Ma374-LAB 02

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Submission Date: 28-01-2021

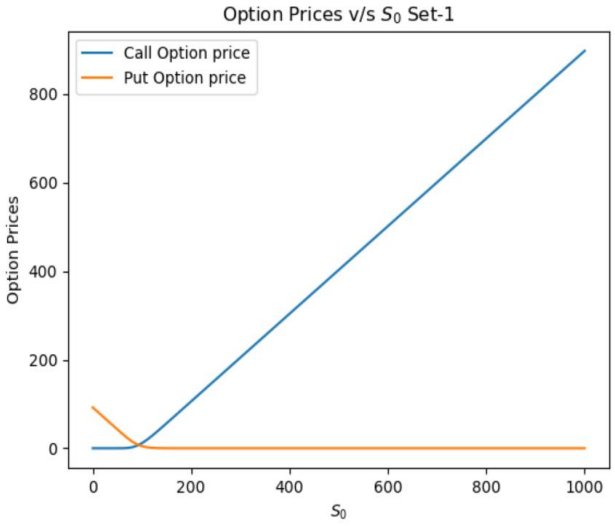
Question 1: S (0) = 100, K = 100, T = 1, M = 100, r = 8%, σ = 20%

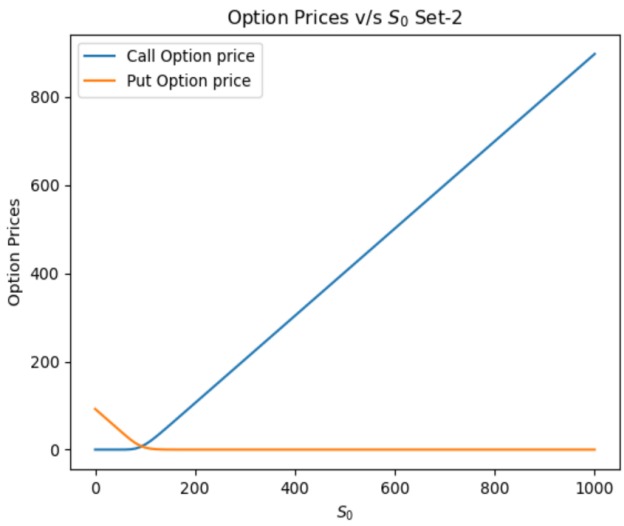
Formula Used according to binomial pricing model:

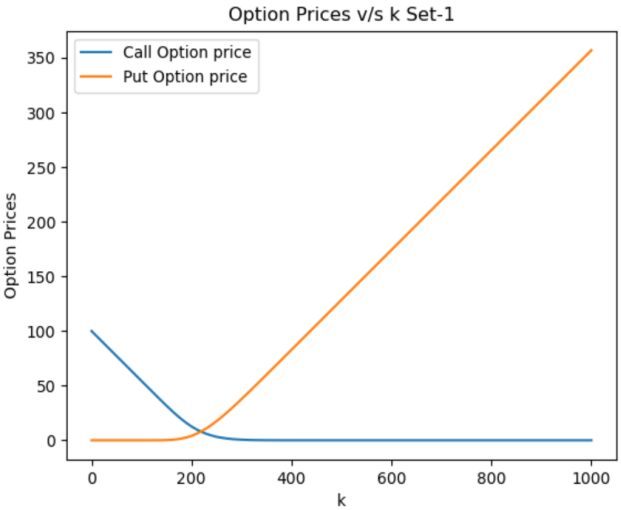
$$Option\ Price = \frac{1}{e^{rT}} \sum_{k=0}^{M} \binom{M}{k} p^k (1-p)^{M-k} f(S(0)u^k d^{M-k})$$

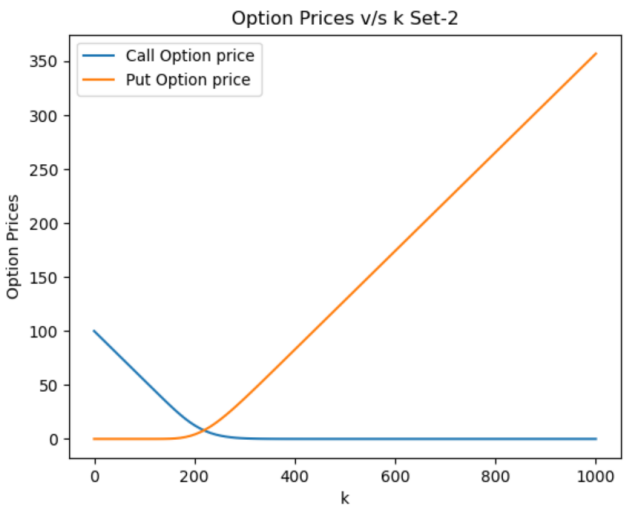
For above mentioned parameters and u, d taken from **Set 1:**
The initial price of European Call - 12.085380013710122
The initial price of European Put - 4.397014652374142
For above mentioned parameters and u, d taken from **Set 2:**
The initial price of European Call - 12.12304707401244
The initial price of European Put - 4.434681712676475

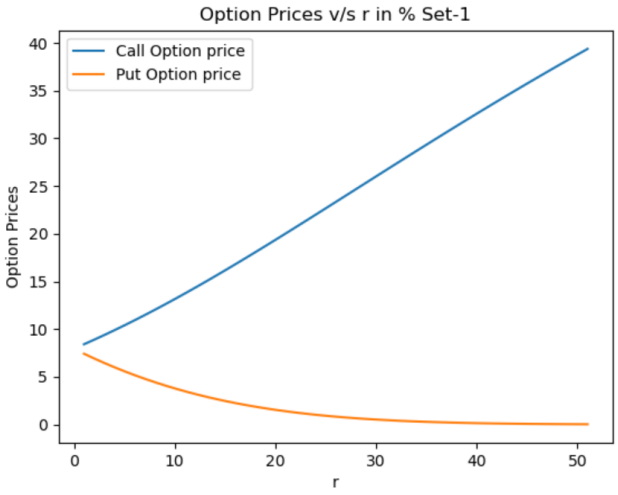
The 2-D plots of the option prices while varying one parameter at a time are shown below:

