

# Lab – 07

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## Ques – 1

The formula for price of European Call Option is: -

$$C(t, x) = xN(d_+(T - t, x)) - Ke^{-r(T-t)}N(d_-(T - t, x))$$

where,

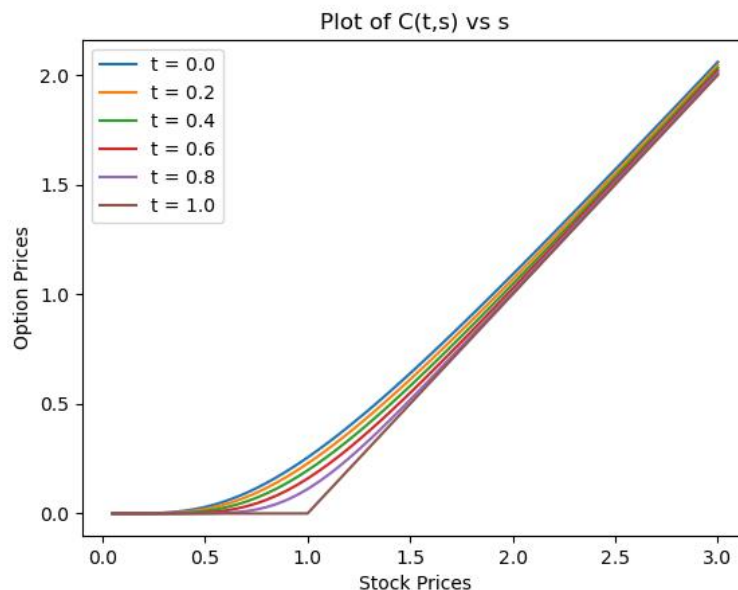
$$d_{\pm}(T - t, x) = \frac{1}{\sigma\sqrt{T-t}}[\log(x/K) + (r \pm \frac{\sigma^2}{2})(T - t)]$$

For the European Put Option, we use the put call parity which is given by: -

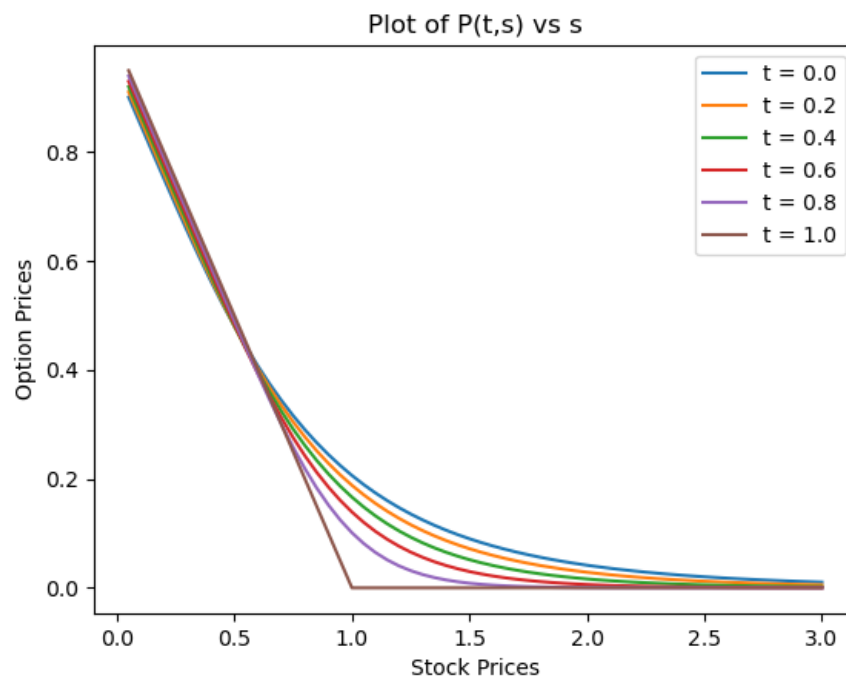
$$C(t, x) - P(t, x) = x - Ke^{-r(T-t)}$$

