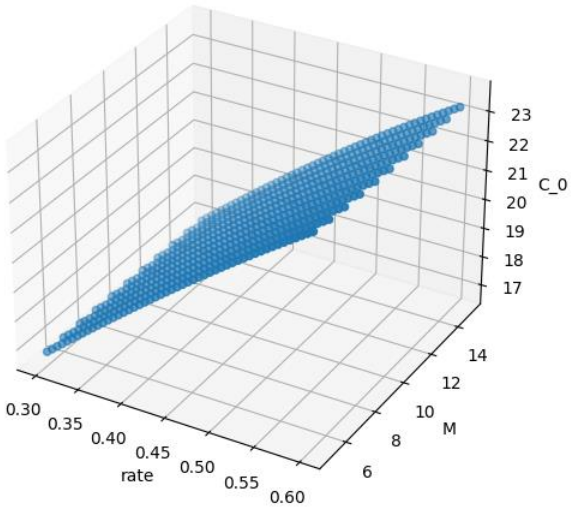




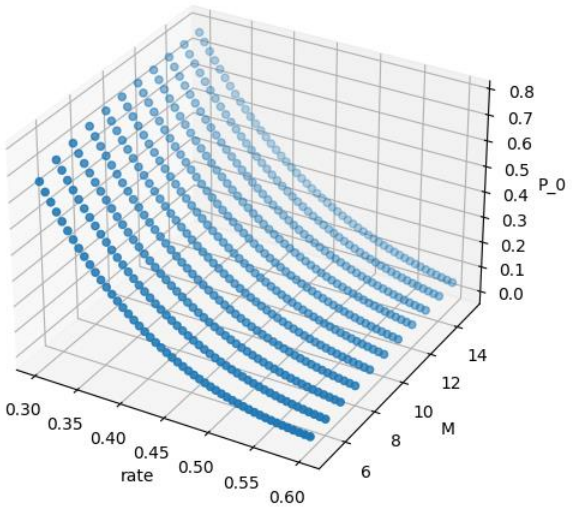


11) Asian option price vs Rate - # sub-intervals with strike: 95

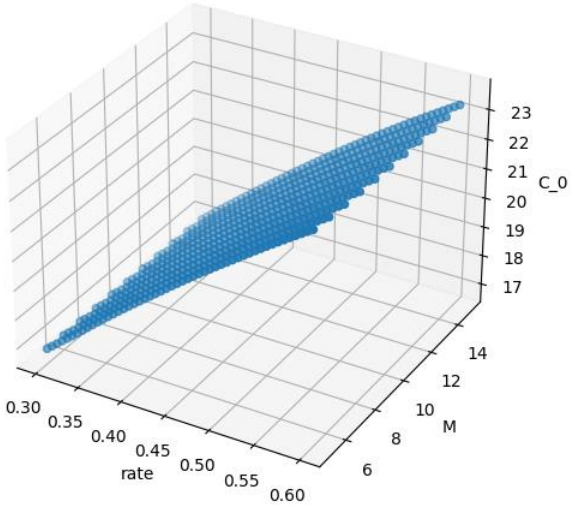
Asian Call Option Prices vs rate and #sub-intervals for part (a) with K: 95



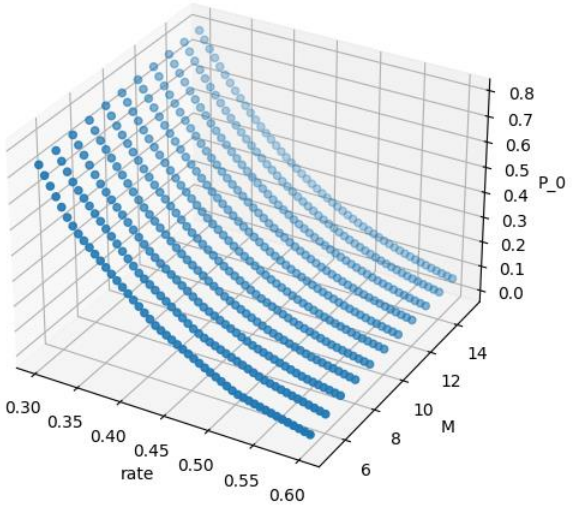
Asian Put Option Prices vs rate and #sub-intervals for part (a) with K: 95



