

Financial Engineering Lab (MA374)

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Roll Number - 180123021

Lab - 02

To run the code type **python3 180123021_Kartikeya_Singh_q1.py** and **python3 180123021_Kartikeya_Singh_q2.py** into the terminal. As a lot of graphs are generated, the execution may take some time.

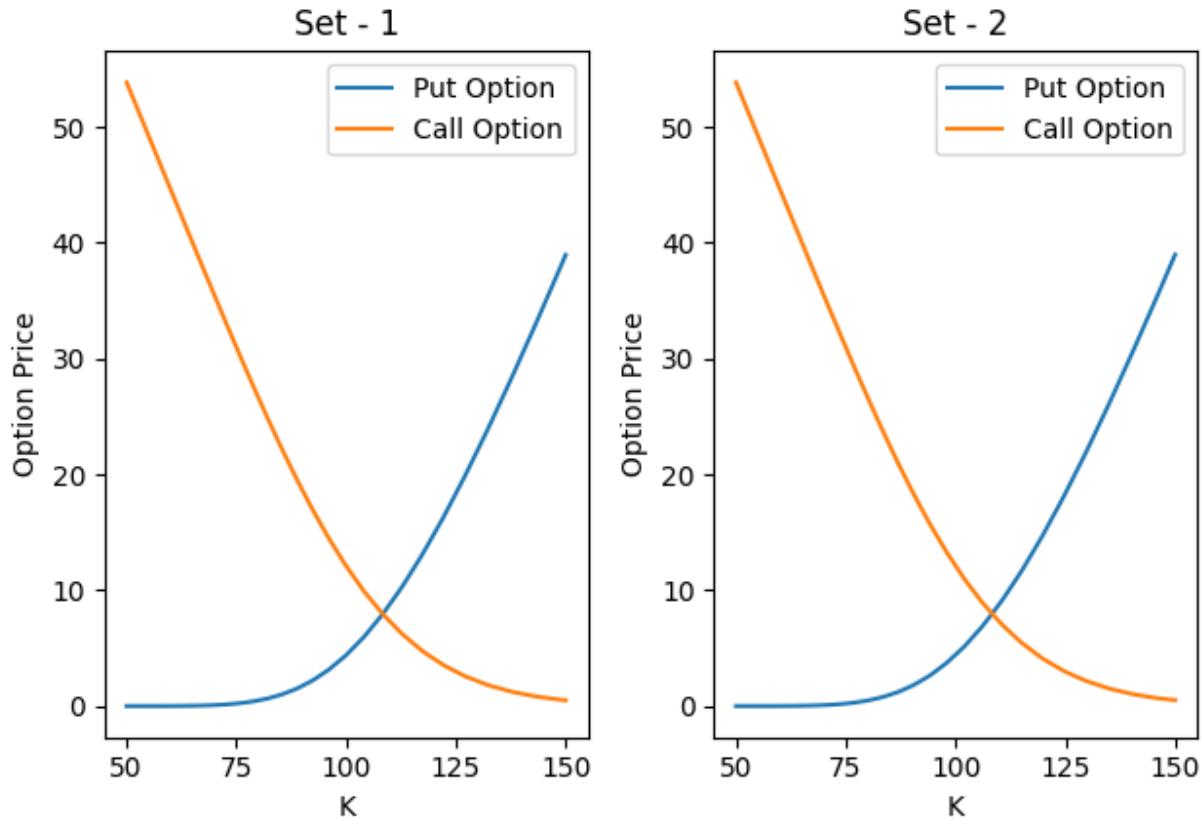
Question 1

The initial price of a European call and a European put option in the binomial model is determined for both sets of (u, d). The initial prices are -

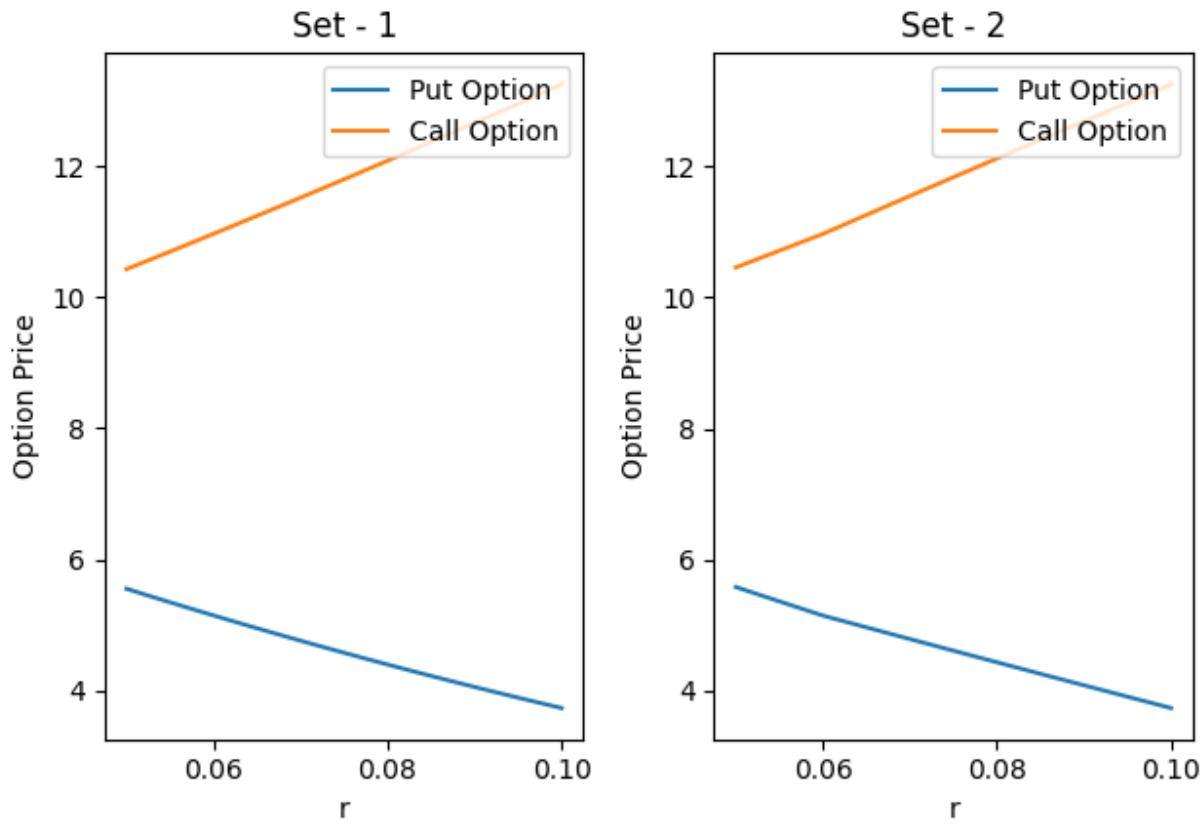
- 1.) Set - 1
 - a.) Call Option Price = 12.085380
 - b.) Put Option Price = 4.397015
- 2.) Set - 2
 - a.) Call Option Price = 12.123047
 - b.) Put Option Price = 4.434682

Now, the sensitivity analysis of the initial price is carried out by varying the parameter taking 1 parameter and 2 parameters at a time. The graphs for the following are -