## Ques – 2

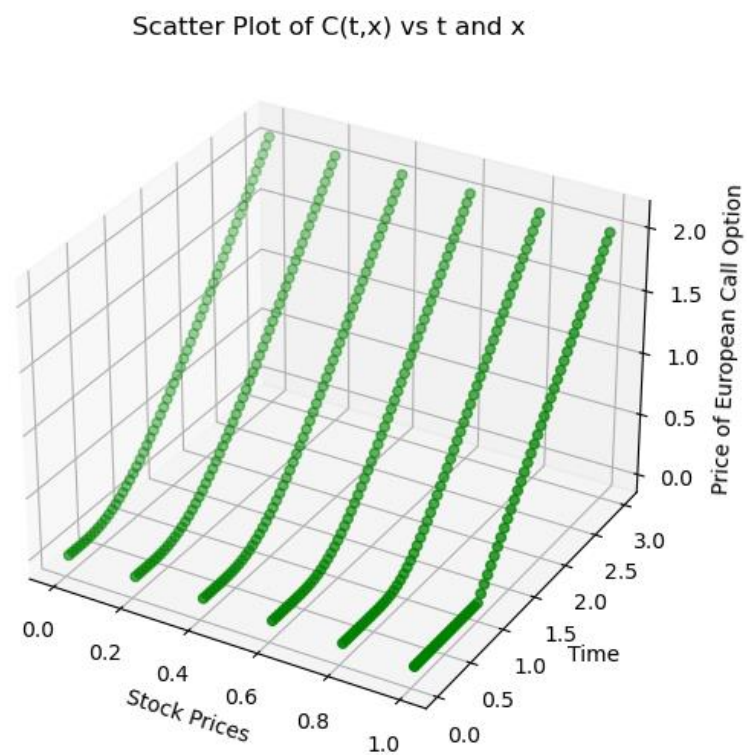
C(t,s) vs s for given time points: -



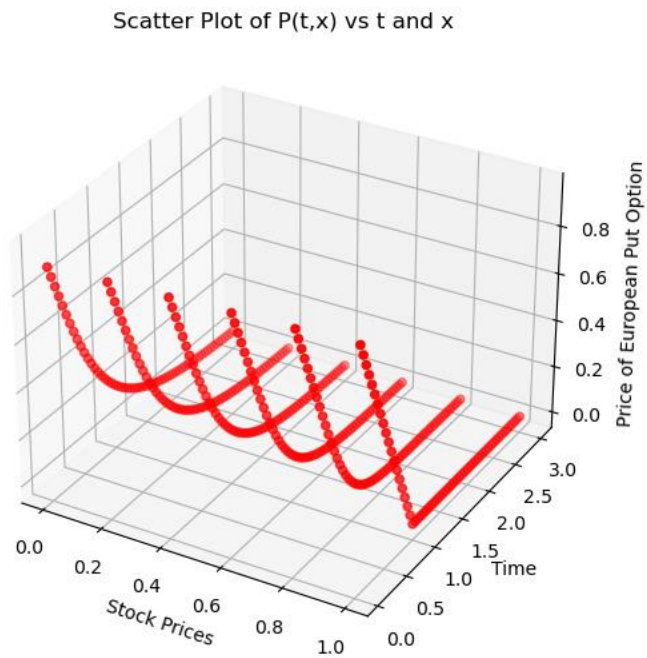
$P(t,s)$  vs  $s$  for given time points: -