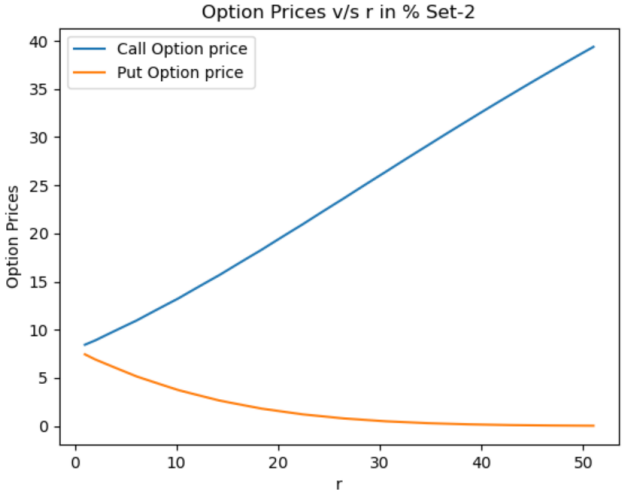


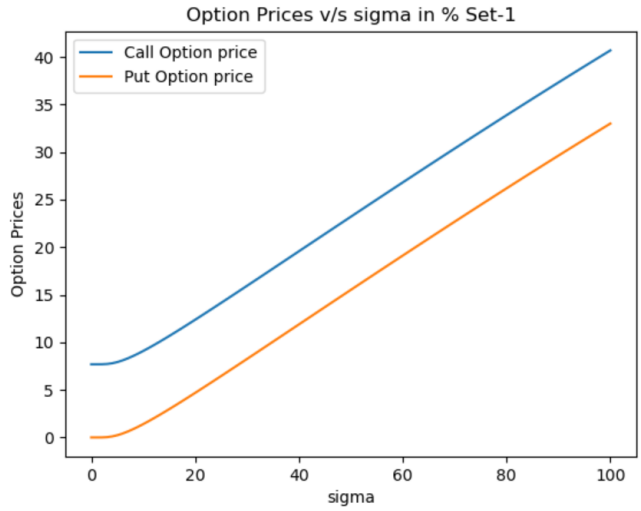


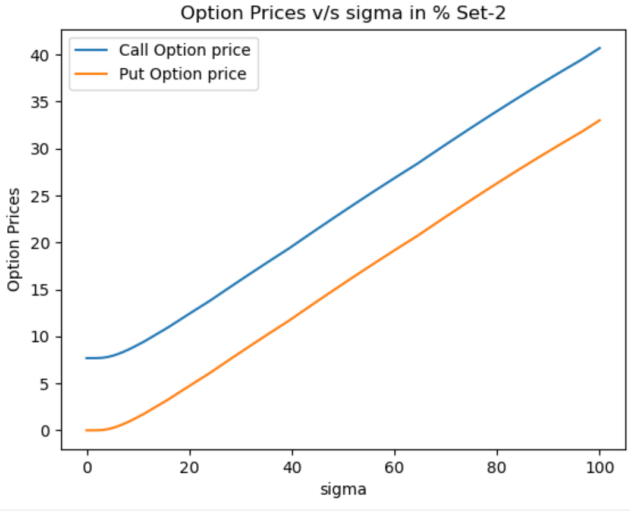


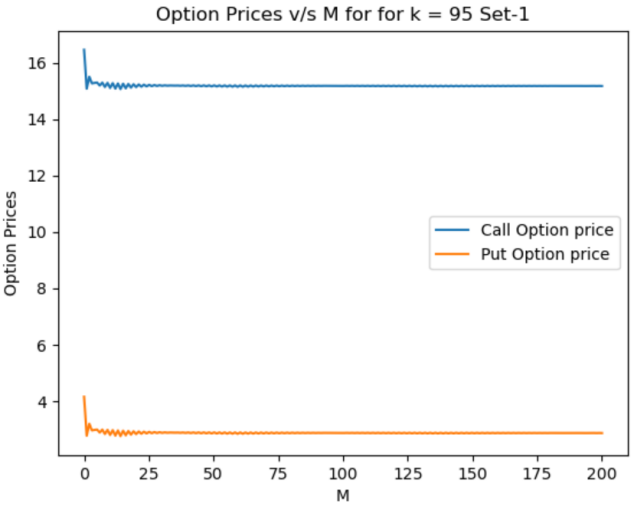


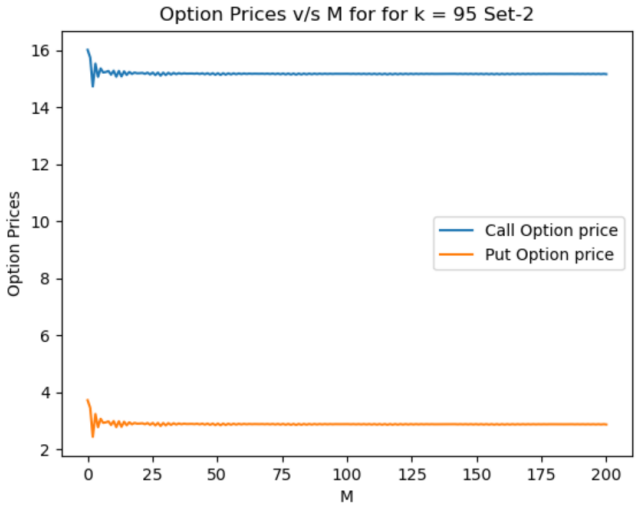

Option Prices v/s r in % Set-1
Call Option price
Put Option price
Option Prices
r

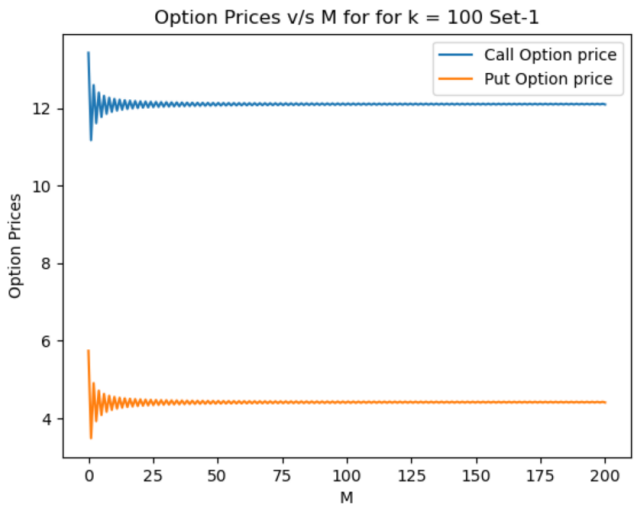

Option Prices v/s r in % Set-2
Call Option price
Put Option price
Option Prices
r

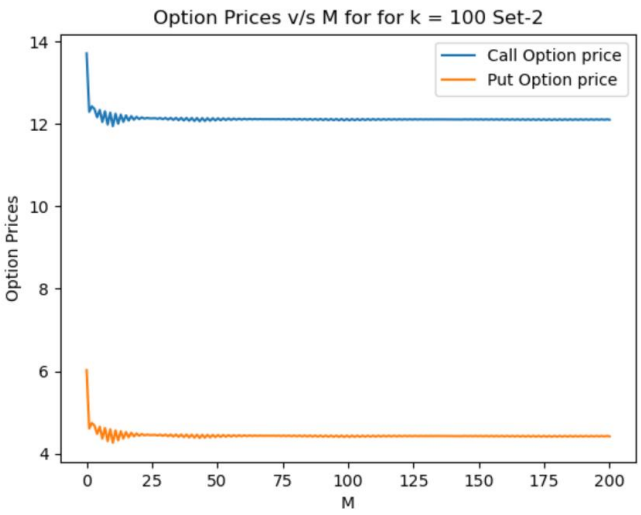

Option Prices v/s sigma in % Set-1
Call Option price
Put Option price
Option Prices
sigma

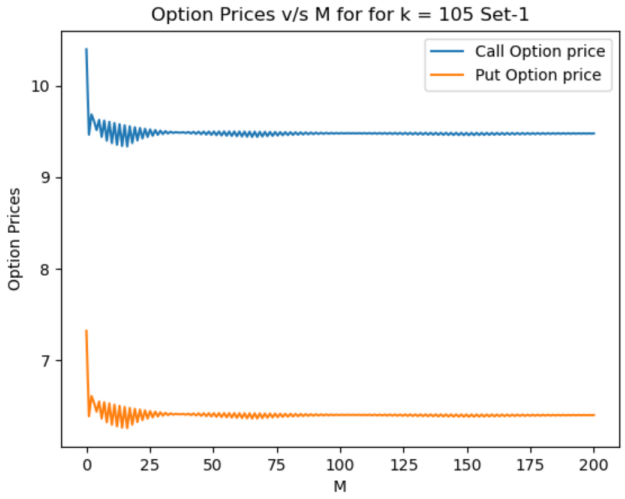

Option Prices v/s sigma in % Set-2
Call Option price
Put Option price
Option Prices
sigma

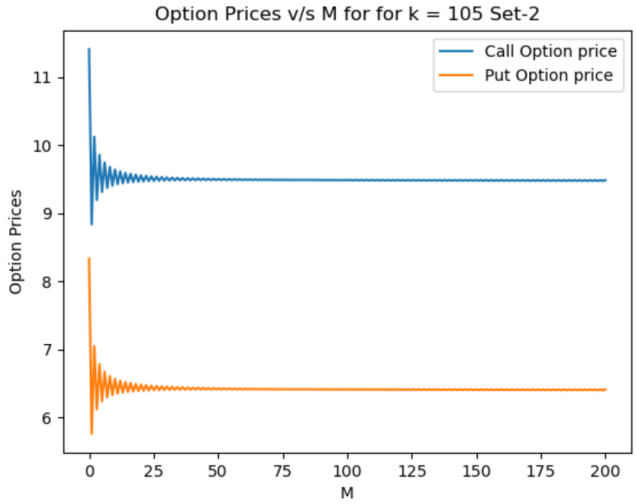

Option Prices v/s M for for k = 95 Set-1
Call Option price
Put Option price
Option Prices
M


Option Prices v/s M for for k = 95 Set-2
Call Option price
Put Option price
Option Prices
M









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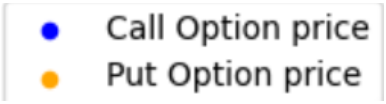
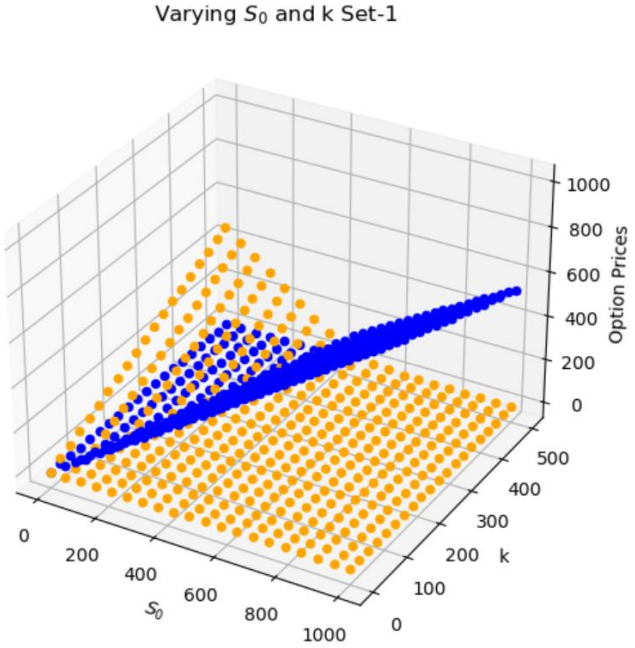
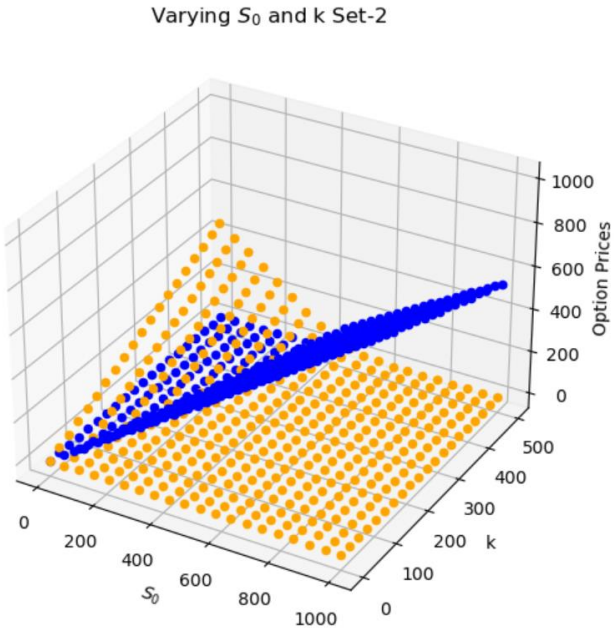
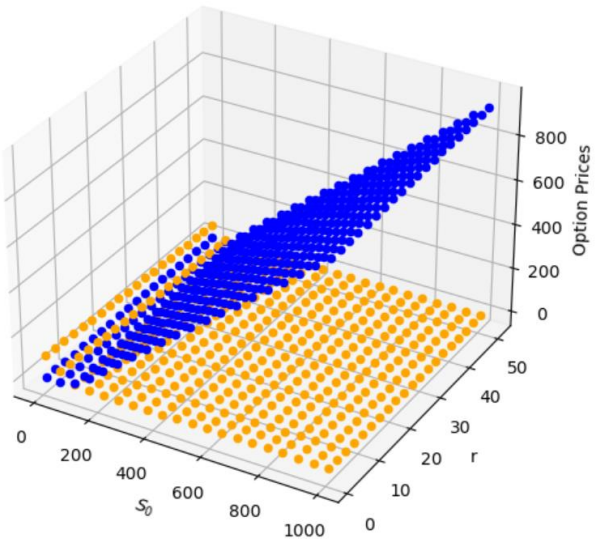