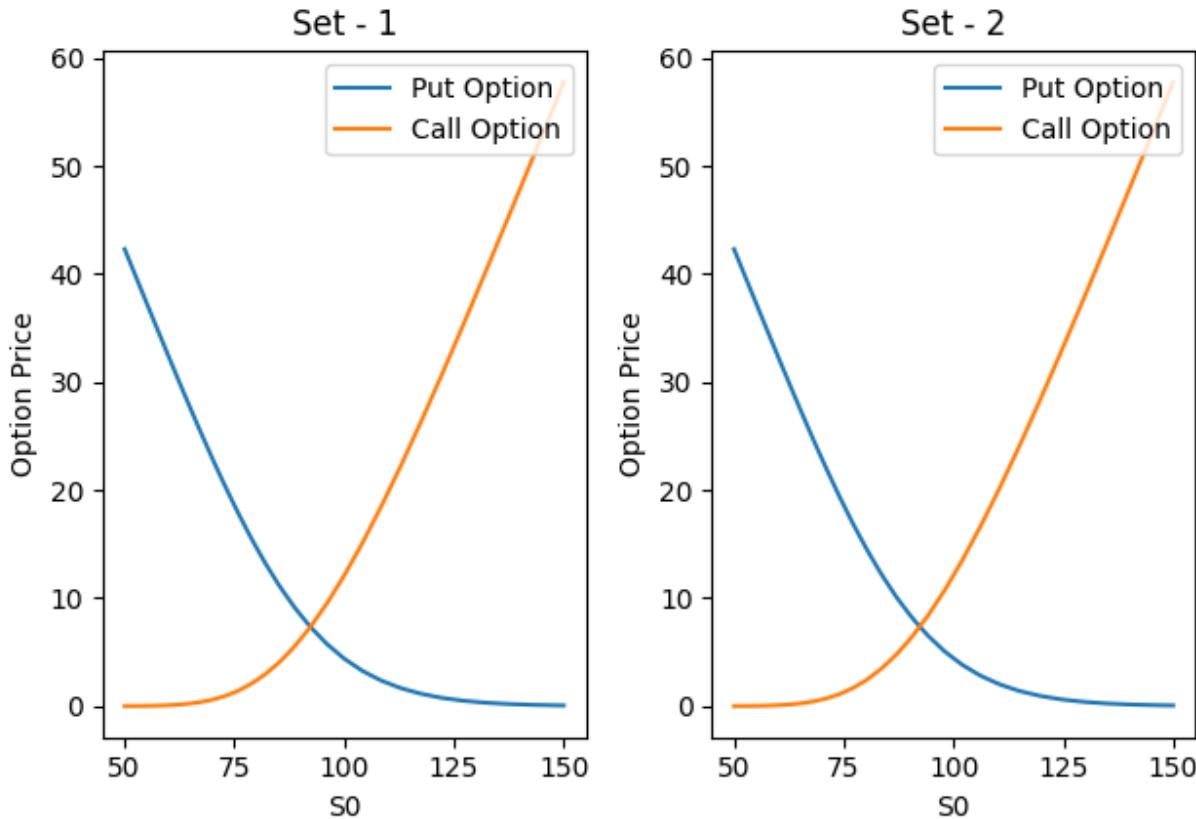
Varying K



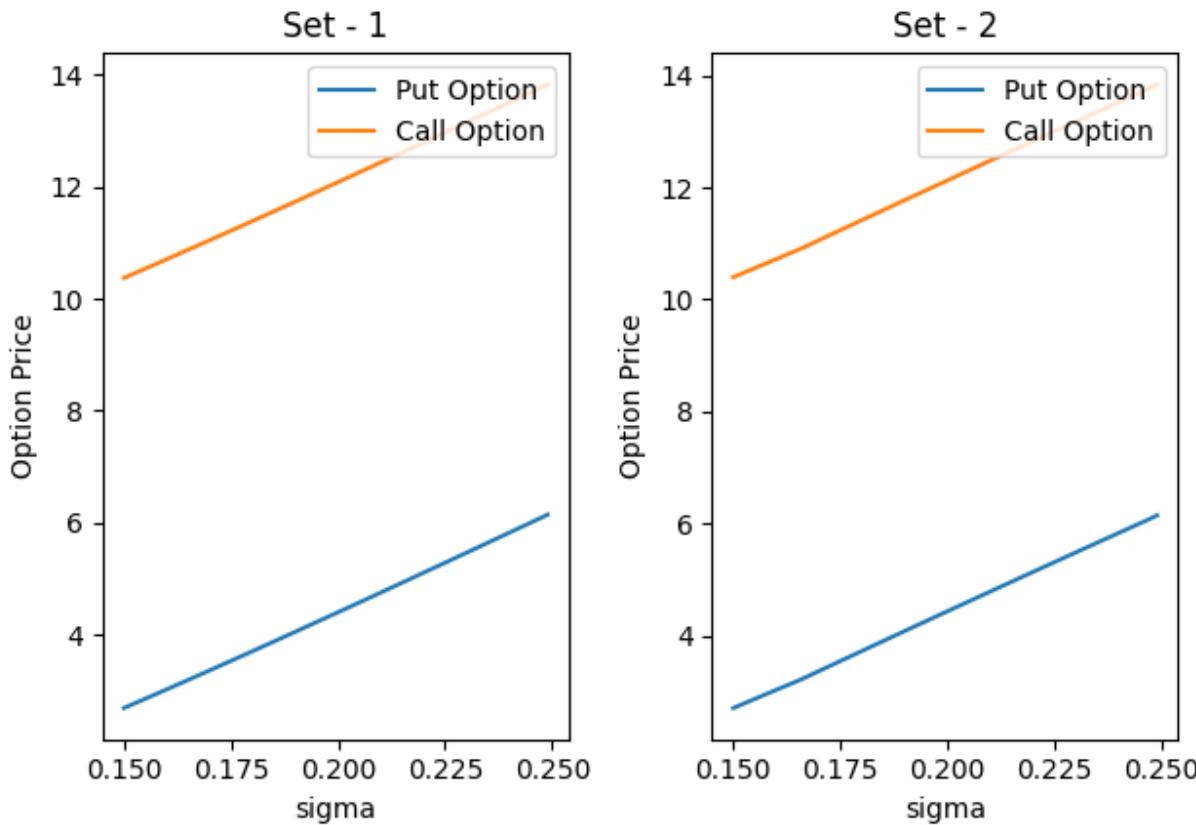
Varying r



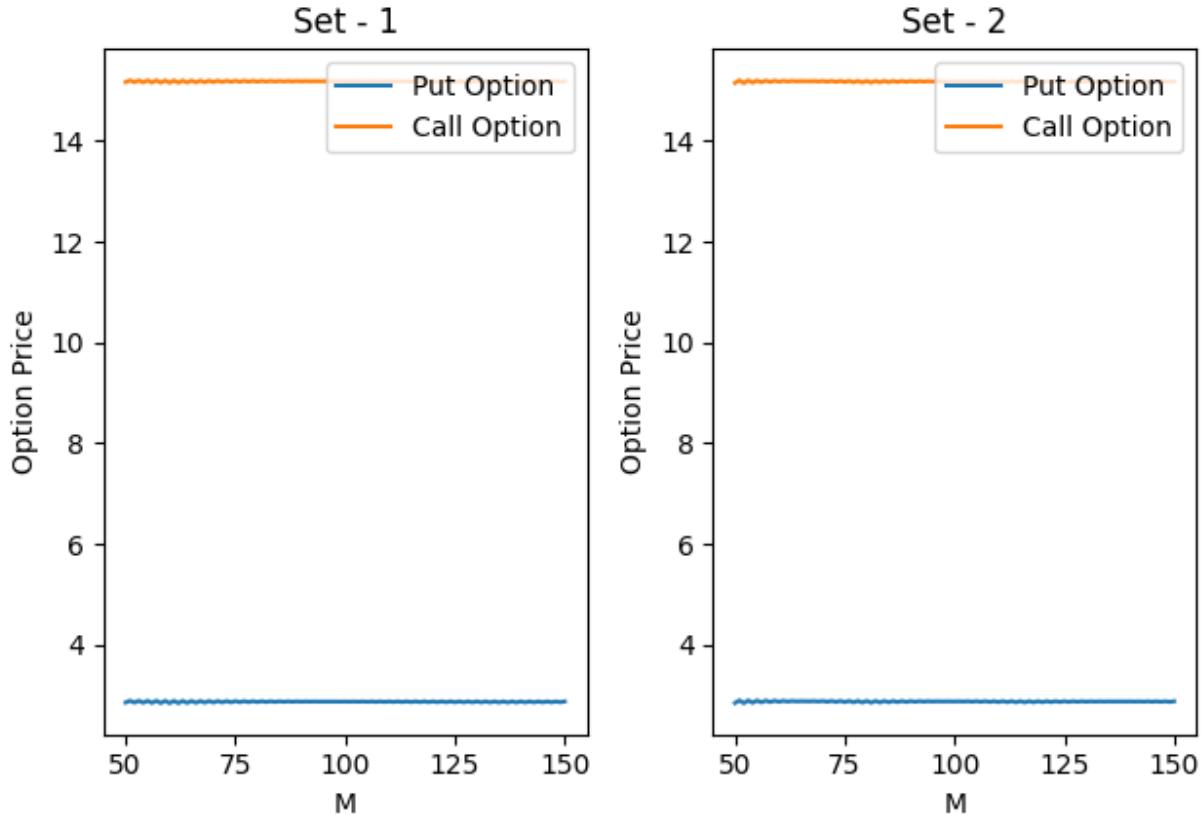
Varying S_0



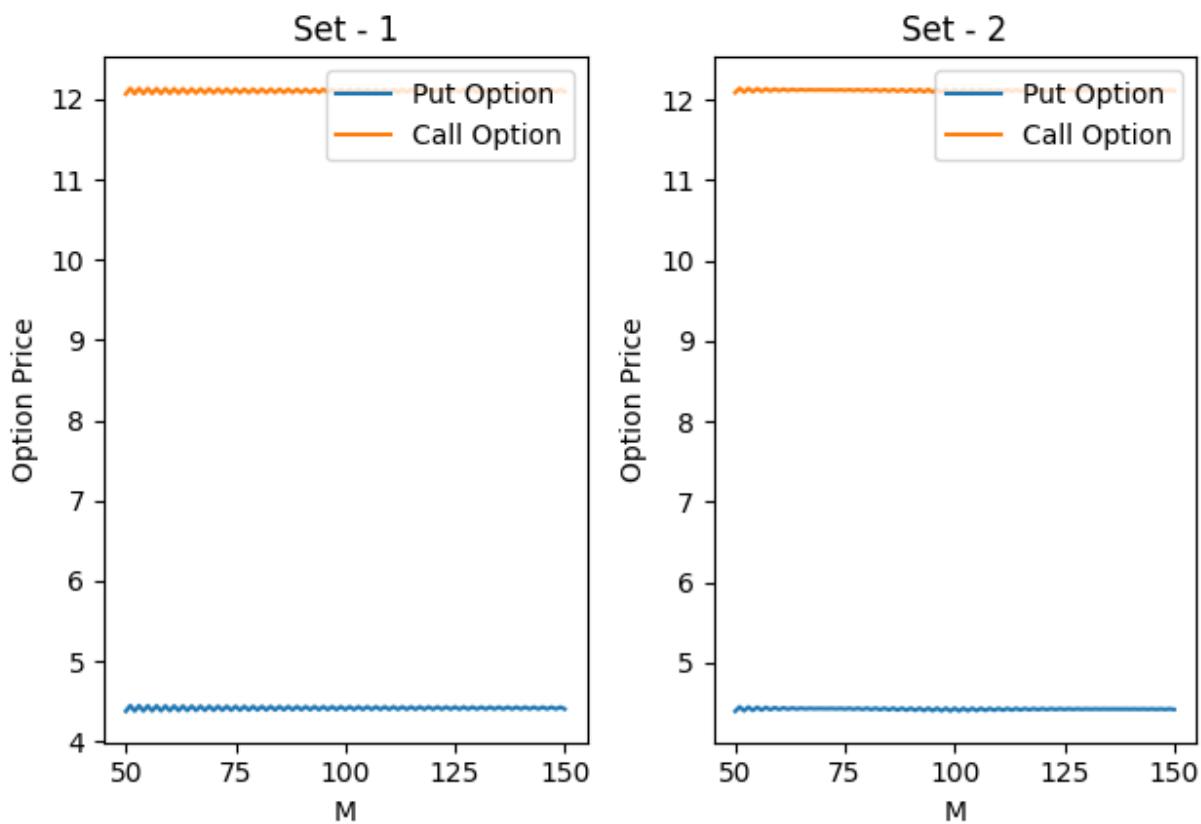
Varying sigma



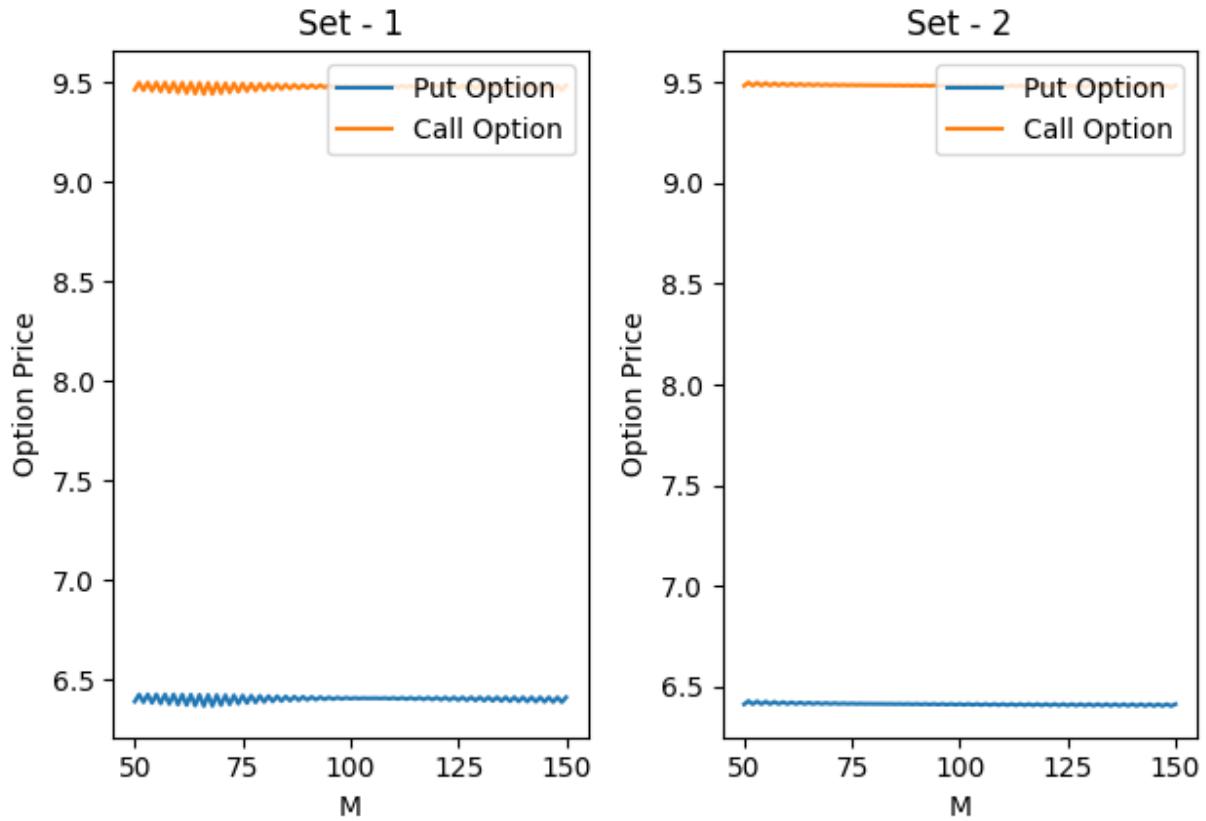
Varying M with K = 95



Varying M with K = 100

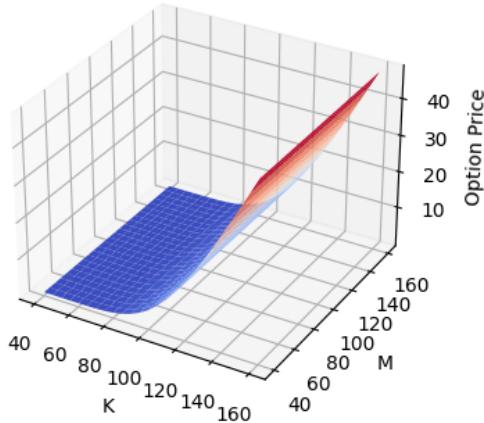


Varying M with K = 105

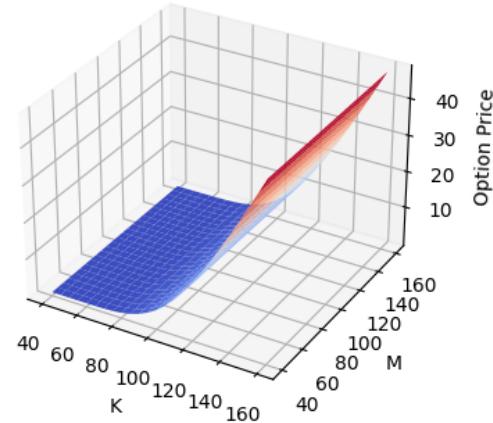


Varying K and M

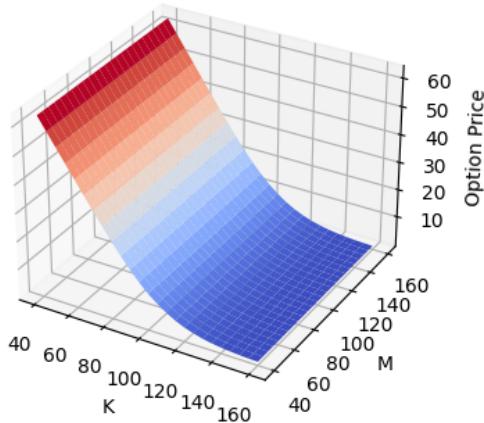
Put Option (Set-1)



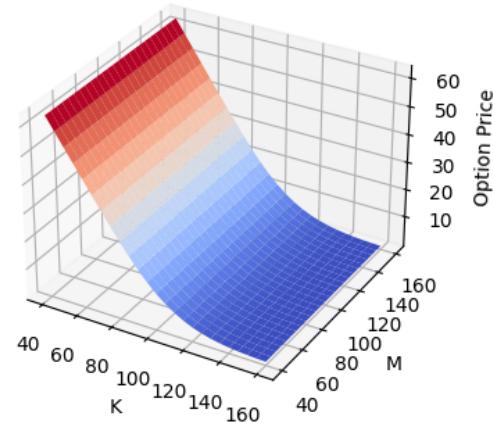
Put Option (Set-2)



Call Option (Set-1)