Asian Call Option Prices vs rate and #sub-intervals for part (b) with K: 95

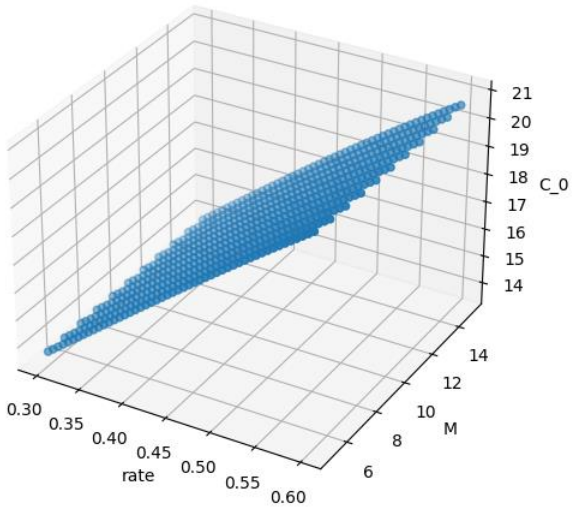


Asian Put Option Prices vs rate and #sub-intervals for part (b) with K: 95

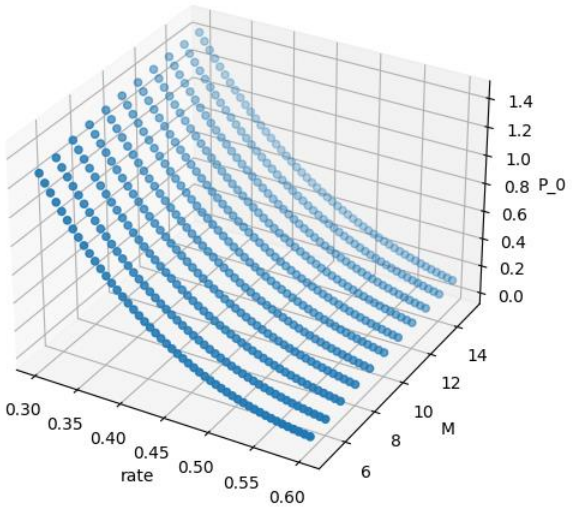


12) Asian option price vs Rate- # sub-intervals with strike: 100

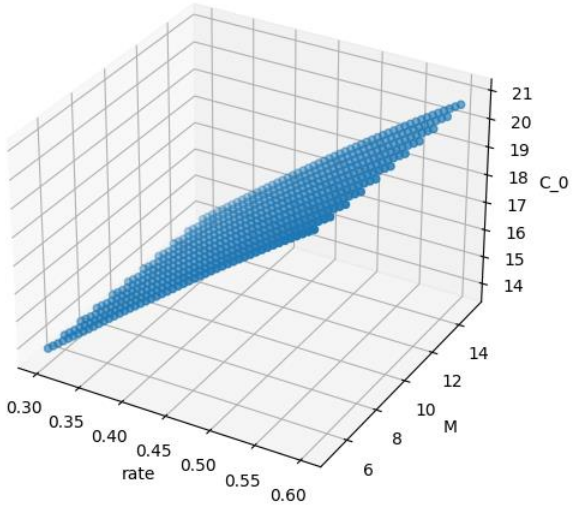
Asian Call Option Prices vs rate and #sub-intervals for part (a) with K: 100



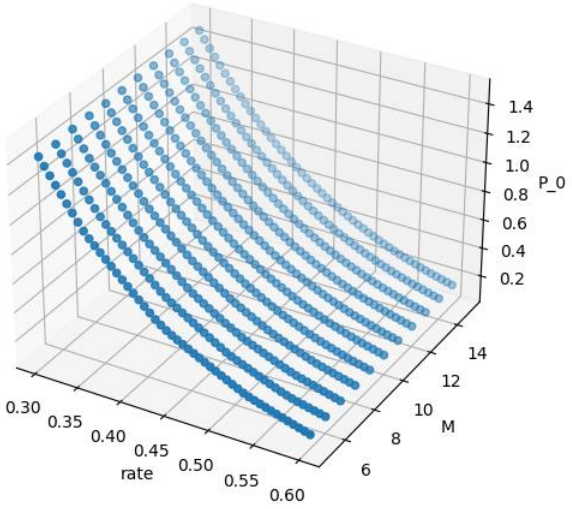
Asian Put Option Prices vs rate and #sub-intervals for part (a) with K: 100