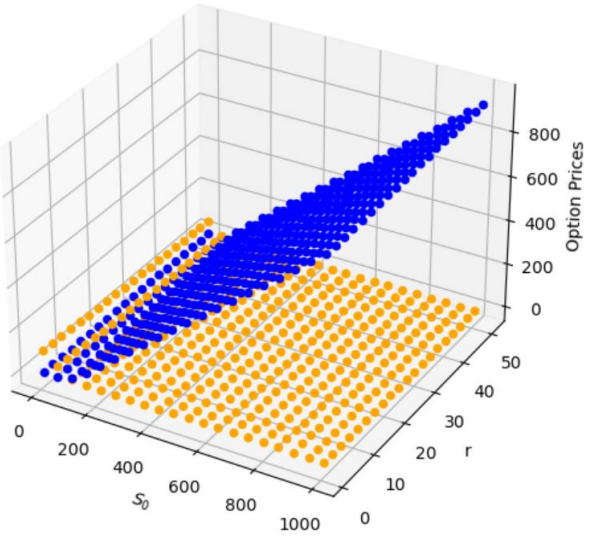




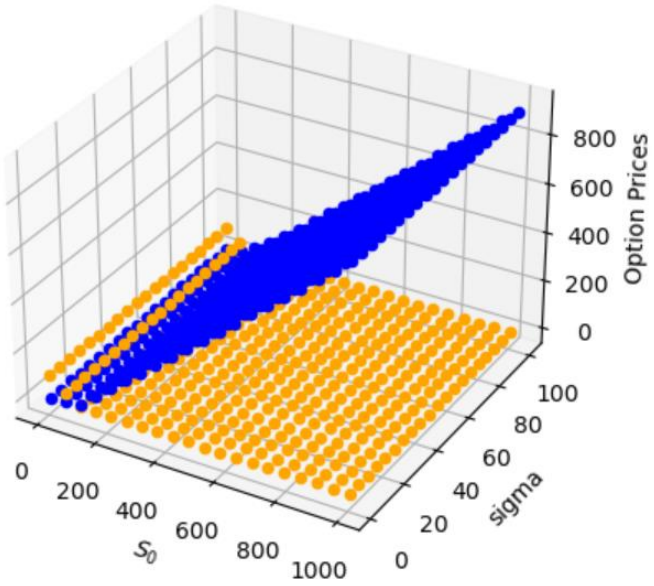
Varying S_0 and r in % Set-1



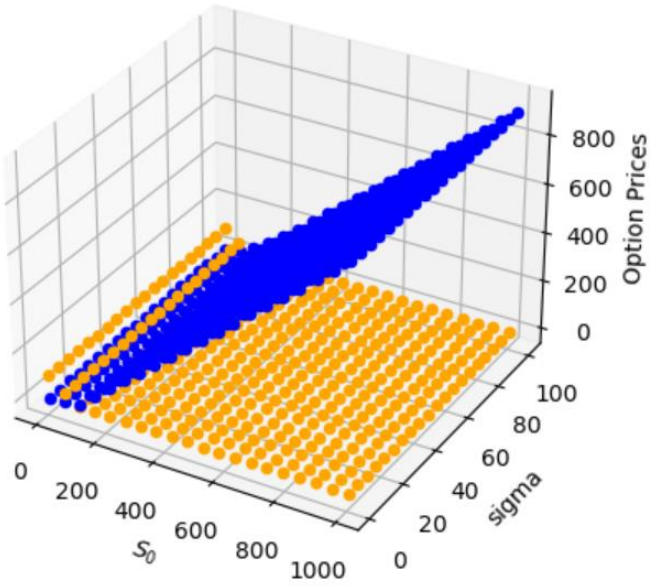
Varying S_0 and r in % Set-2



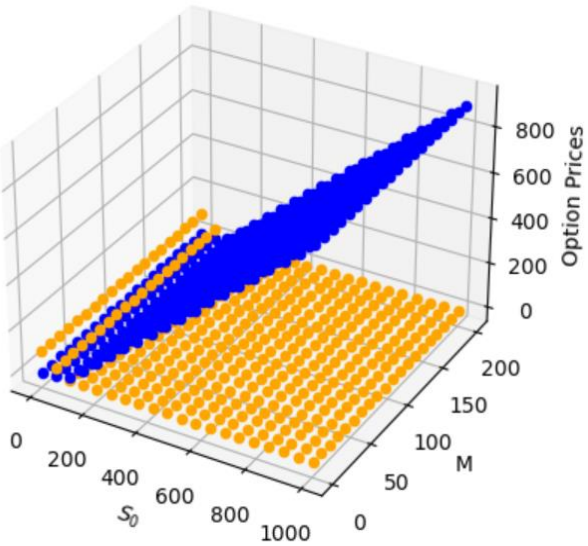
Varying S_0 and sigma Set-1



Varying S_0 and sigma Set-2



Varying S_0 and M Set-1



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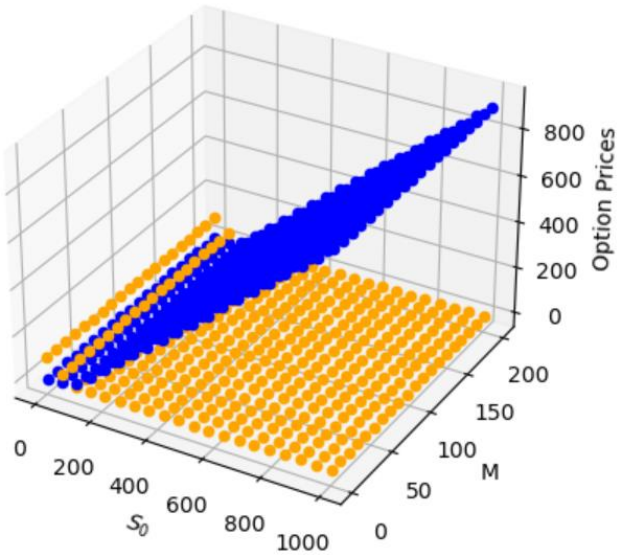
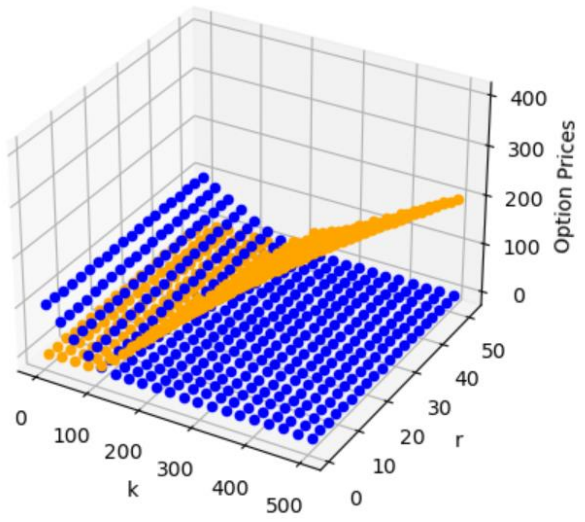
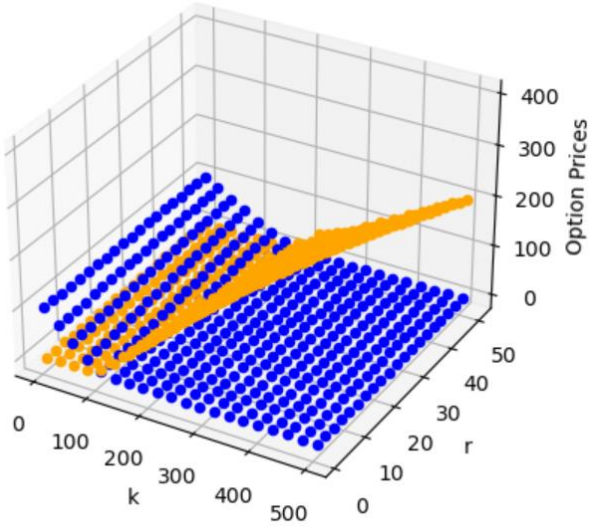