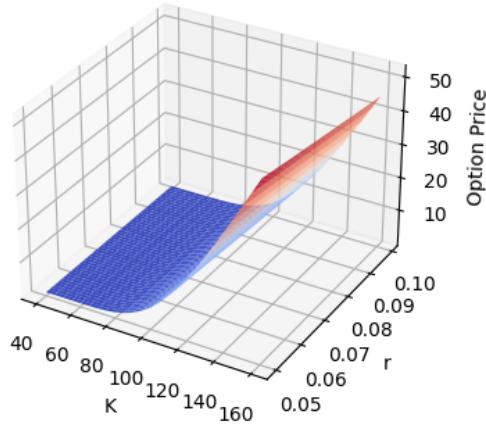


Call Option (Set-2)

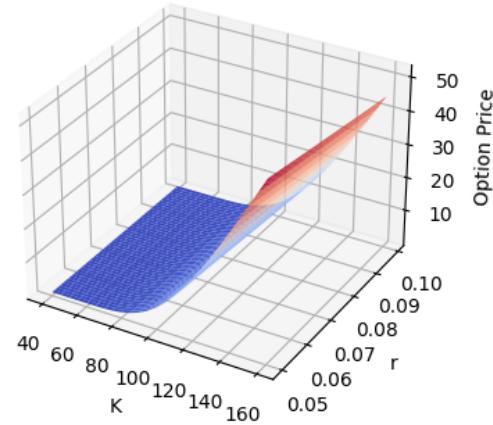


Varying K and r

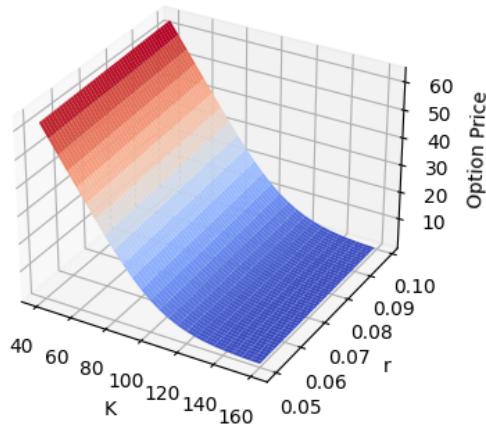
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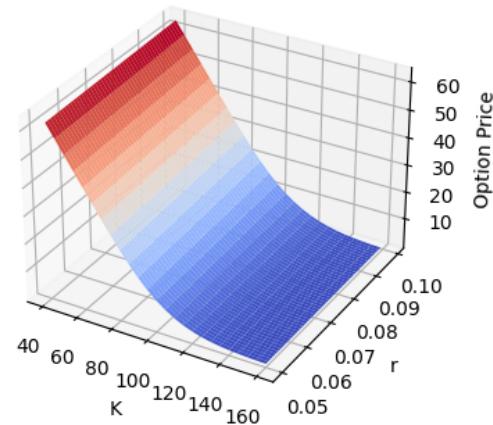
Put Option (Set-2)



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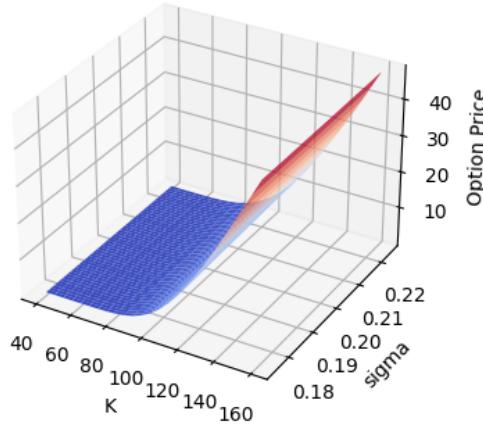


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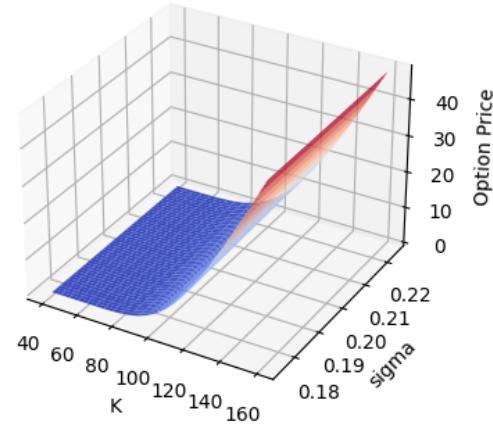


Varying K and sigma

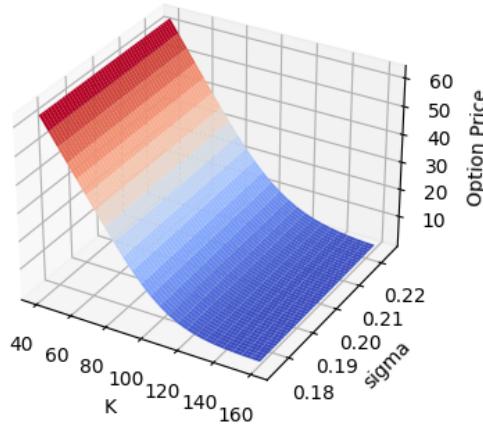
Put Option (Set-1)



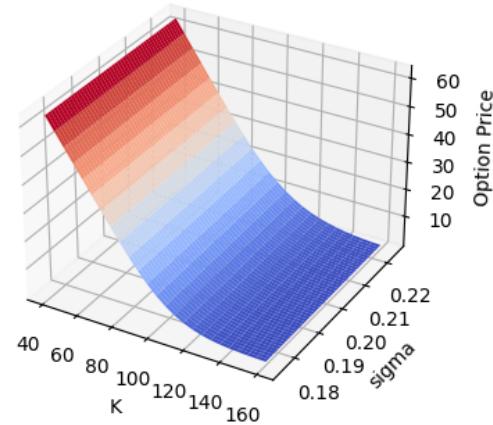
Put Option (Set-2)



Call Option (Set-1)

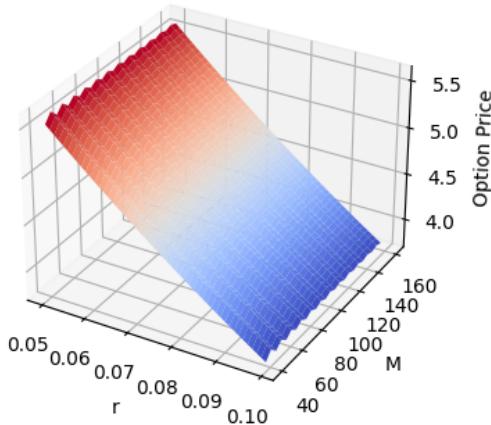


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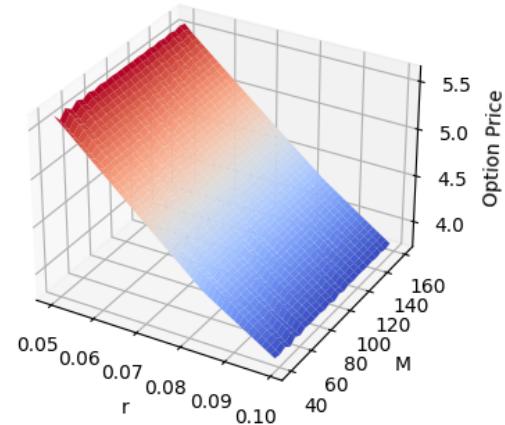


Varying r and M

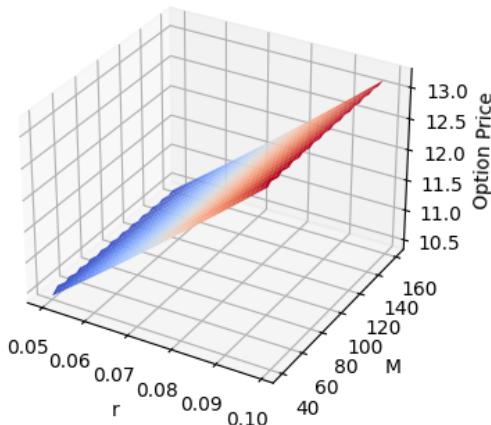
Put Option (Set-1)



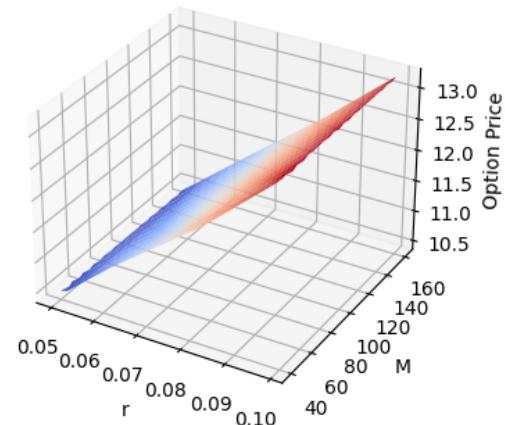
Put Option (Set-2)



Call Option (Set-1)

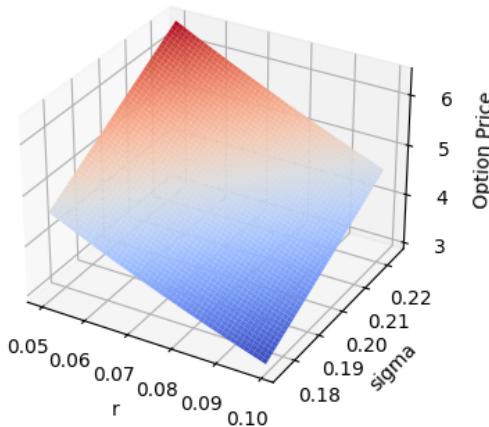


Call Option (Set-2)

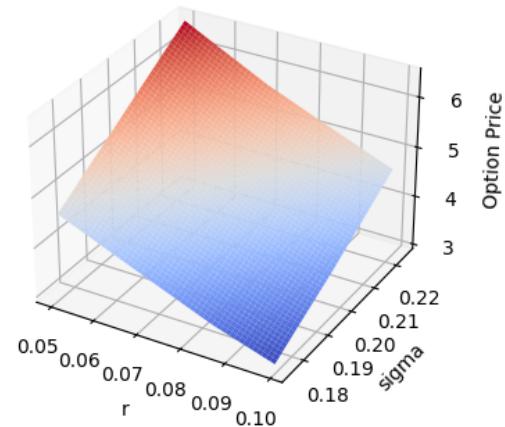


Varying r and sigma

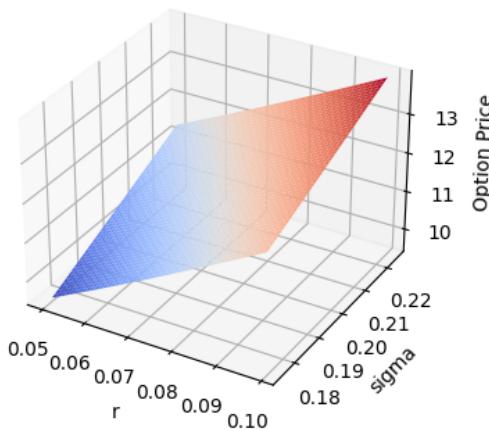
Put Option (Set-1)



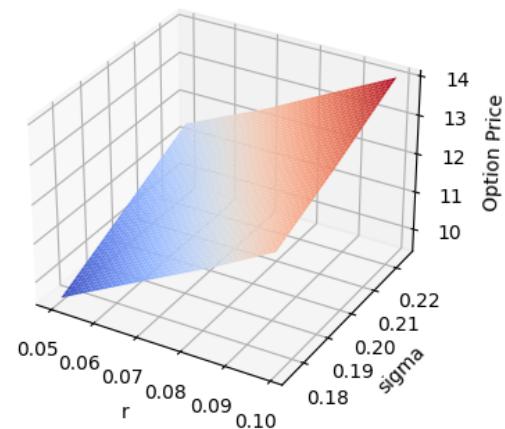
Put Option (Set-2)



Call Option (Set-1)

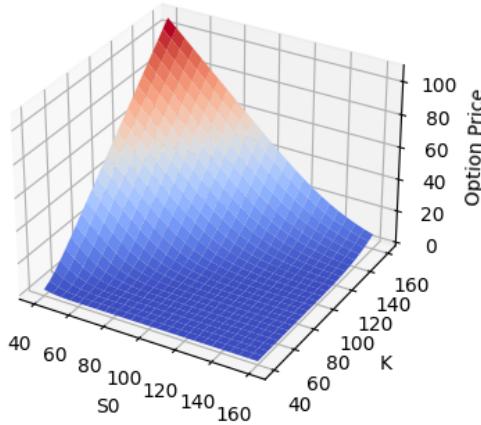


Call Option (Set-2)