Asian Call Option Prices vs rate and #sub-intervals for part (b) with K: 100

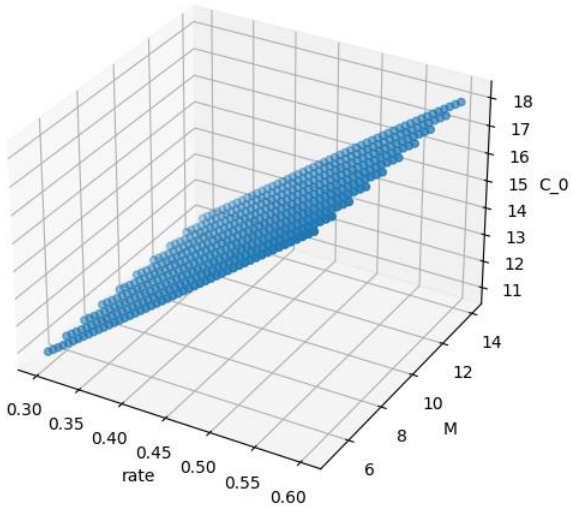


Asian Put Option Prices vs rate and #sub-intervals for part (b) with K: 100

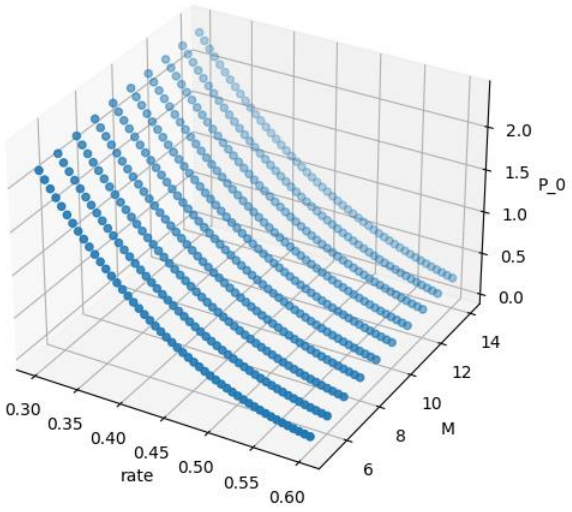


13) Asian option price vs Rate - # sub-intervals with strike: 105

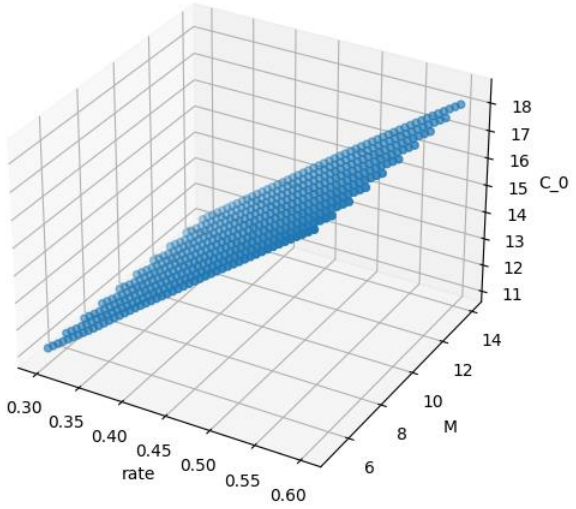
Asian Call Option Prices vs rate and #sub-intervals for part (a) with K: 105



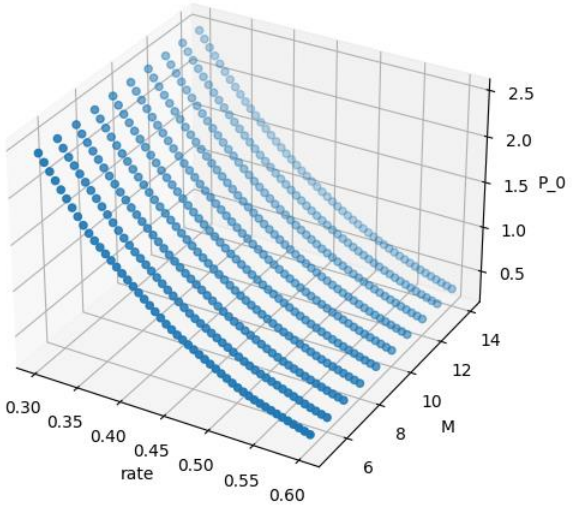
Asian Put Option Prices vs rate and #sub-intervals for part (a) with K: 105