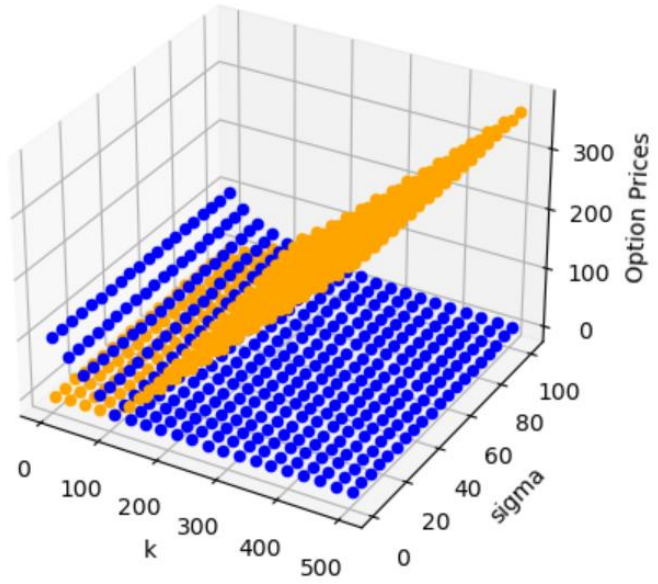
Varying k and r in % Set-1



Varying k and r in % Set-2



Varying k and sigma Set-1



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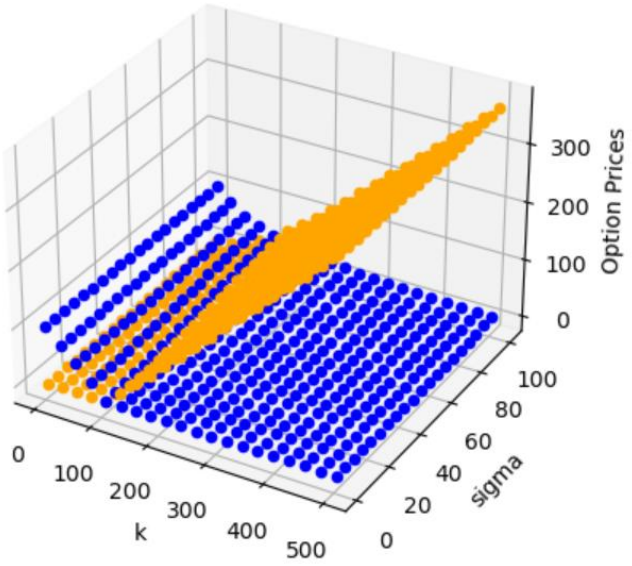
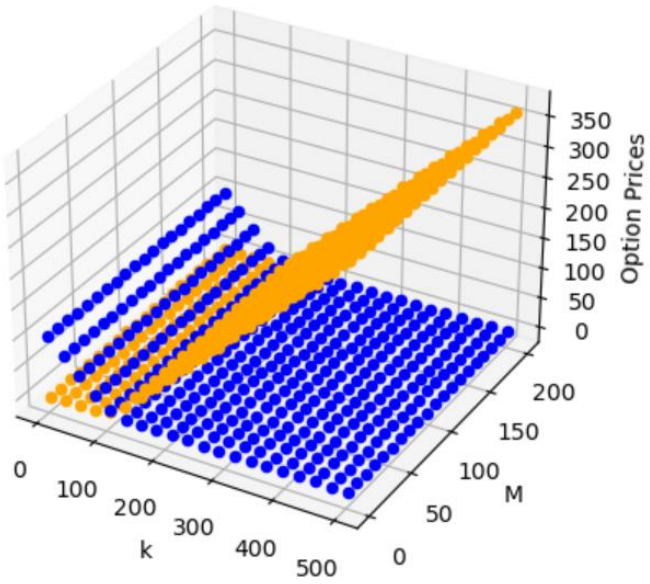


Varying k and M Set-1



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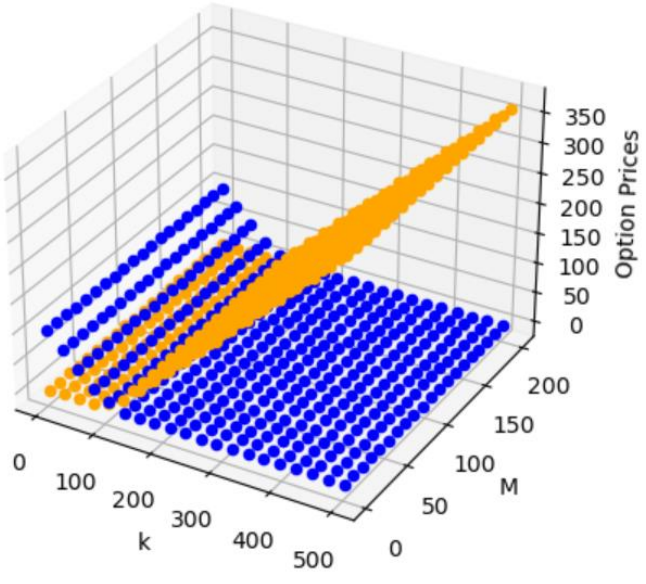
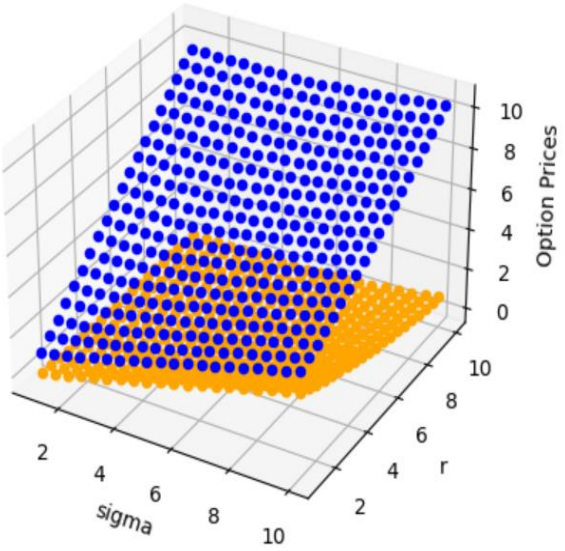
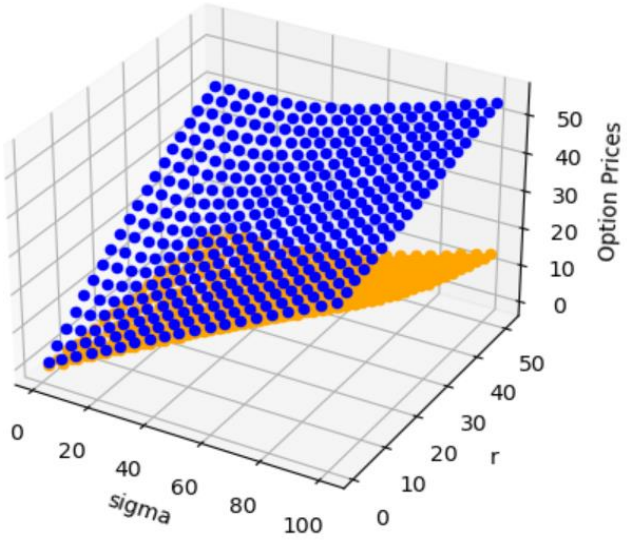


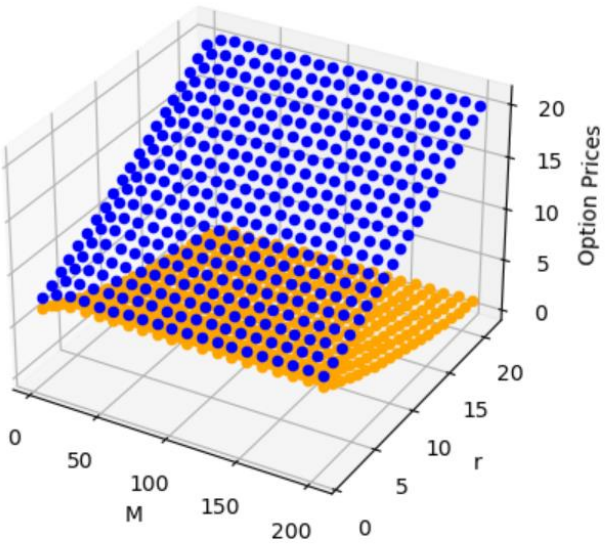
Varying sigma and r Set-1



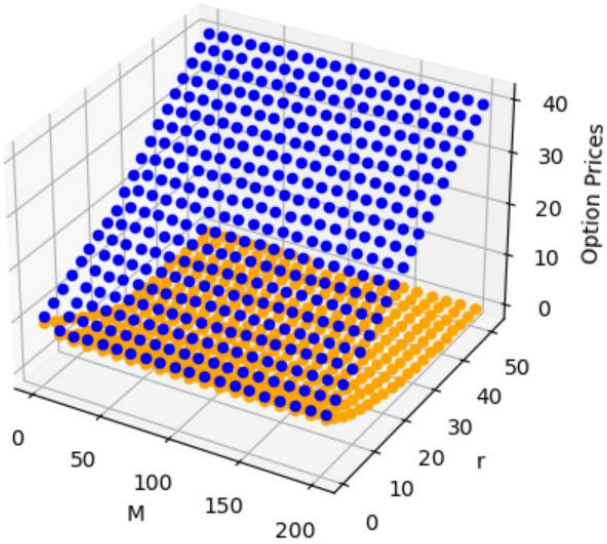
Varying sigma and r Set-2



Varying M and r Set-1



Varying M and r Set-2



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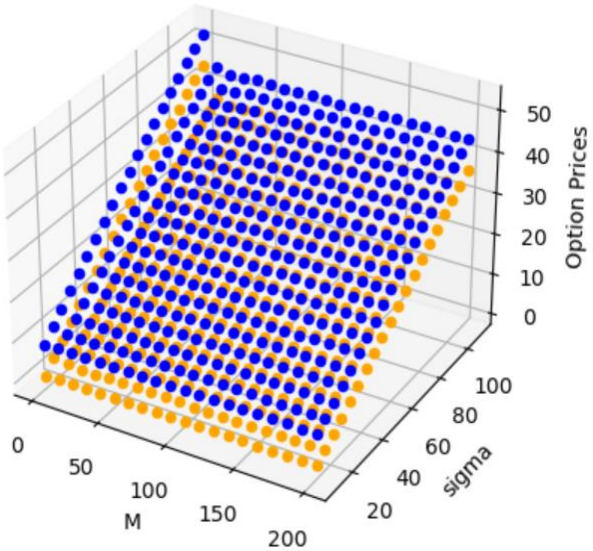
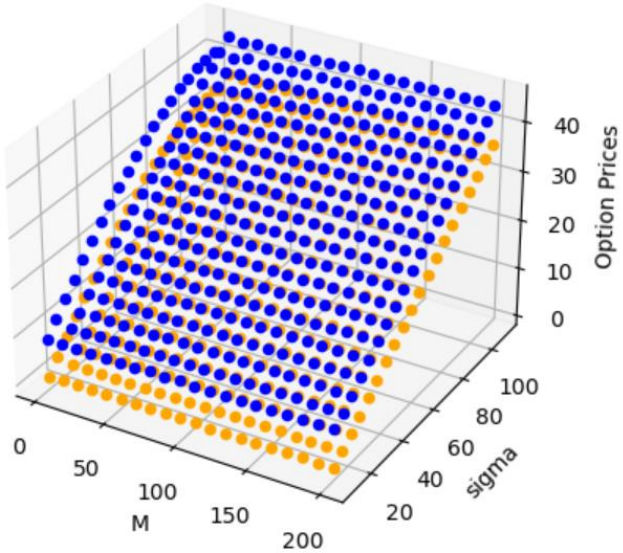