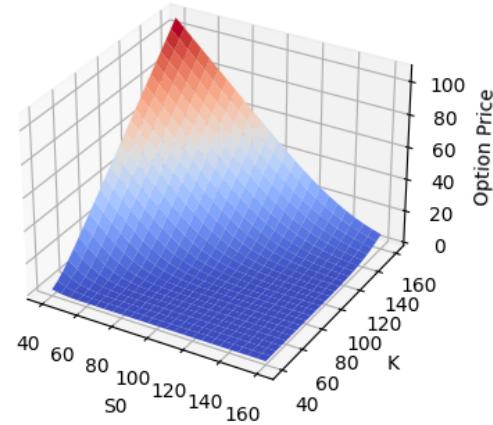


Varying S_0 and K

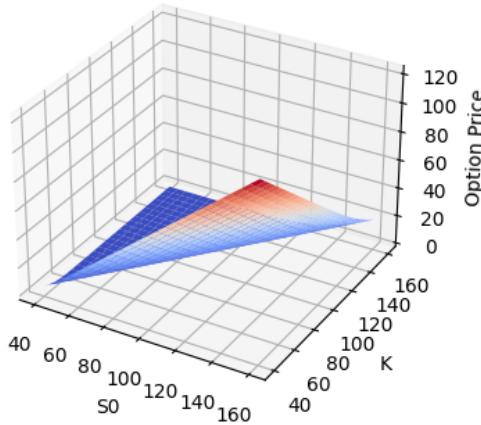
Put Option (Set-1)



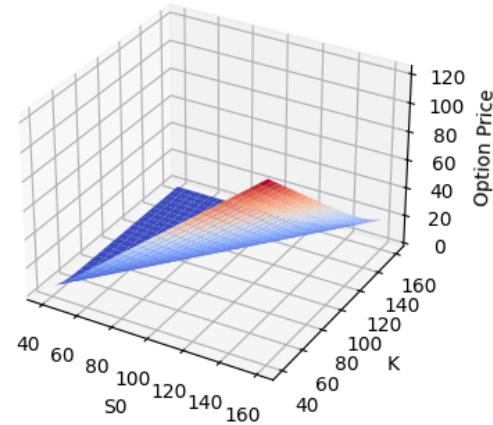
Put Option (Set-2)



Call Option (Set-1)

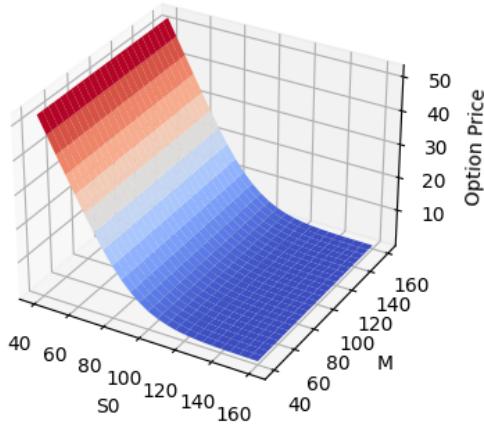


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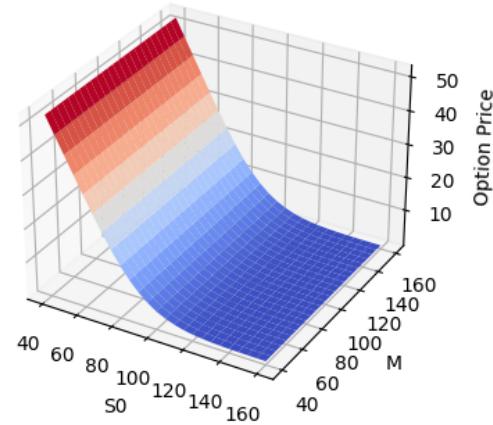


Varying S_0 and M

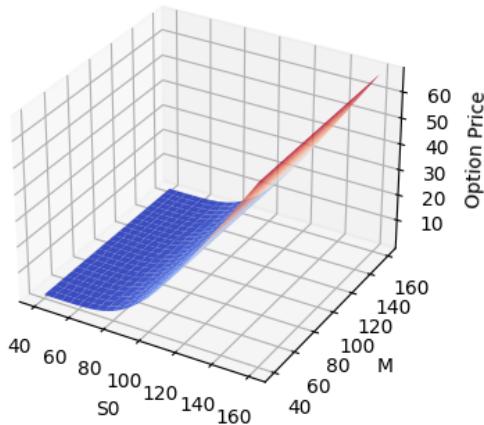
Put Option (Set-1)



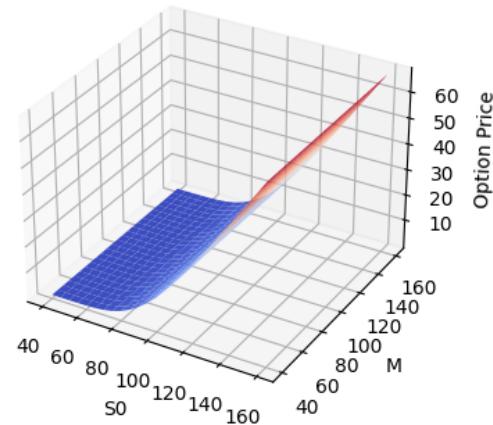
Put Option (Set-2)



Call Option (Set-1)

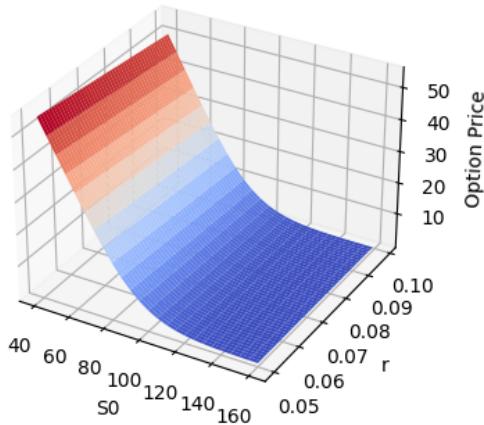


Call Option (Set-2)

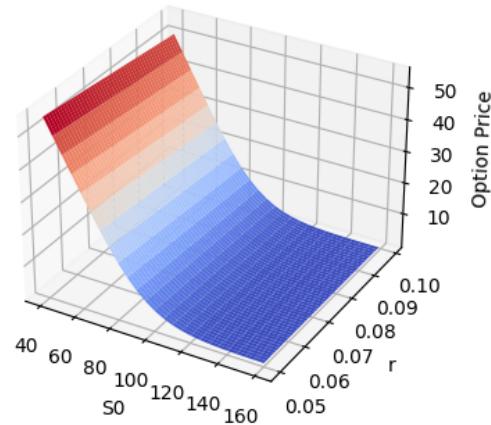


Varying S_0 and r

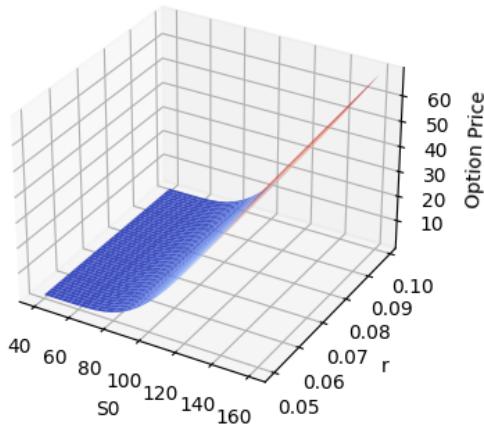
Put Option (Set-1)



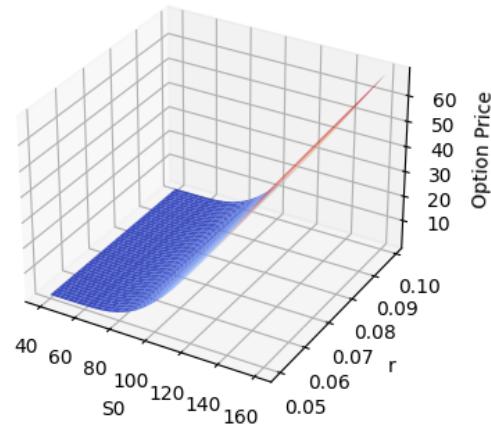
Put Option (Set-2)



Call Option (Set-1)

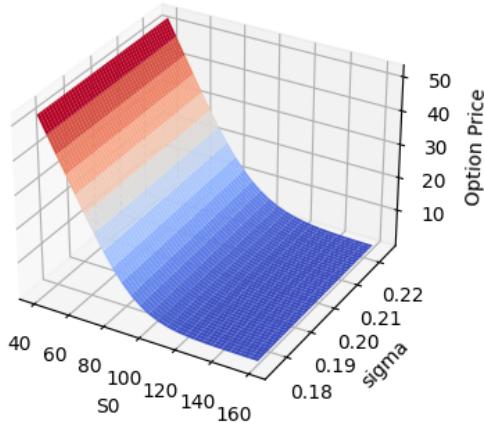


Call Option (Set-2)

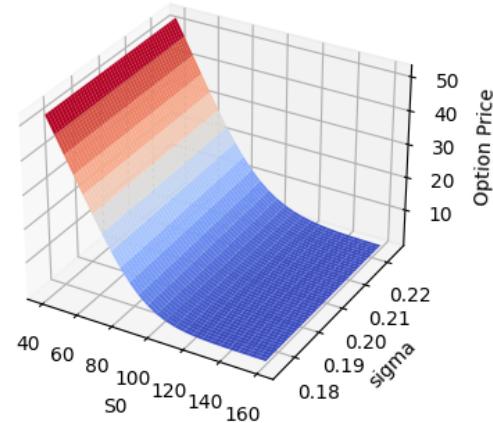


Varying S_0 and sigma

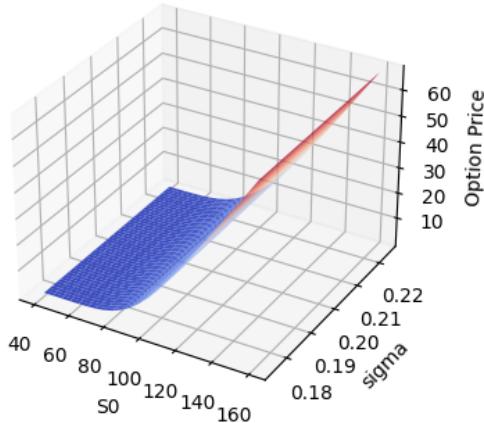
Put Option (Set-1)



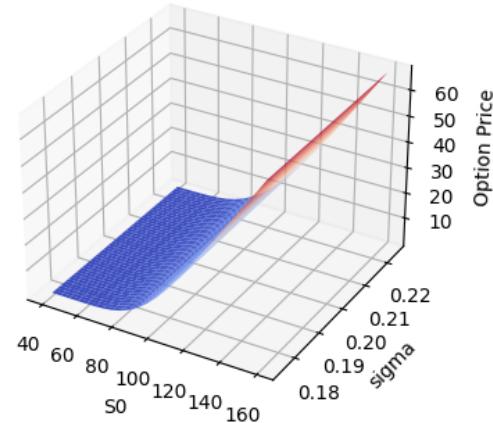
Put Option (Set-2)



Call Option (Set-1)

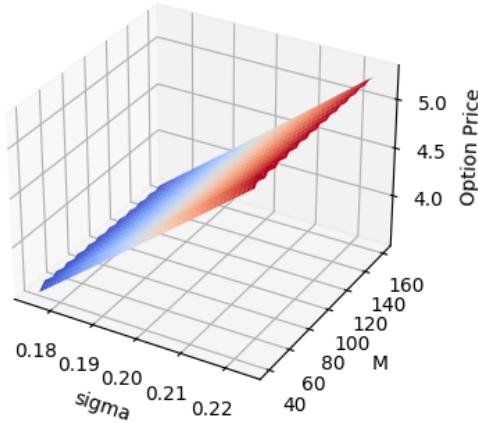


Call Option (Set-2)

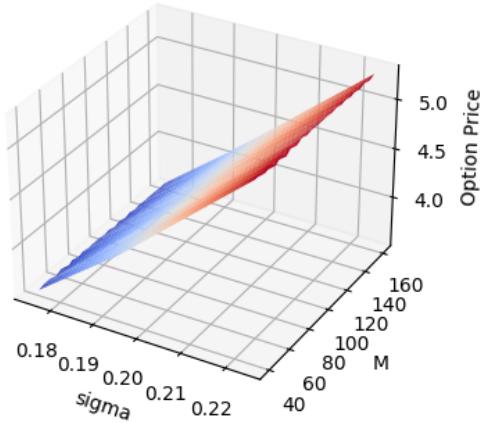


Varying sigma and M

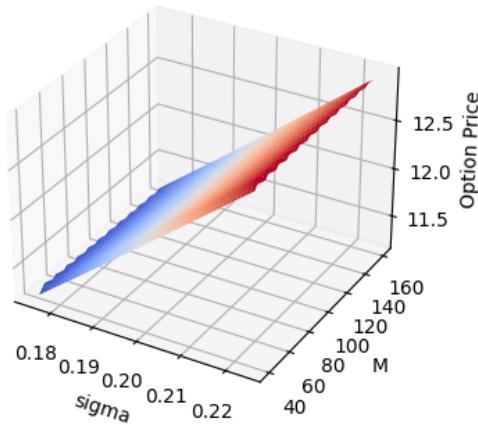
Put Option (Set-1)