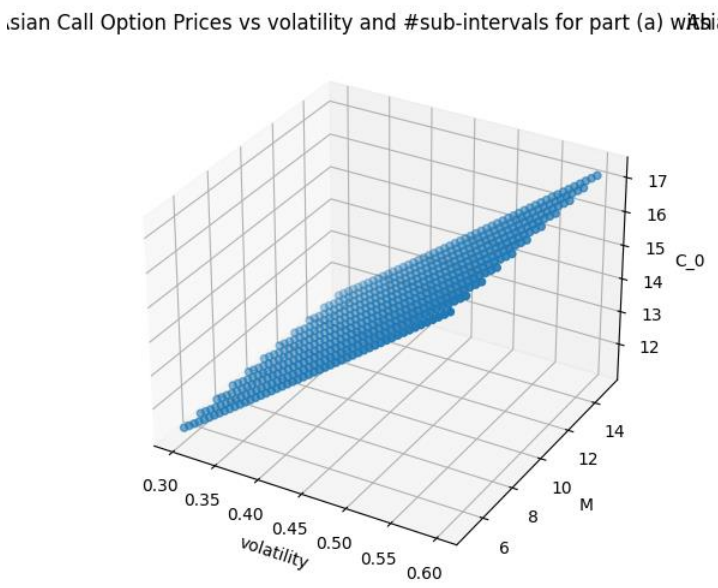
Asian Call Option Prices vs rate and #sub-intervals for part (b) with K: 105

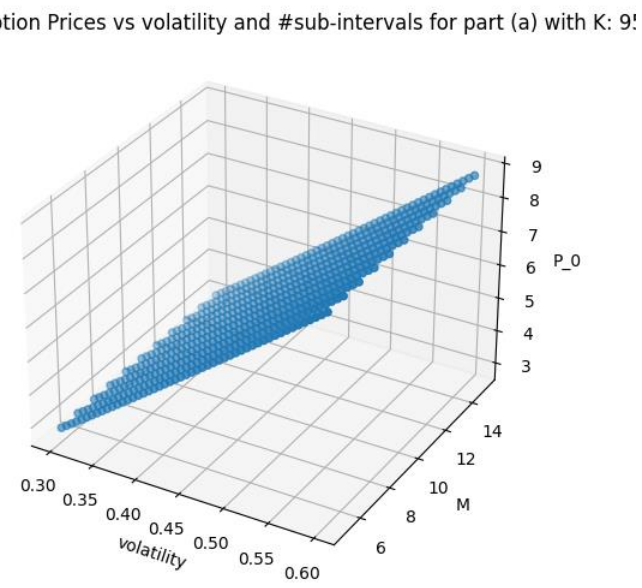


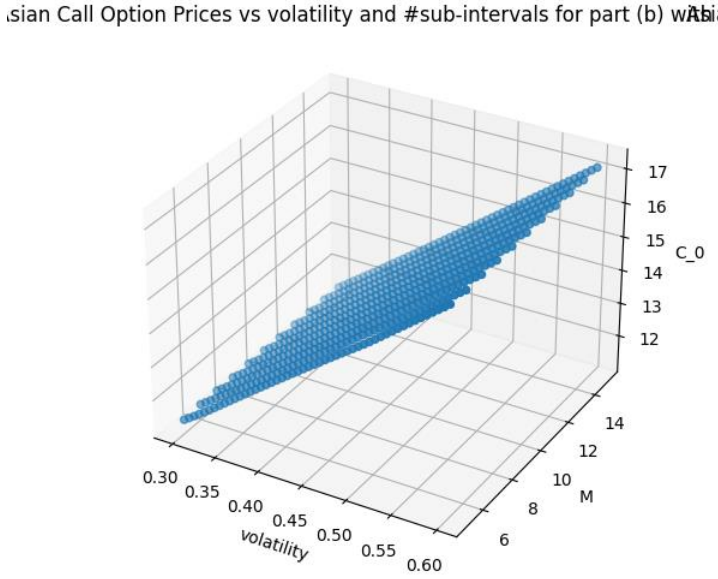
Asian Put Option Prices vs rate and #sub-intervals for part (b) with K: 105