Varying M and sigma Set-2



Question 2: S (0) = 100, K = 100, T = 1, M = 10, r = 8%, σ = 20%

Path dependent derivative taken for this exercise has payoff for call and put options as follows:

Payoff for call option = Max (0, ($\frac{1}{2}(\mathrm{Max}(\mathrm{S(t)}) + \mathrm{Min}(\mathrm{S(t)}) - \mathrm{K} : 0 \leq t \leq T$))

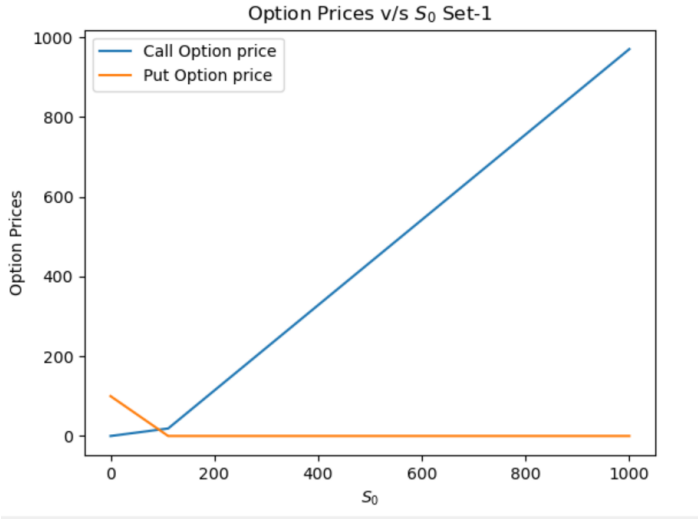
Payoff for call option = Max (0, ($K - \frac{1}{2}(\mathrm{Max}(\mathrm{S(t)}) + \mathrm{Min}(\mathrm{S(t)}) : 0 \leq t \leq T$))

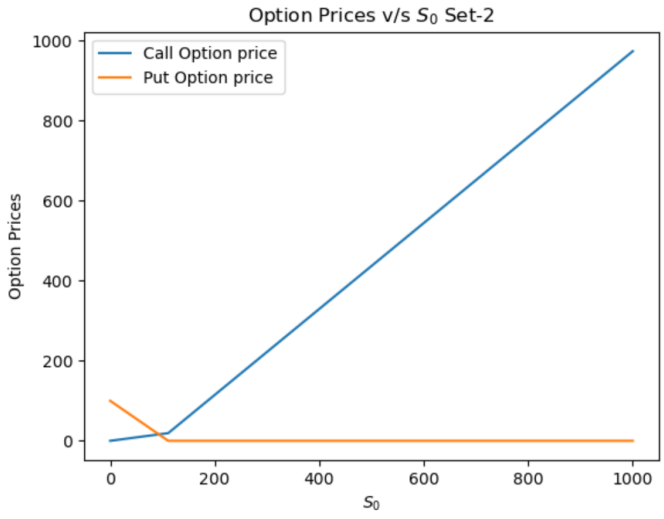
For above mentioned parameters and u, d taken from **Set 1:**
The initial price of Call - 7.492163645569773
The initial price of Put - 2.7341844236221524
For above mentioned parameters and u, d taken from **Set 2:**
The initial price of Call - 7.525969155357044
The initial price of Put - 2.7376922309528795

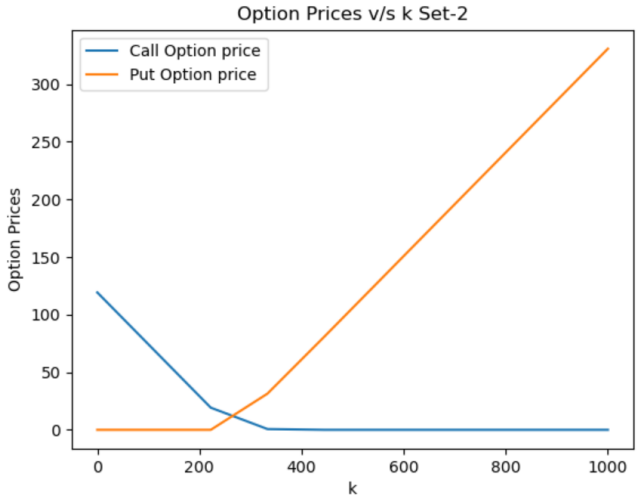
Formula Used for according to binomial pricing model:

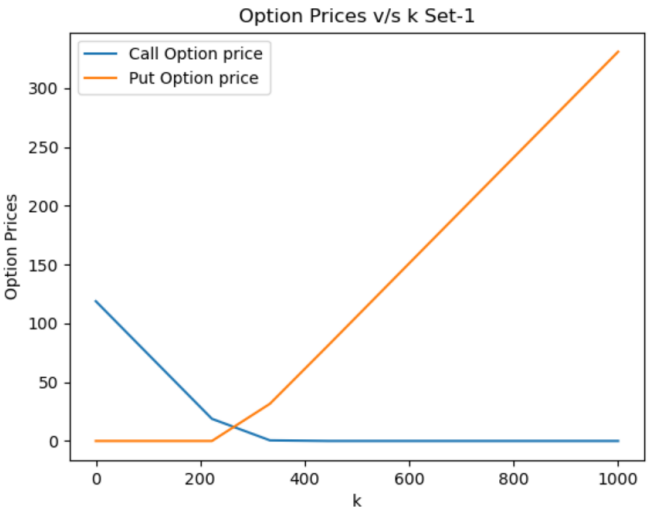
$$Option\ Price = \frac{1}{e^{rT}} \sum_{over\ all\ paths} p^u (1-p)^{M-u} f(S_{max}, S_{min})$$

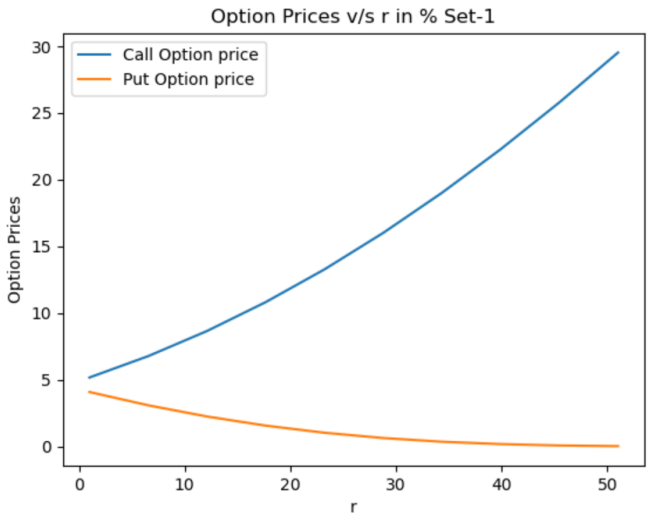
The 2-D plots of the option prices while varying one parameter at a time are shown below:










Option Prices v/s r in % Set-1
Call Option price
Put Option price
Option Prices
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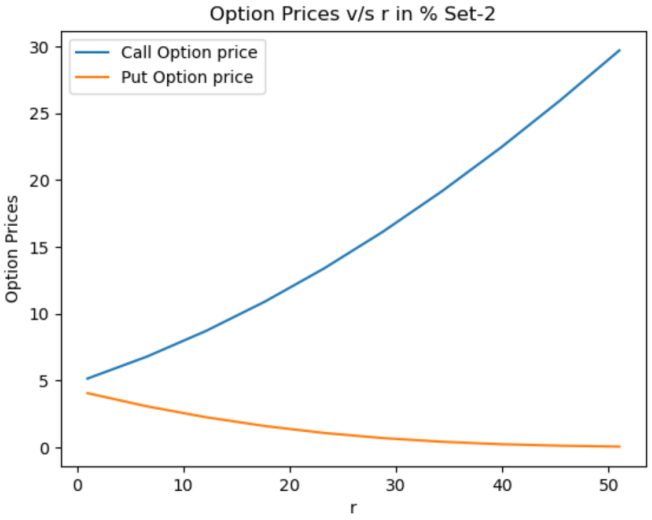
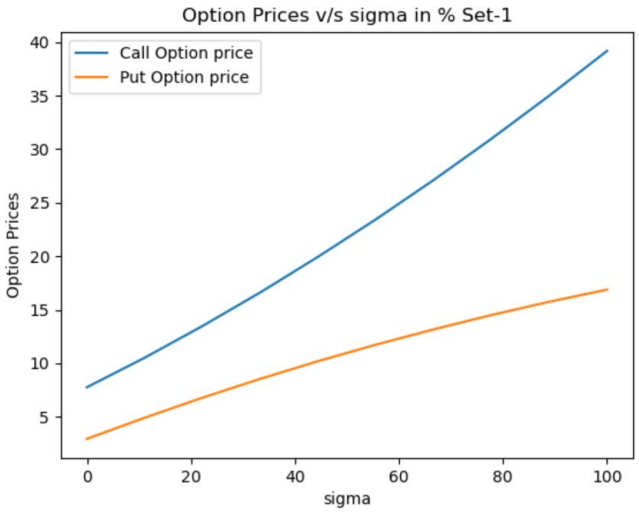
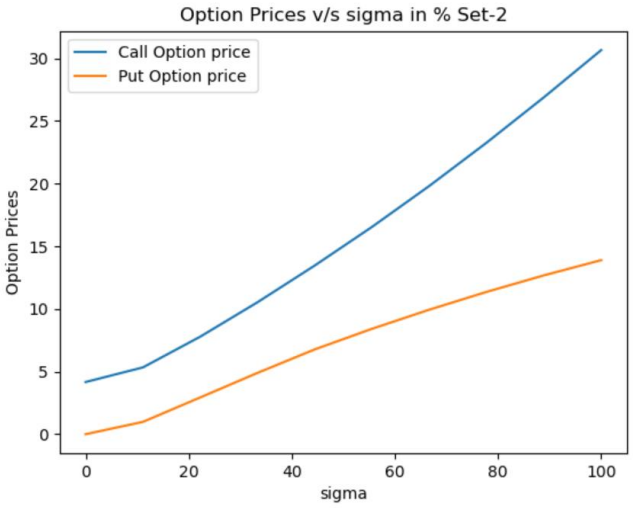