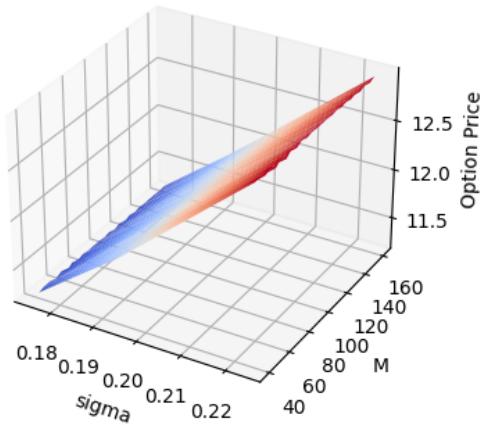
Put Option (Set-2)



Call Option (Set-1)



Call Option (Set-2)



Question 2

The initial price of a Call and a put option is determined for both sets of (u, d) using a path-dependent derivative (Asian Option). The initial prices are -

3.) Set - 1

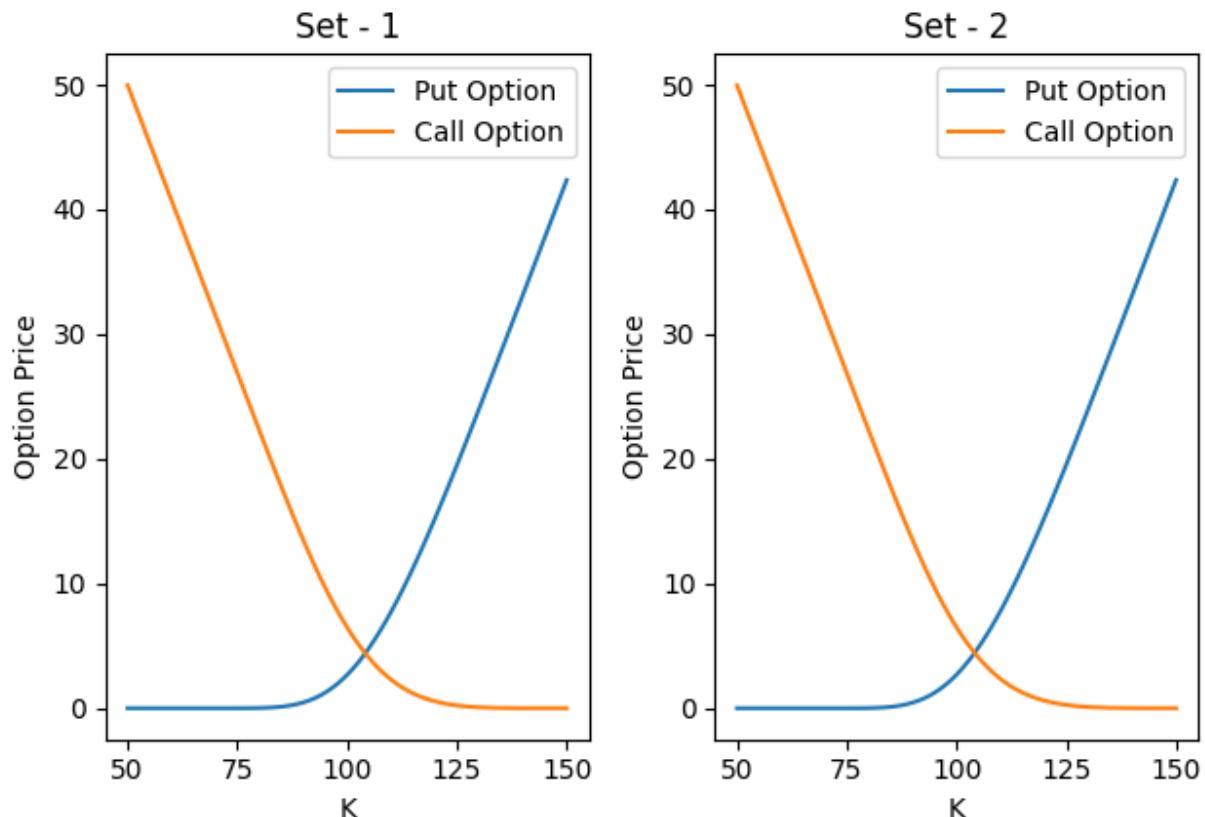
- a.) Call Option Price = 6.476003
- b.) Put Option Price = 2.677946

4.) Set - 2

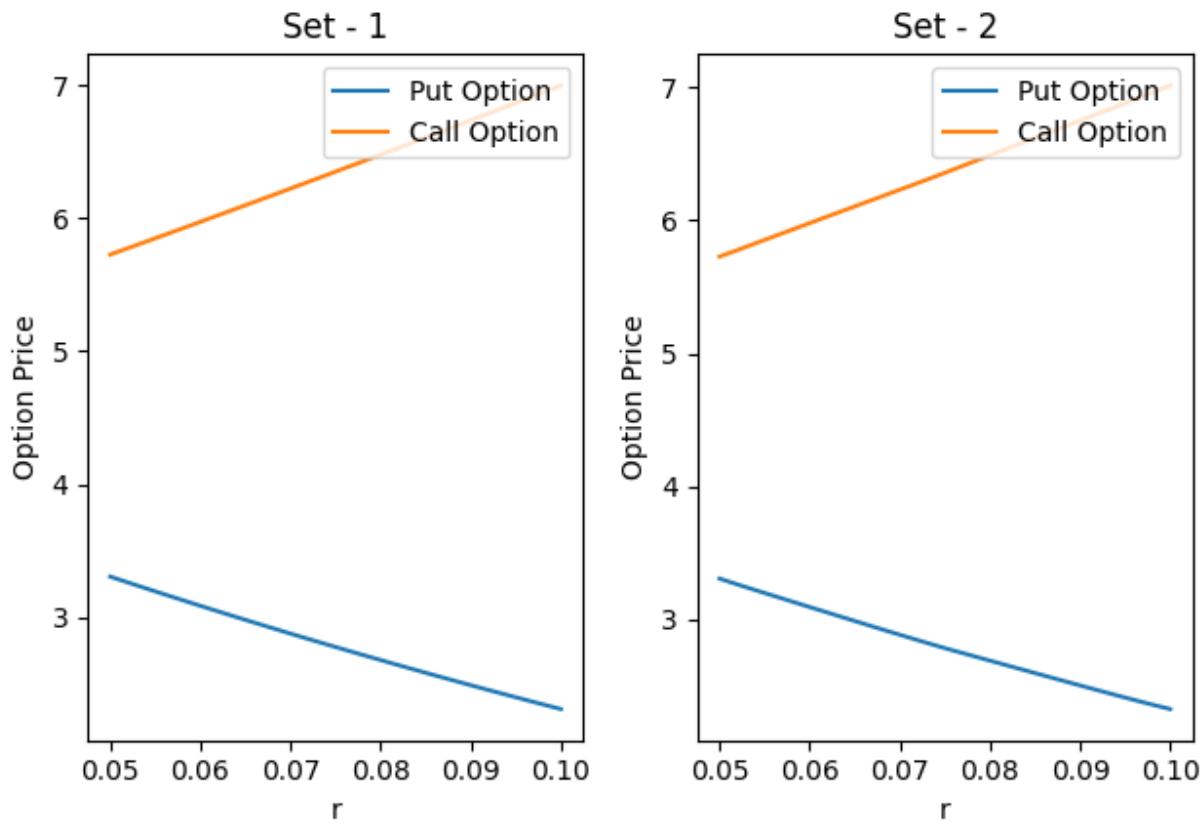
- a.) Call Option Price = 6.490029
- b.) Put Option Price = 2.691972

Now, the sensitivity analysis of the initial price is carried out by varying the parameter taking 1 parameter and 2 parameters at a time. The graphs for the following are -