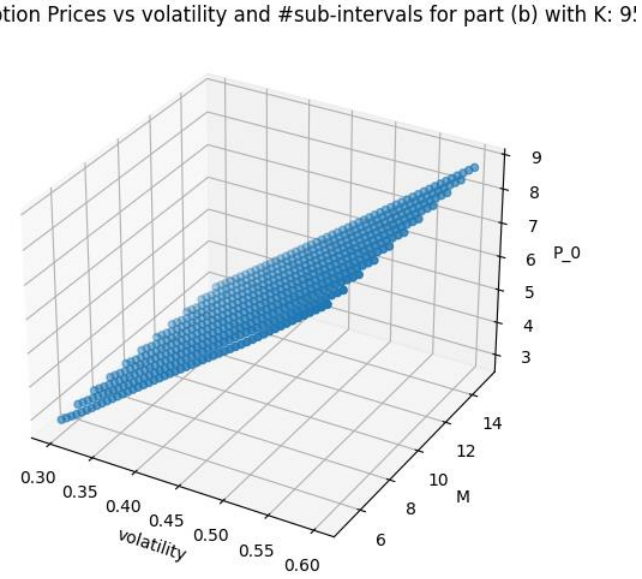


14) Asian option price vs Volatility - # sub-intervals with strike: 95



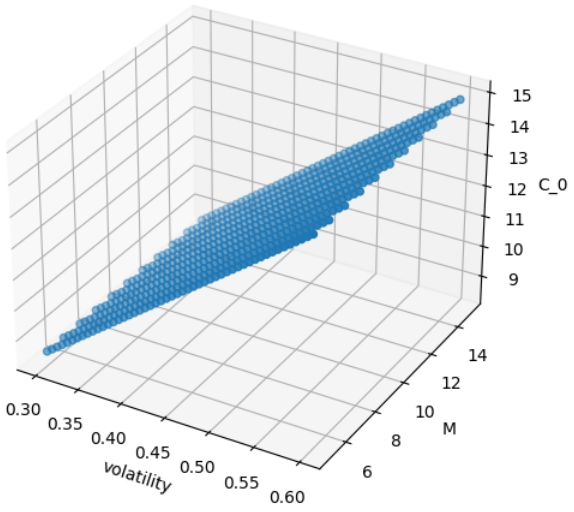




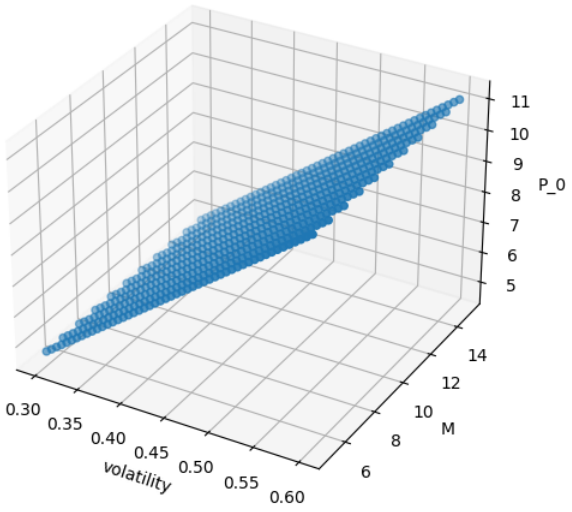


15) Asian option price vs Volatility - # sub-intervals with strike: 100

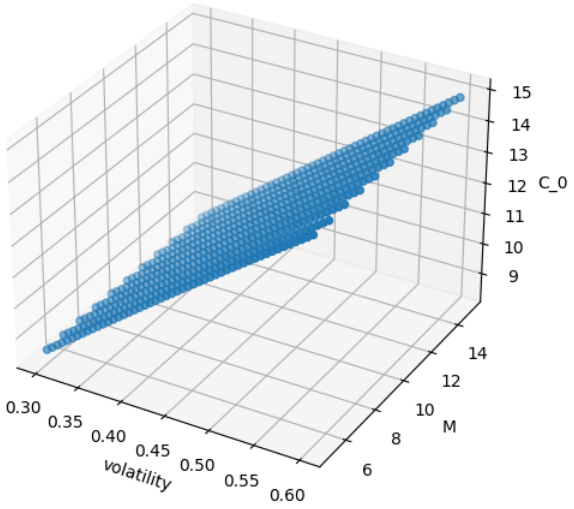
sian Call Option Prices vs volatility and #sub-intervals for part (a) with K: 100



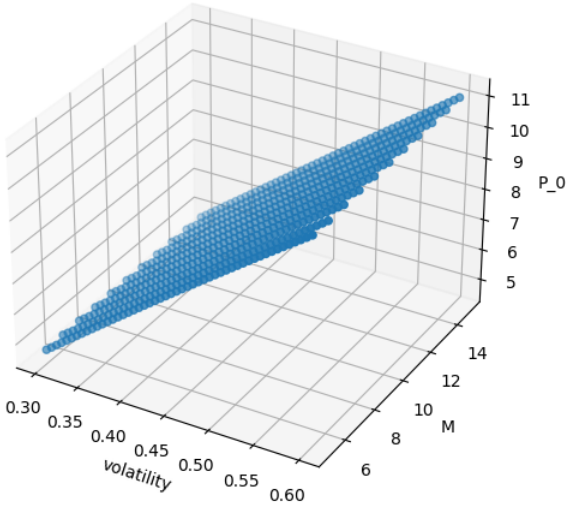
Asian Put Option Prices vs volatility and #sub-intervals for part (a) with K: 10



sian Call Option Prices vs volatility and #sub-intervals for part (b) with K: 100



Asian Put Option Prices vs volatility and #sub-intervals for part (b) with K: 10



16) Asian option price vs Volatility - # sub-intervals with strike: 105