Option Prices v/s r in % Set-2
Call Option price
Put Option price
Option Prices
r


Option Prices v/s sigma in % Set-1
Call Option price
Put Option price
Option Prices
sigma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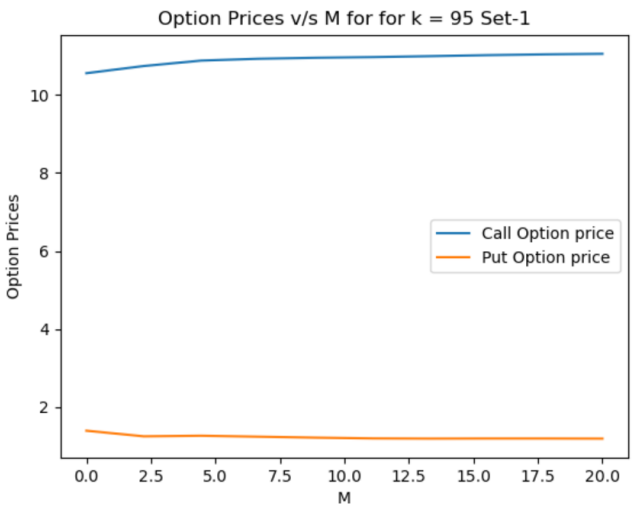
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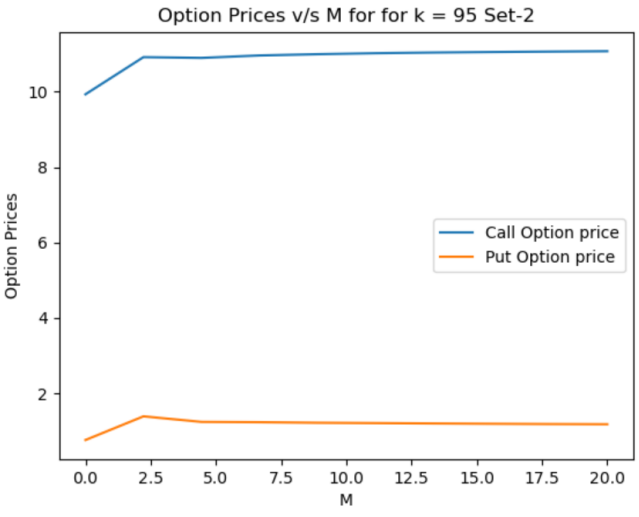
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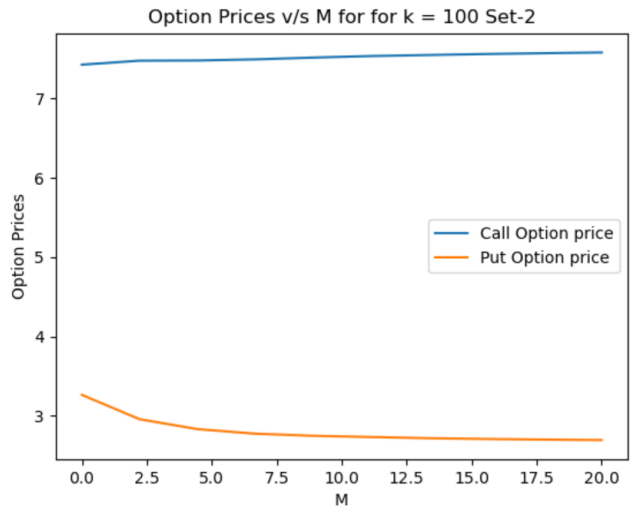

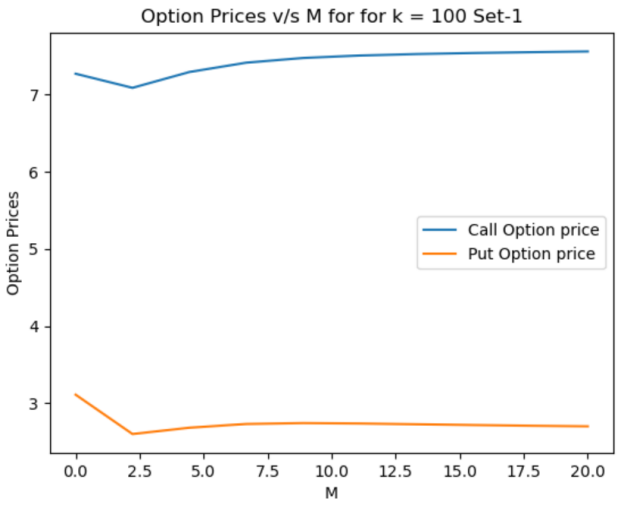

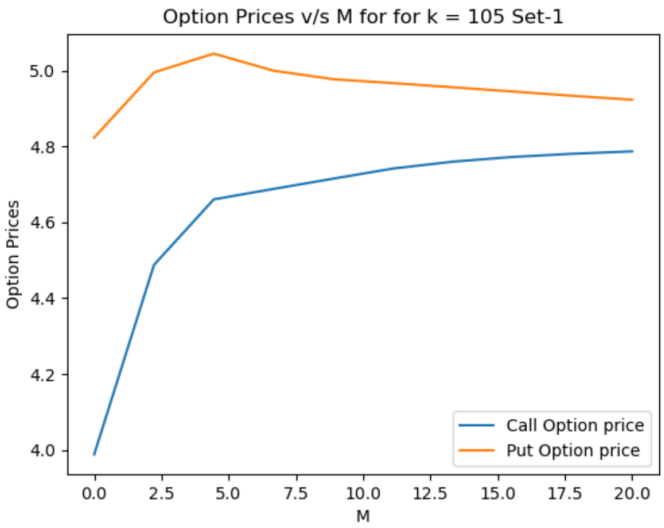

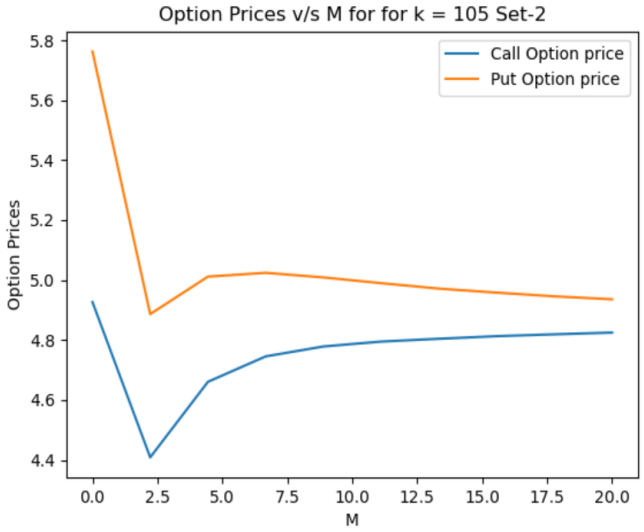

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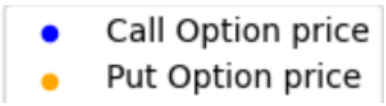
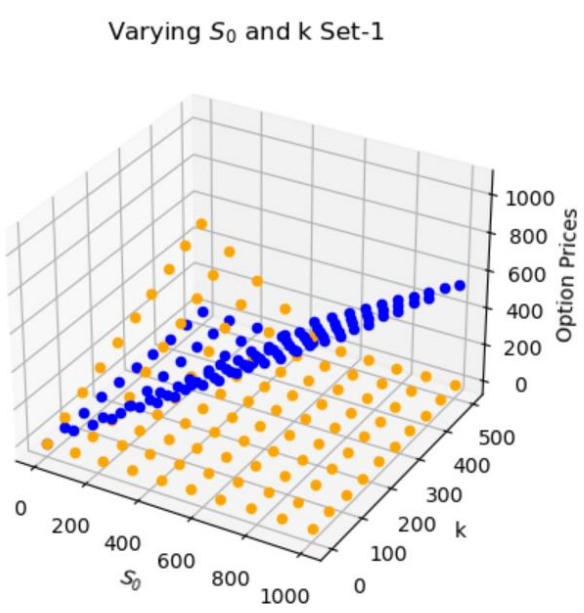
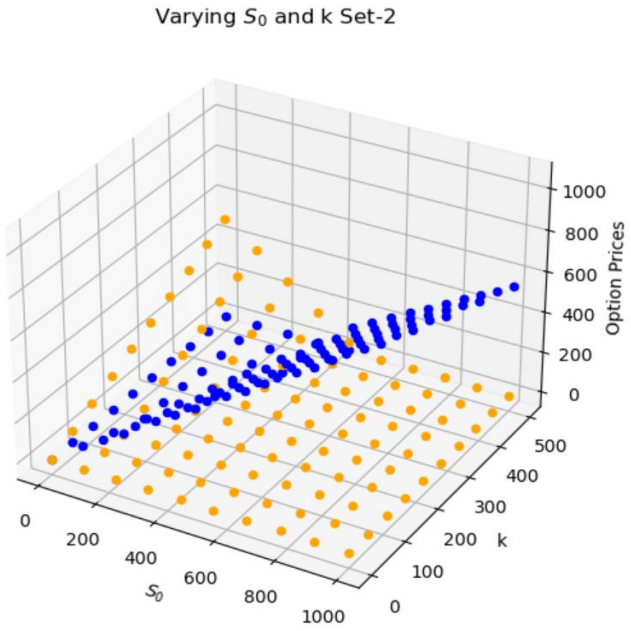
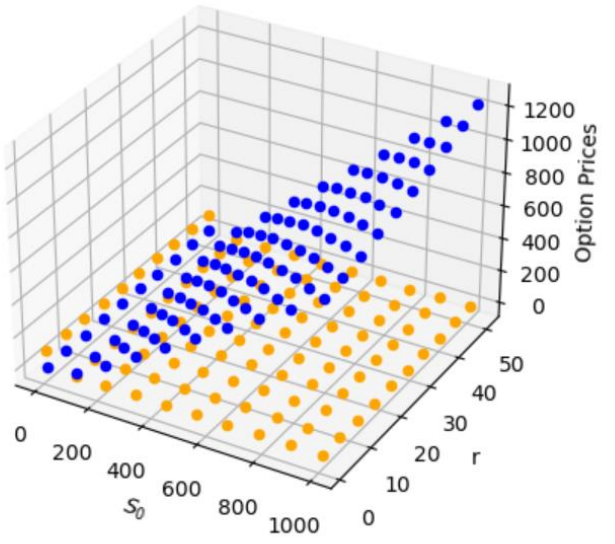