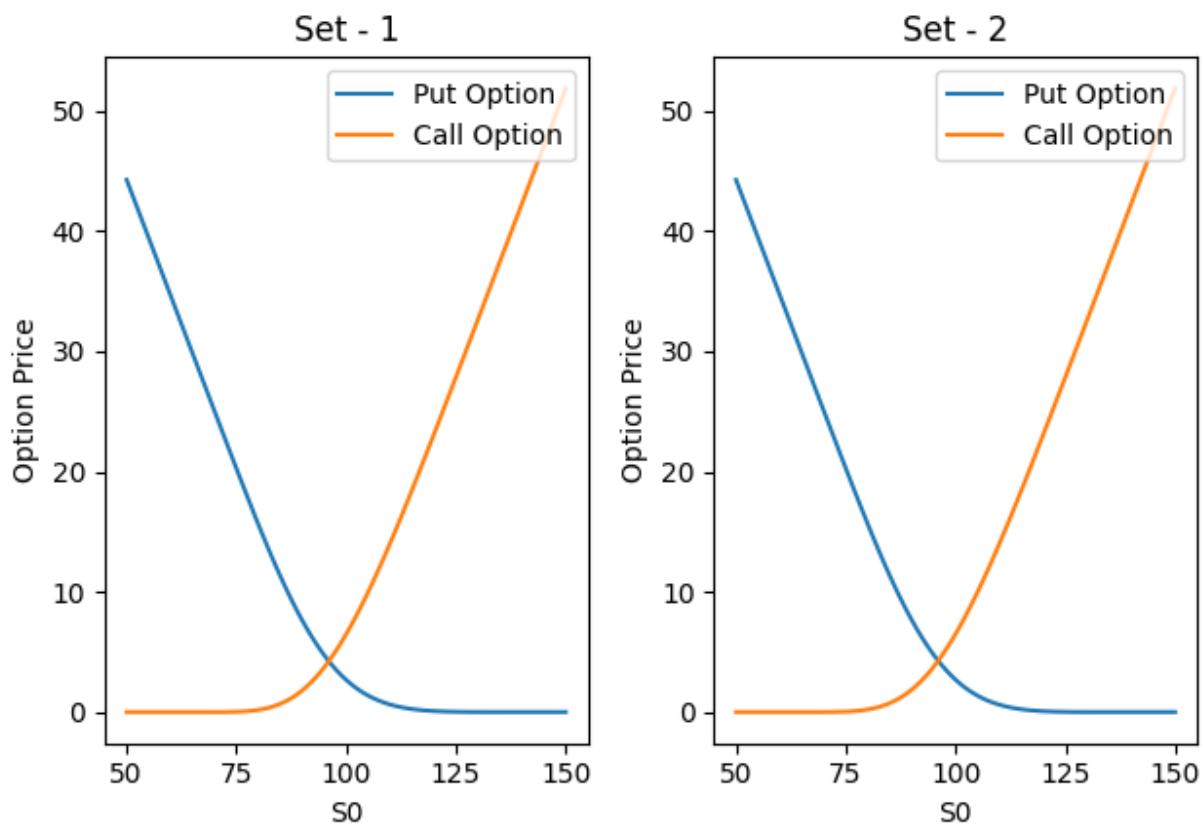
Varying K



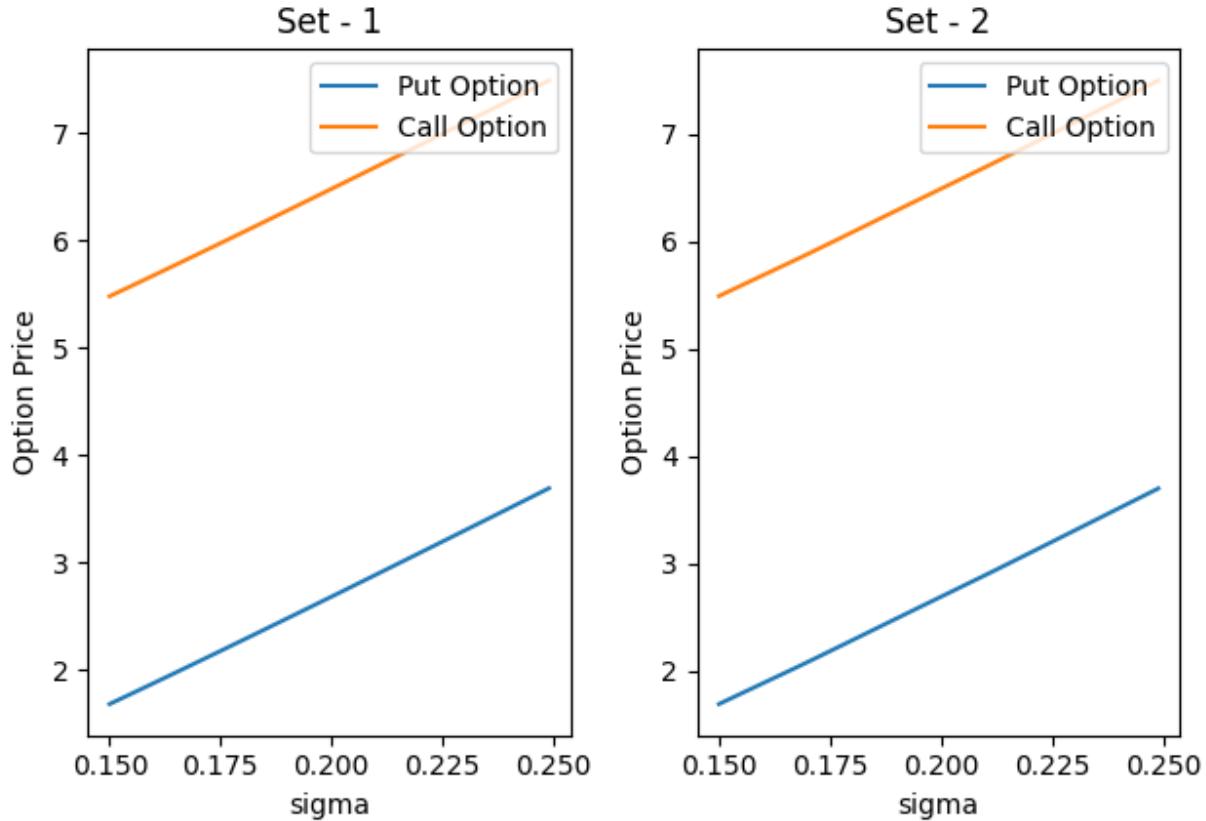
Varying r



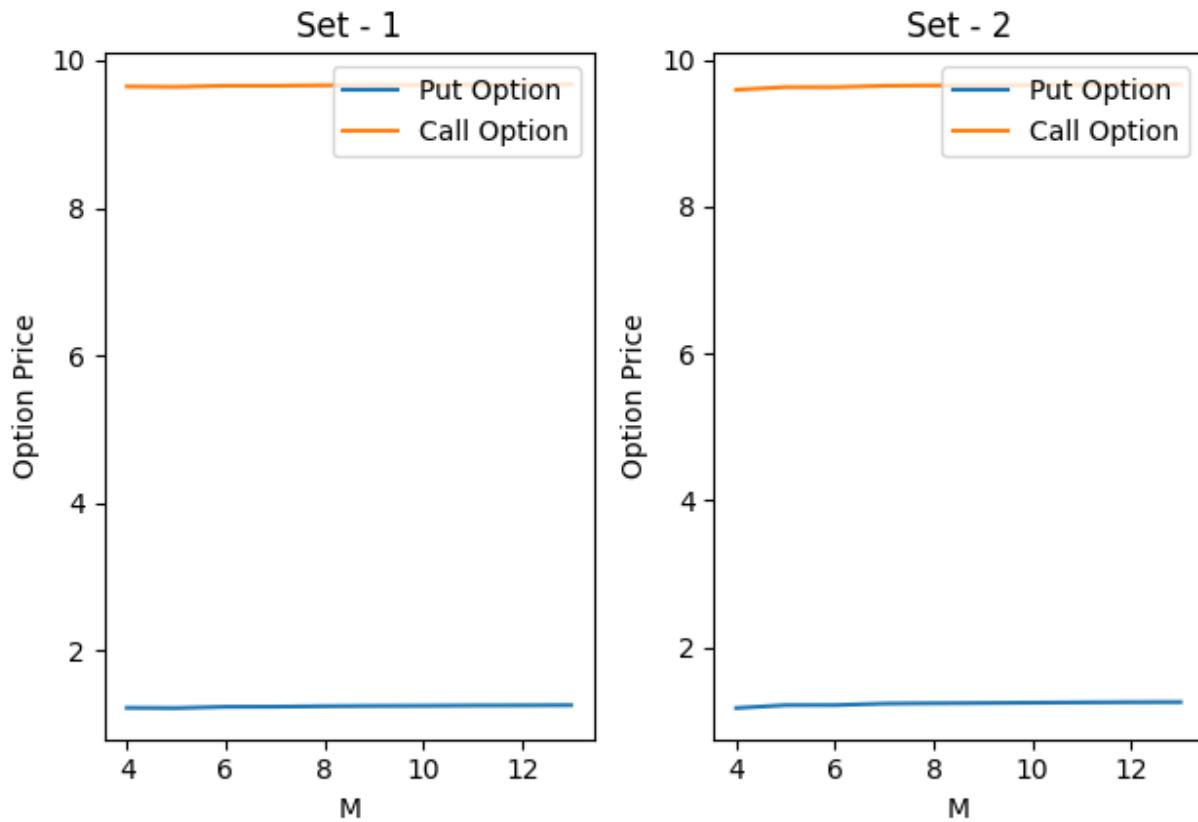
Varying S_0



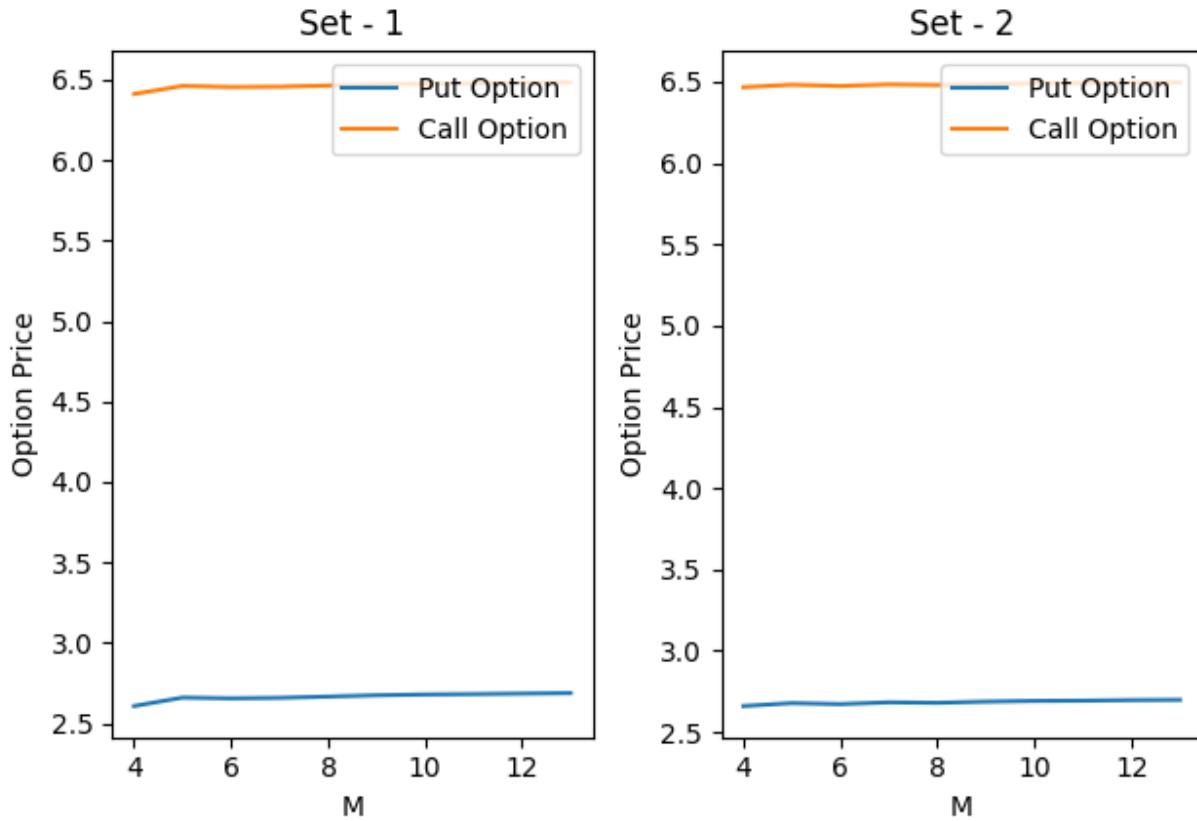
Varying sigma



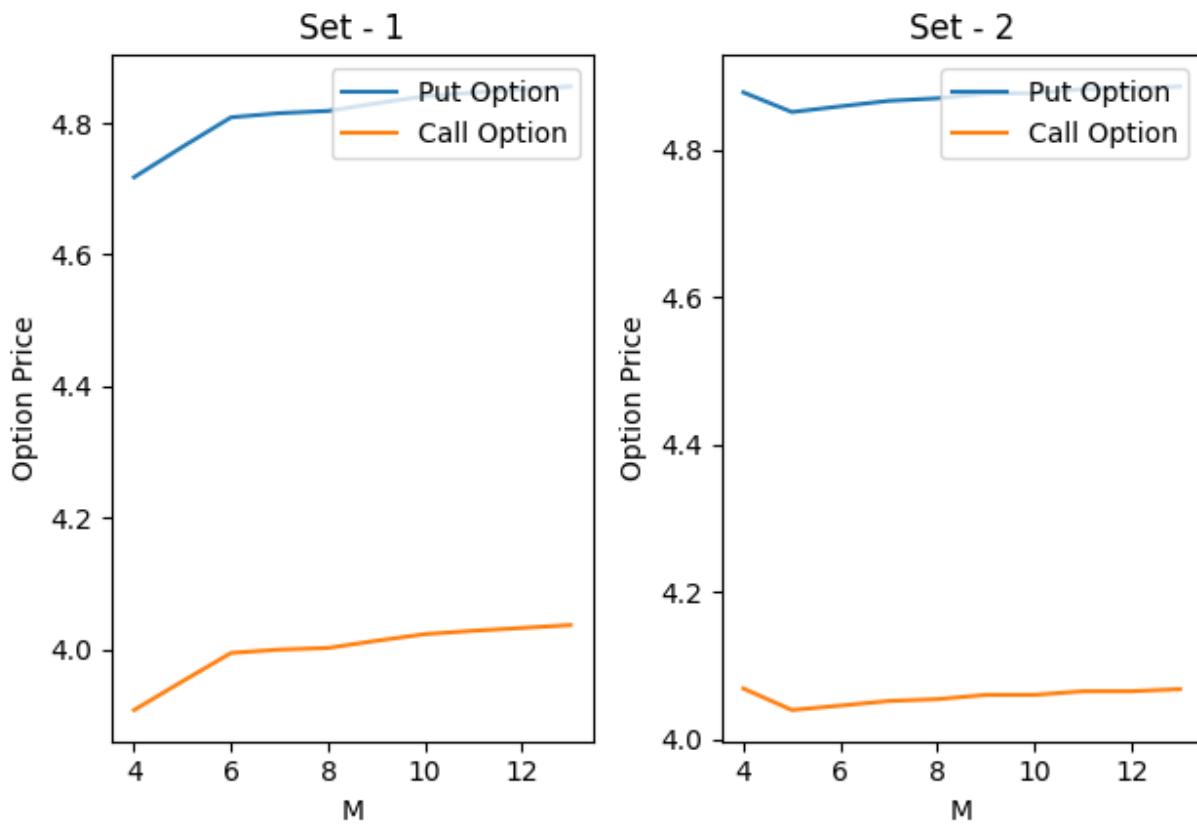
Varying M with K = 95



Varying M with K = 100

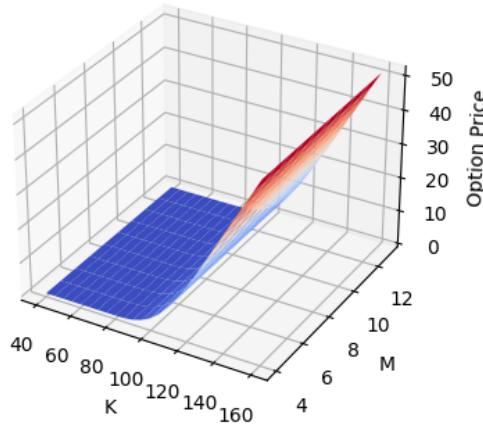


Varying M with K = 105

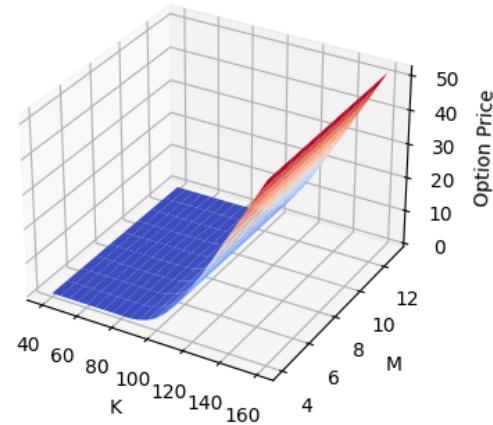


Varying K and M

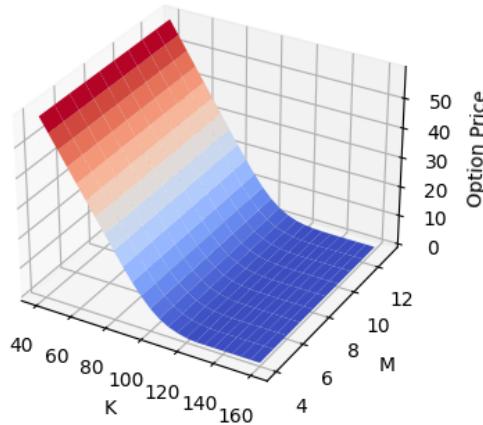
Put Option (Set-1)



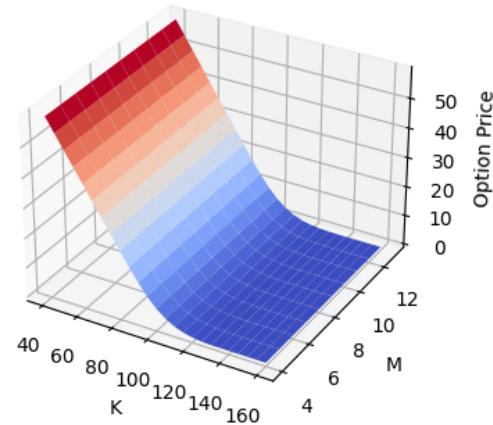
Put Option (Set-2)



Call Option (Set-1)

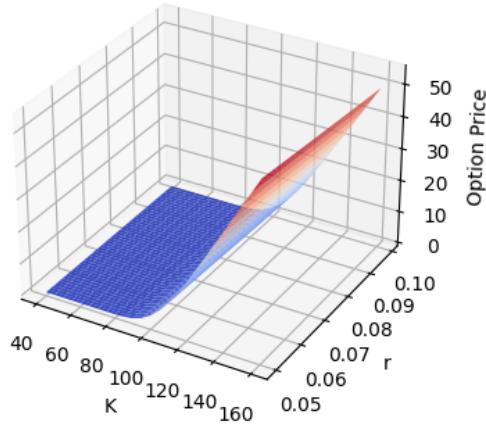


Call Option (Set-2)

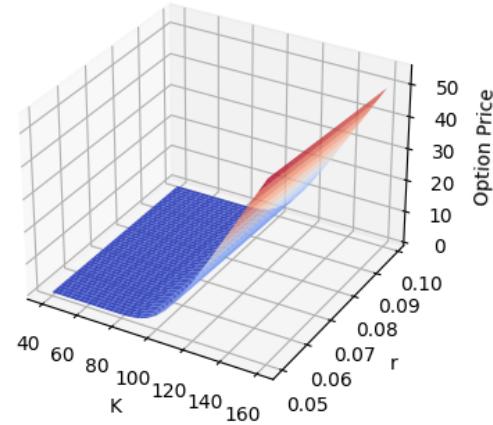


Varying K and r

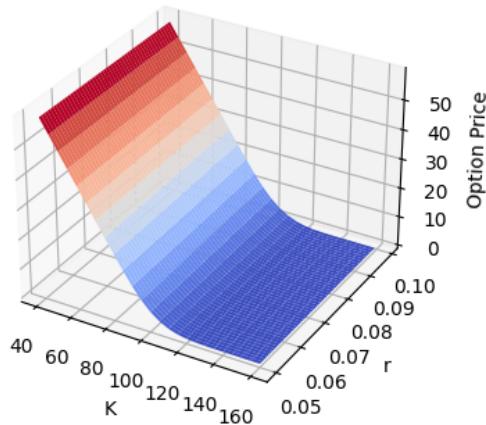
Put Option (Set-1)



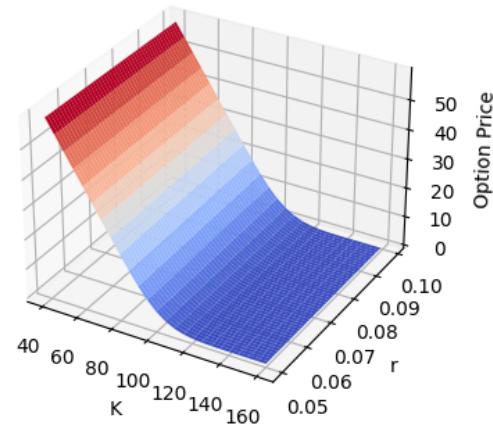
Put Option (Set-2)



Call Option (Set-1)

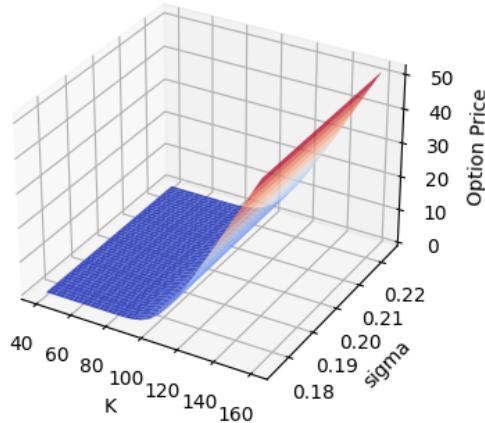


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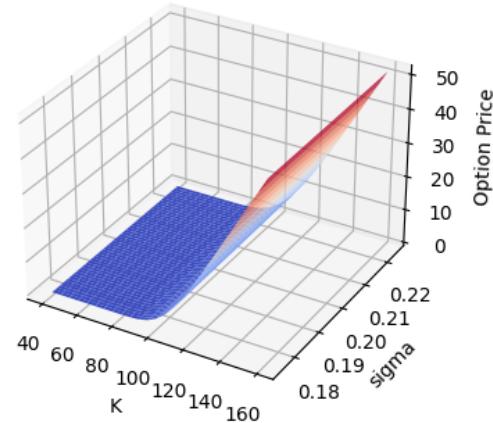


Varying K and sigma

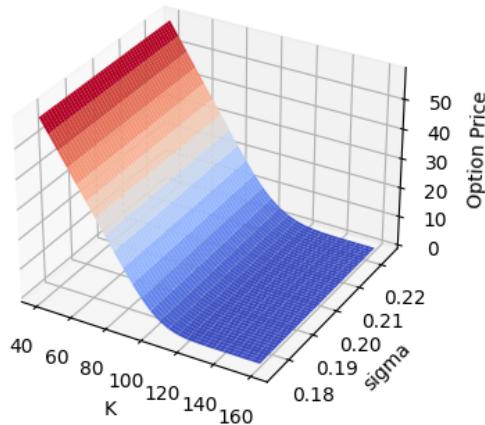
Put Option (Set-1)



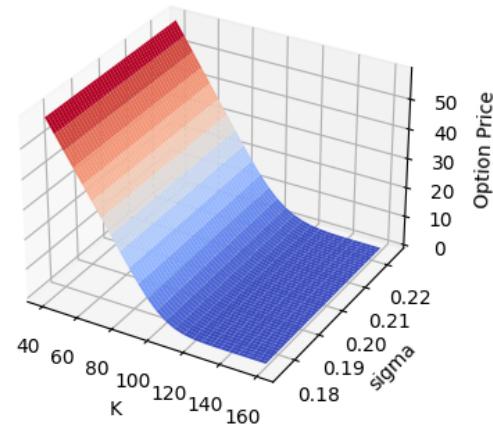
Put Option (Set-2)



Call Option (Set-1)

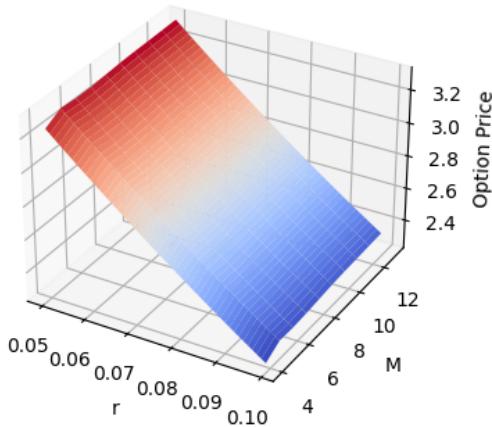


Call Option (Set-2)

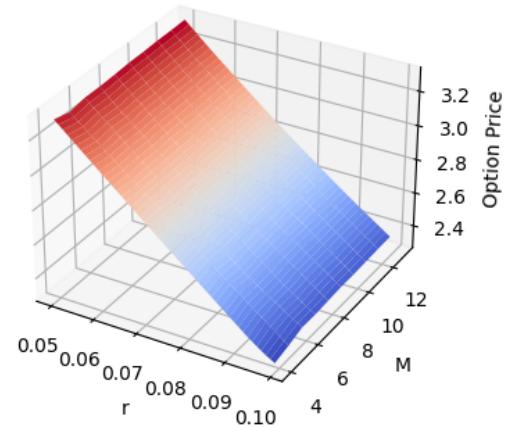


Varying r and M

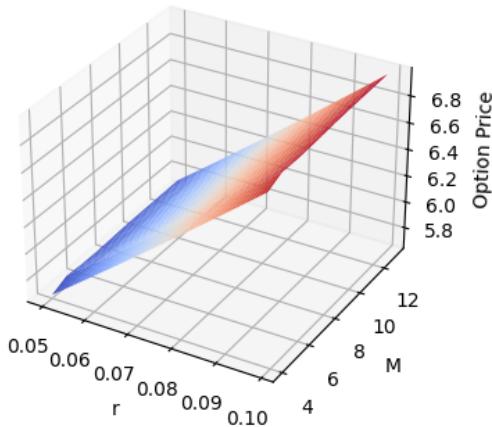
Put Option (Set-1)



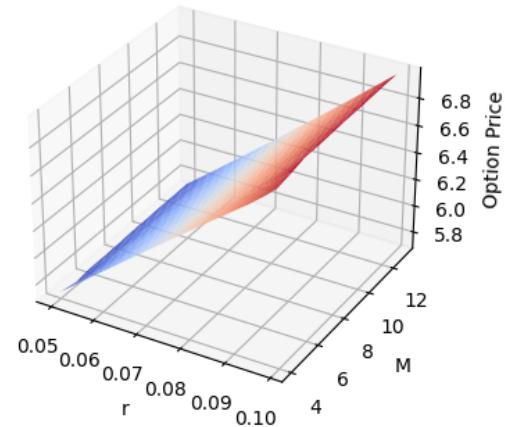
Put Option (Set-2)



Call Option (Set-1)

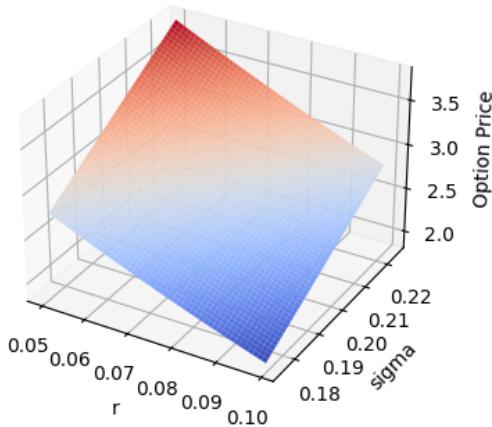


Call Option (Set-2)

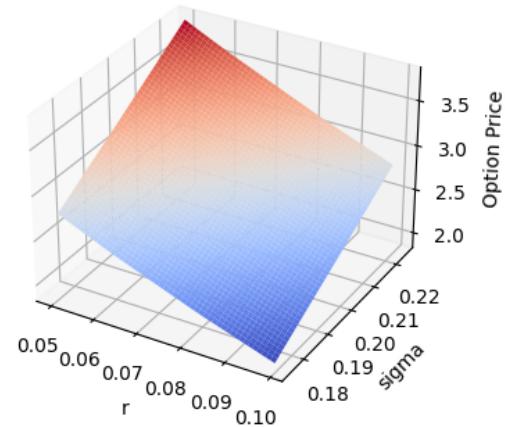


Varying r and sigma

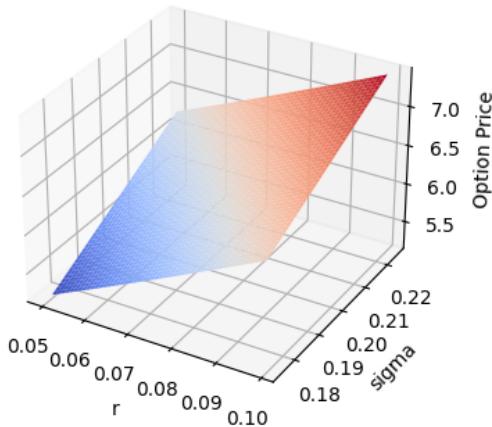
Put Option (Set-1)



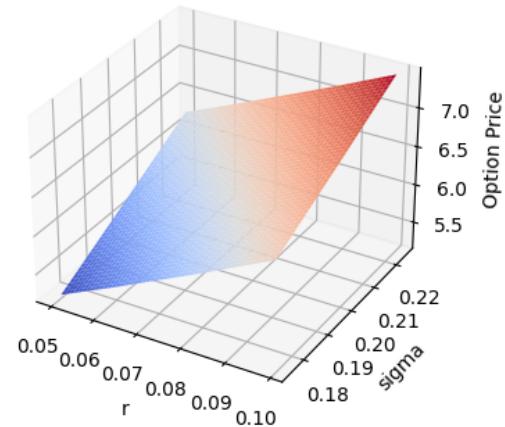
Put Option (Set-2)



Call Option (Set-1)

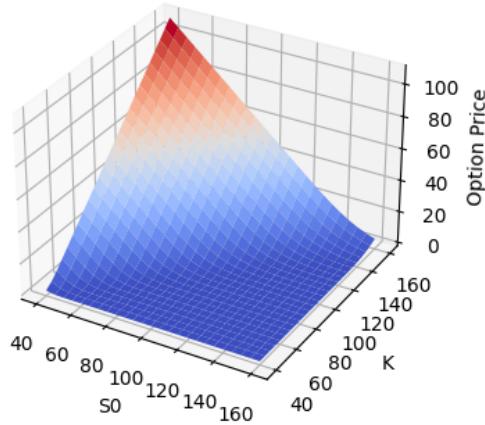


Call Option (Set-2)