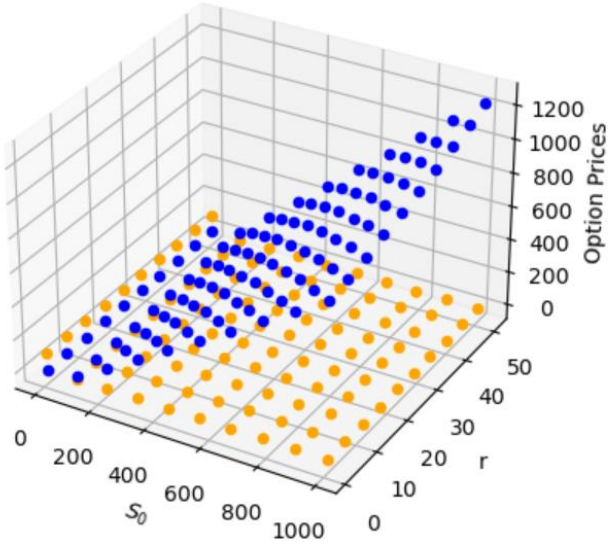




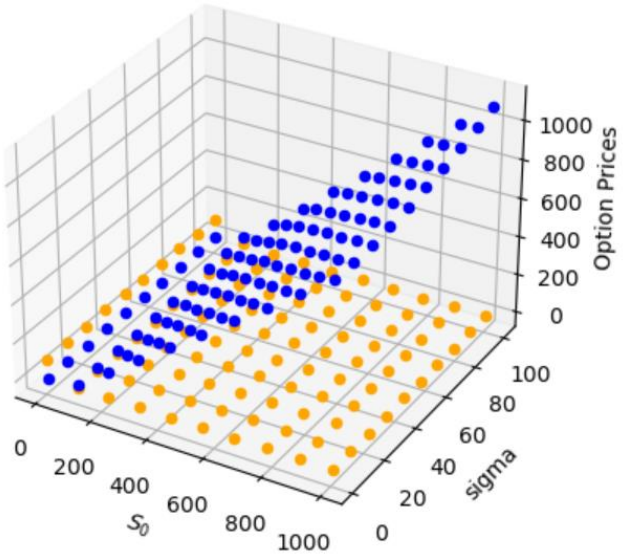
Varying S_0 and r in % Set-1



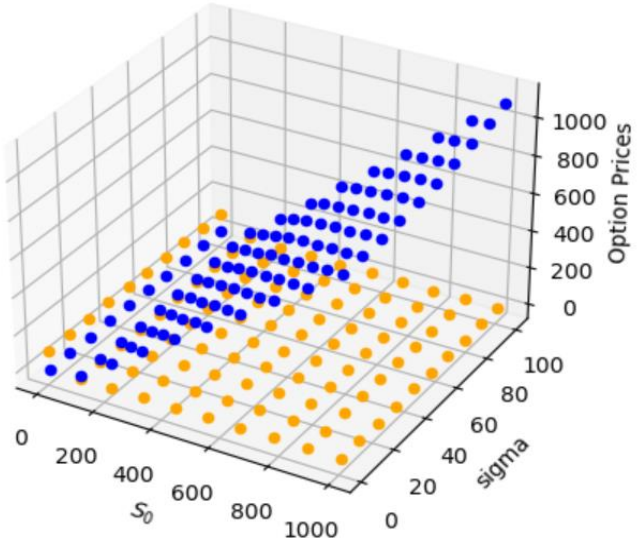
Varying S_0 and r in % Set-2



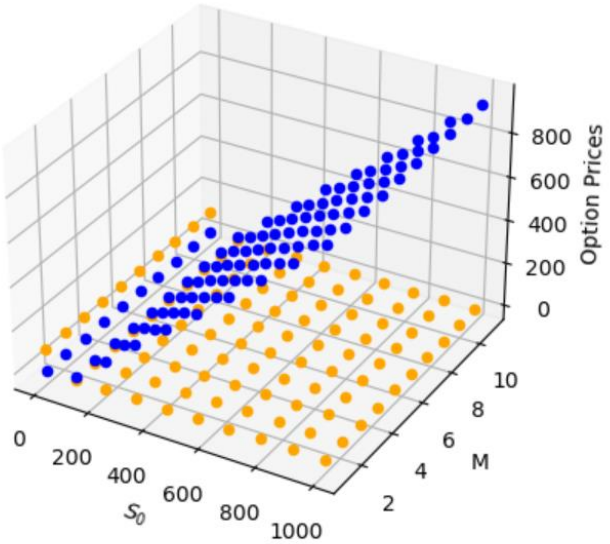
Varying S_0 and sigma in % Set-1



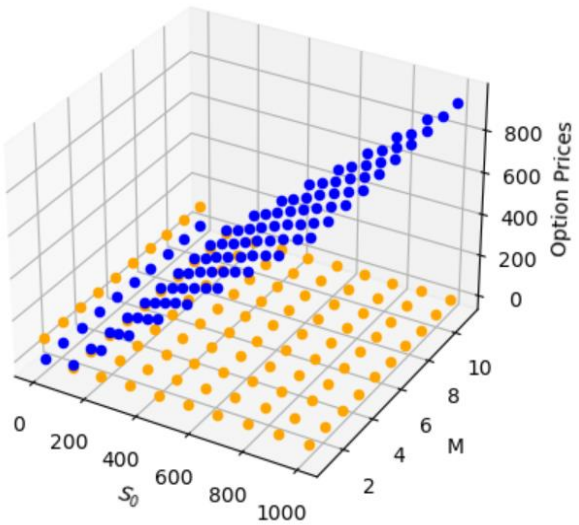
Varying S_0 and sigma in % Set-2



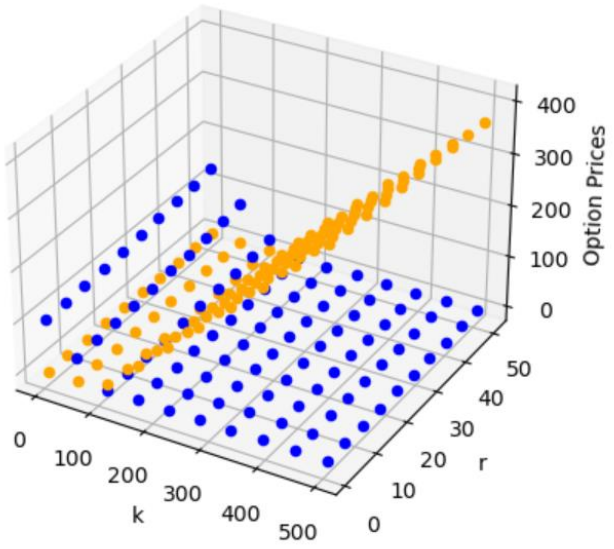
Varying S_0 and M Set-1



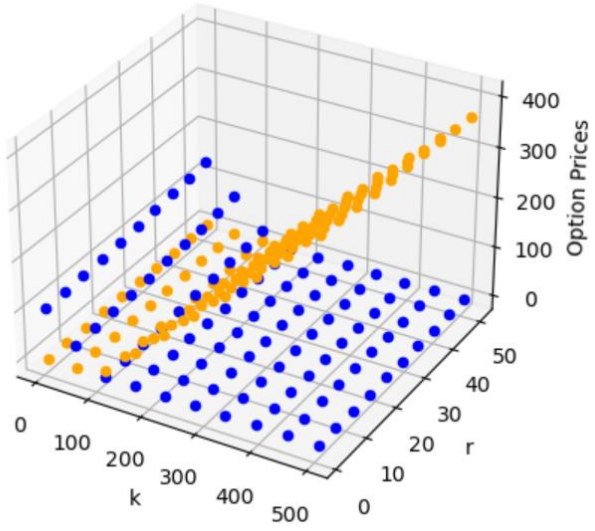
Varying S_0 and M Set-2



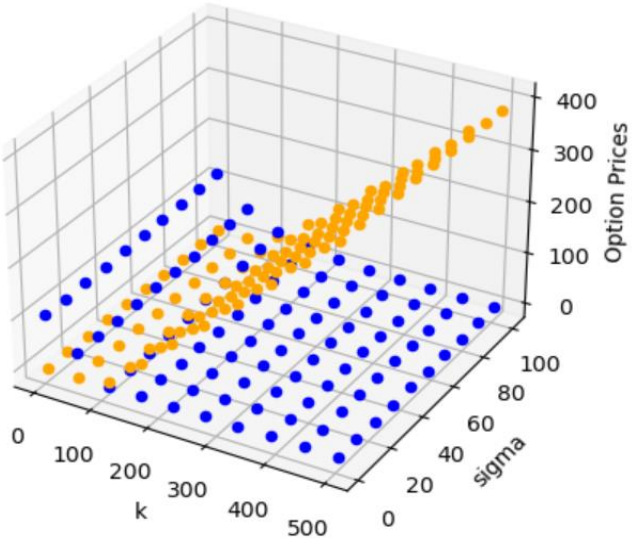
Varying k and r in % Set-1



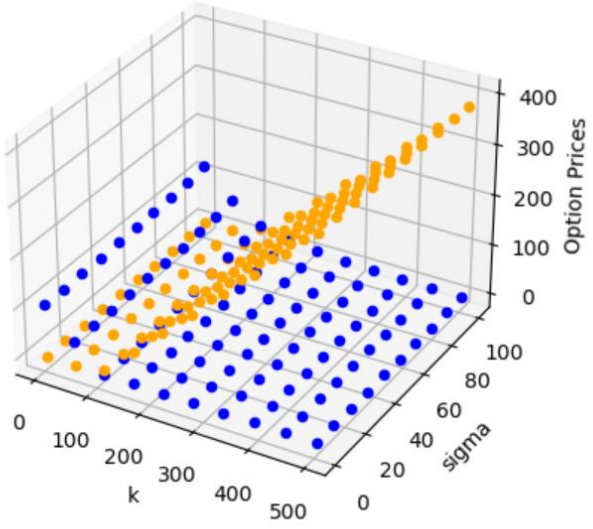
Varying k and r in % Set-2



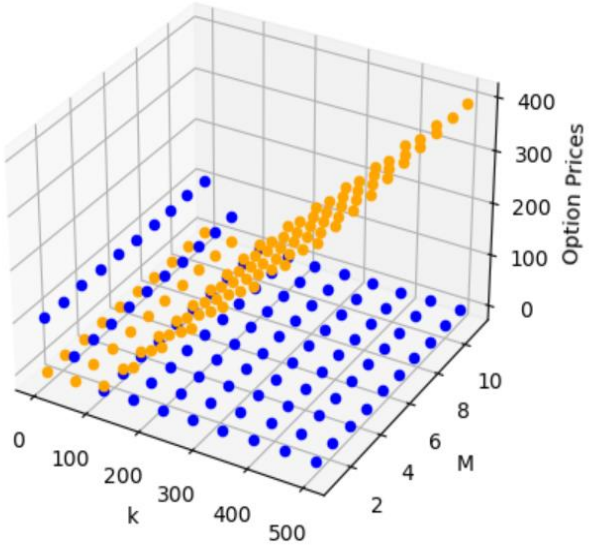
Varying k and sigma in % Set-1



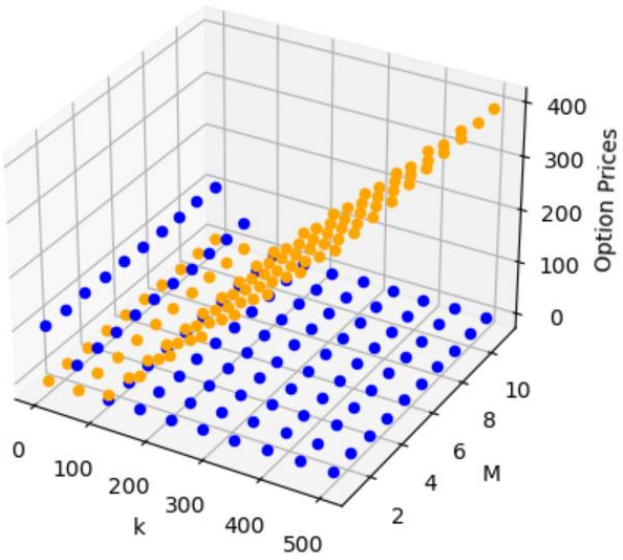
Varying k and sigma in % Set-2



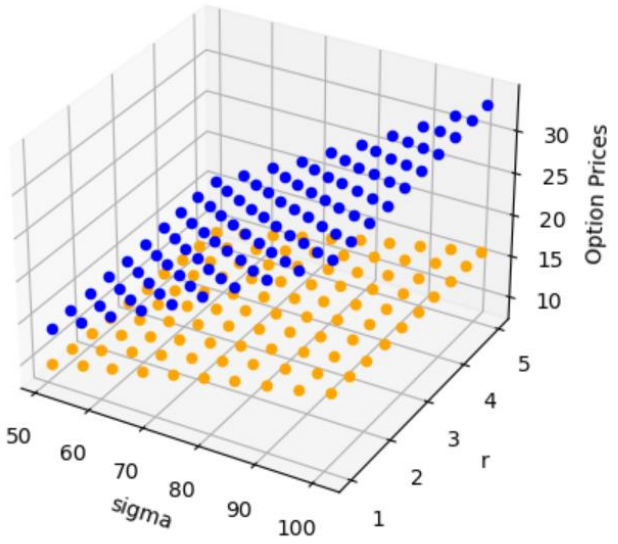
Varying k and M Set-1



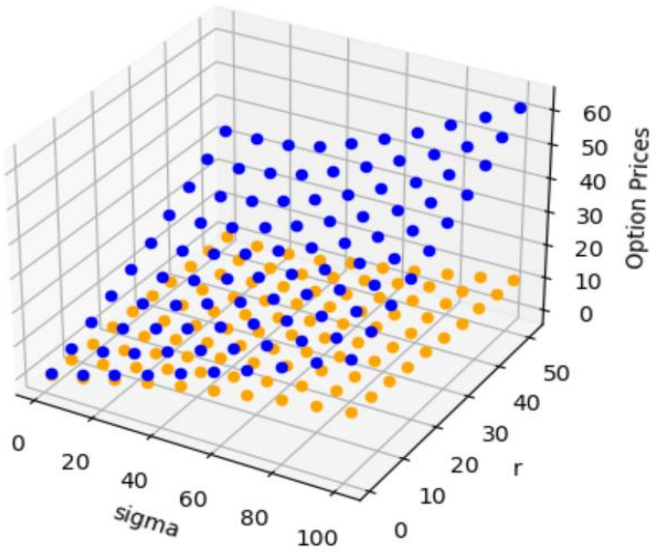
Varying k and M Set-2



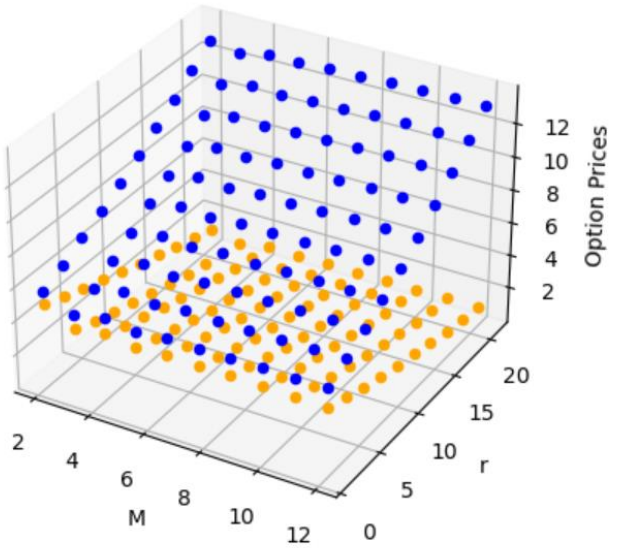
Varying sigma in % and r in % Set-1



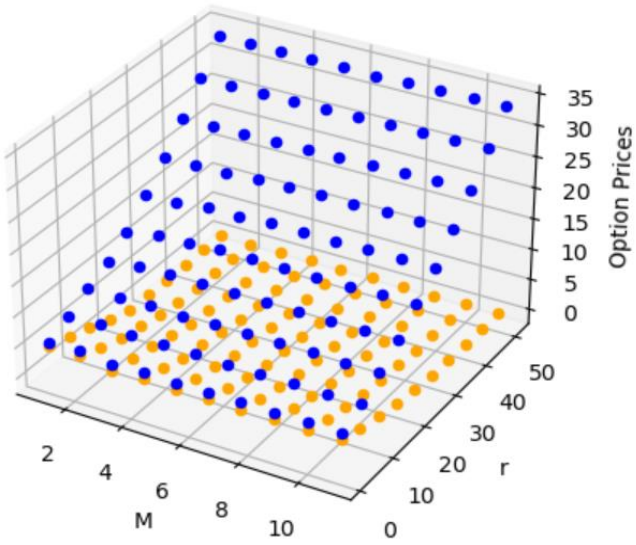
Varying sigma in % and r in % Set-2



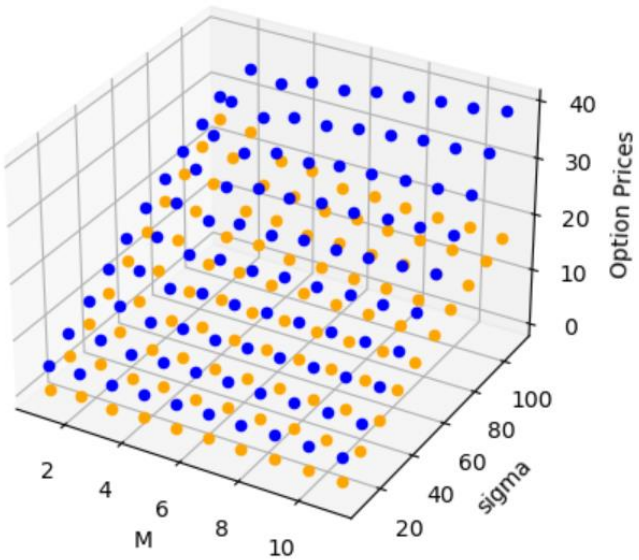
Varying M and r in % Set-1



Varying M and r in % Set-2



Varying M and sigma in % Set-1



Varying M and sigma in % Set-2