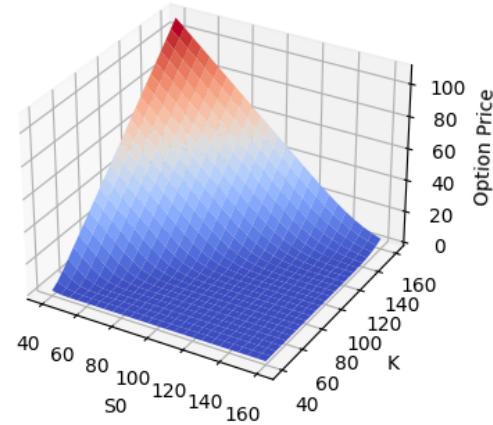


Varying S_0 and K

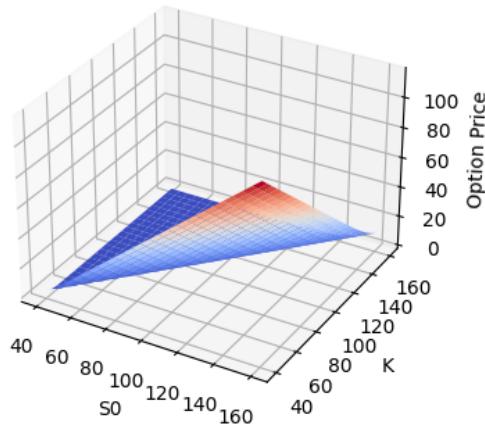
Put Option (Set-1)



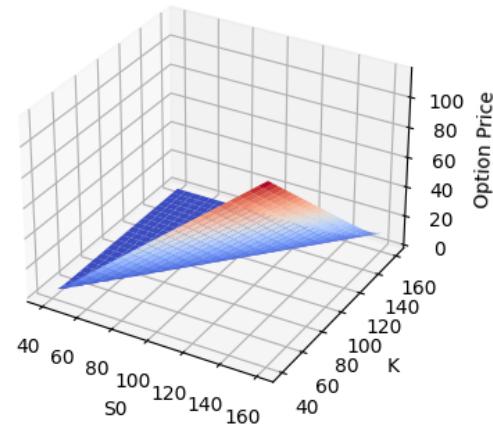
Put Option (Set-2)



Call Option (Set-1)

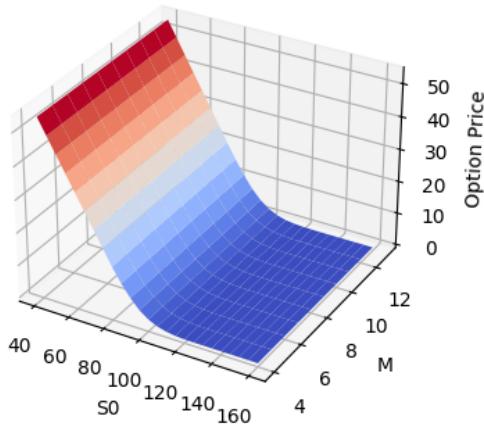


Call Option (Set-2)

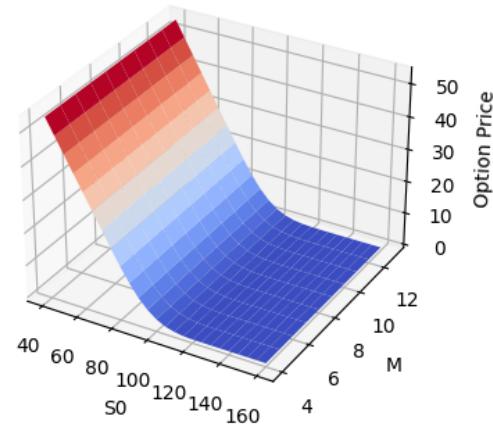


Varying S_0 and M

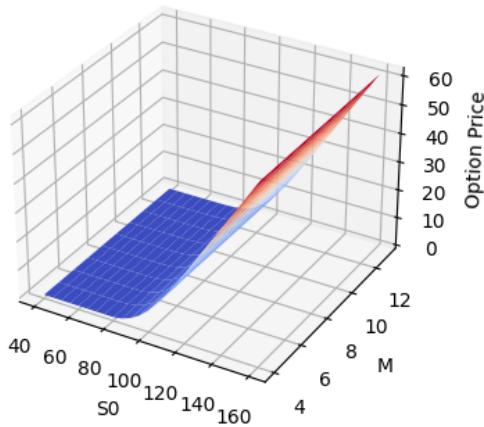
Put Option (Set-1)



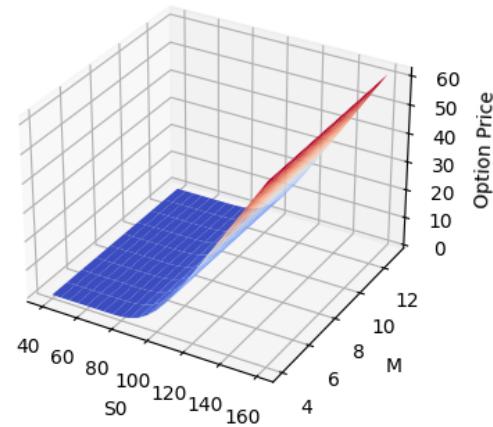
Put Option (Set-2)



Call Option (Set-1)

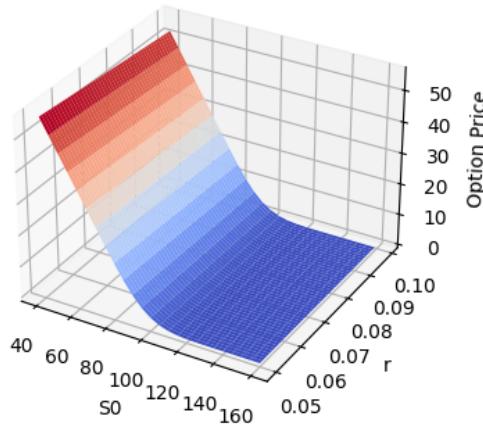


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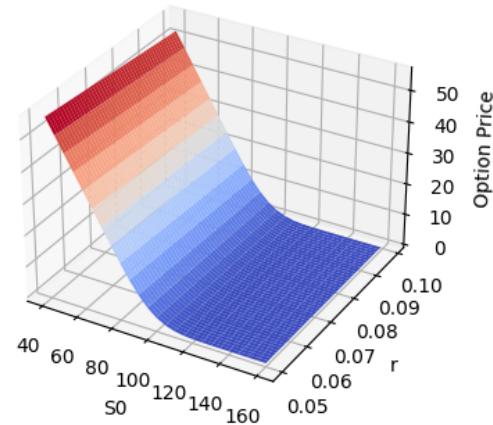


Varying S_0 and r

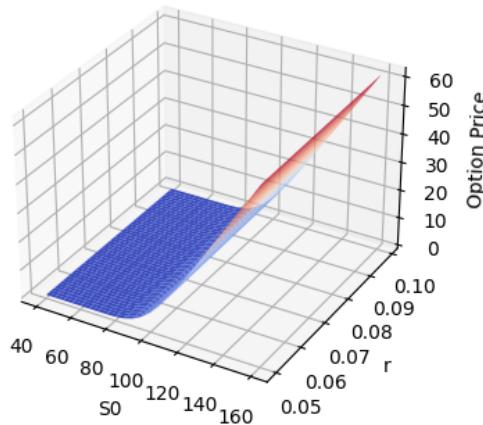
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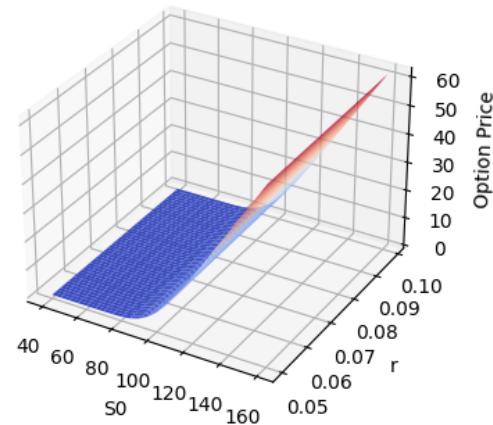
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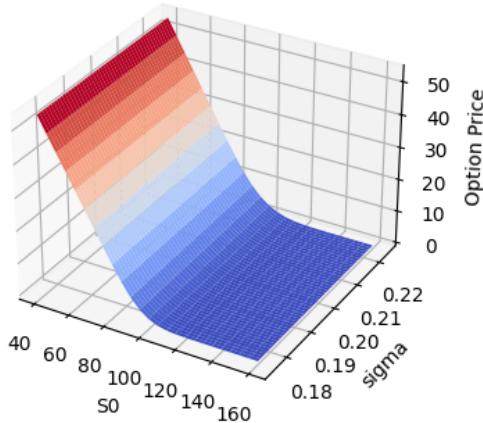


Call Option (Set-2)

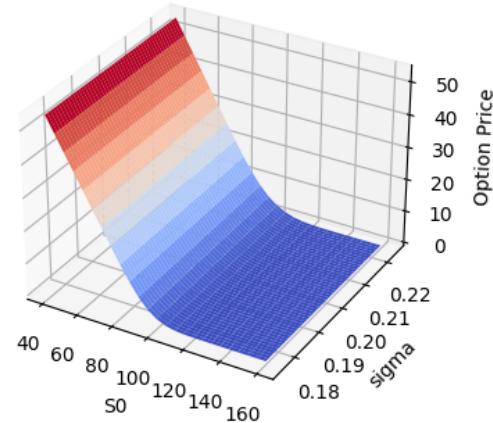


Varying S_0 and sigma

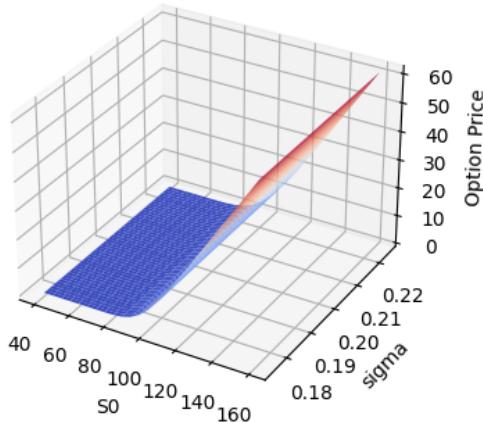
Put Option (Set-1)



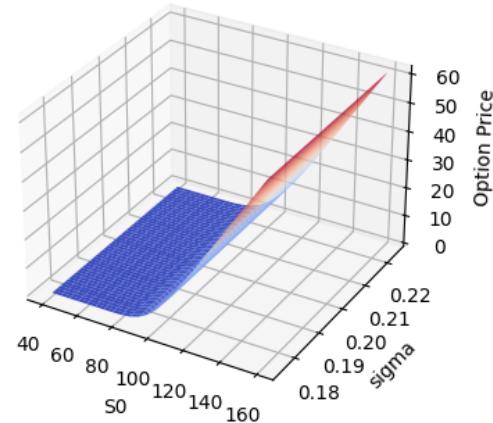
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Call Option (Set-1)

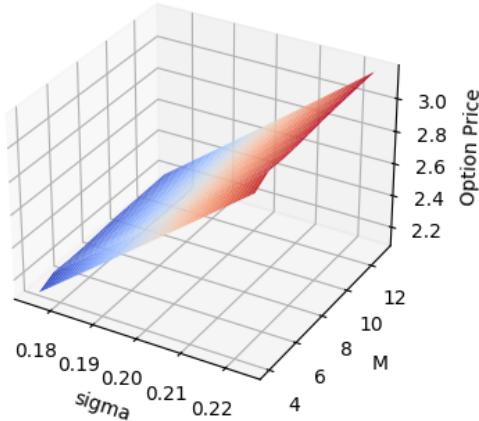


Call Option (Set-2)

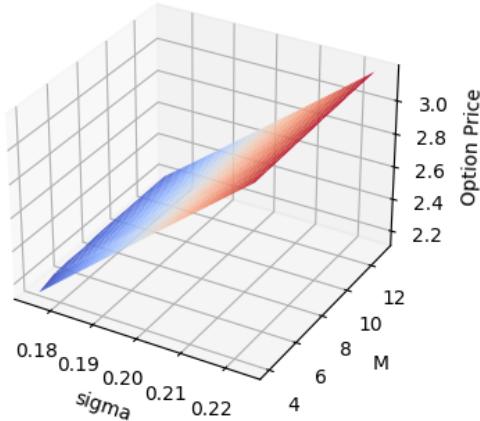


Varying sigma and M

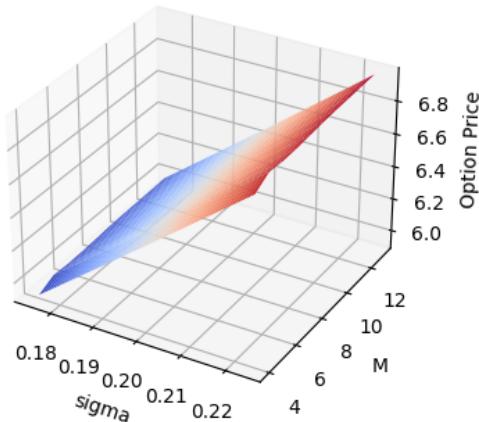
Put Option (Set-1)



Put Option (Set-2)



Call Option (Set-1)



Call Option (Set-2)