$C(t,s)$  vs both  $t$  and  $s$  for given time points: -

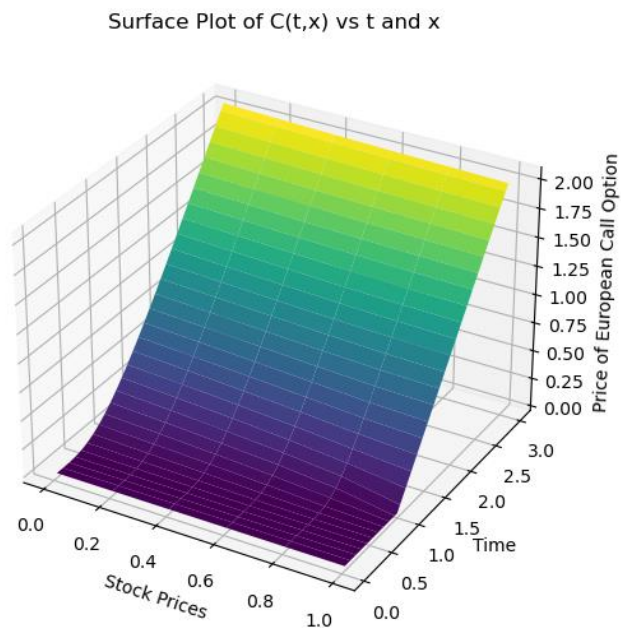


$P(t,s)$  vs both  $s$  and  $t$  for given time points: -

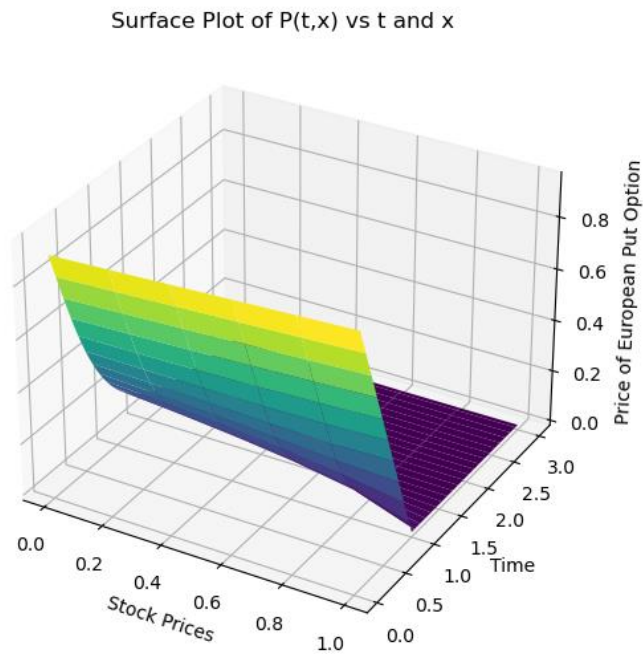


### Ques – 3

$C(t,s)$  as a smooth surface: -

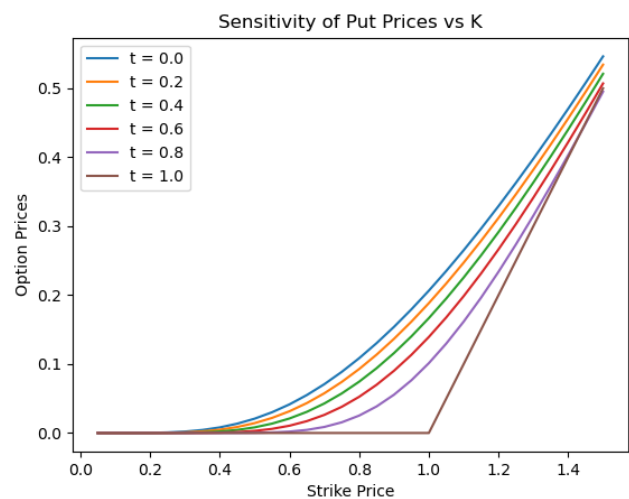
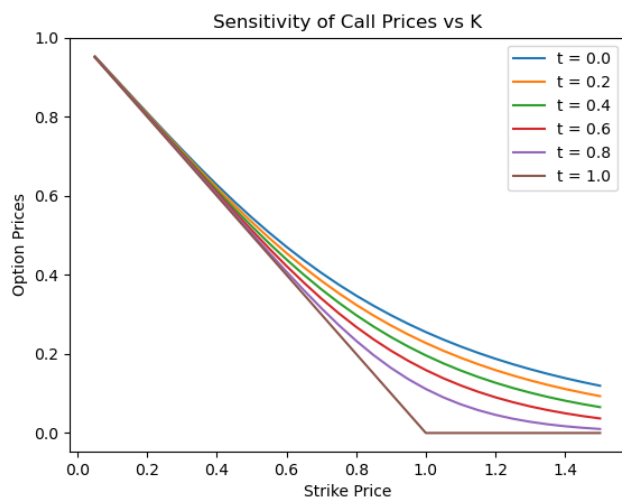


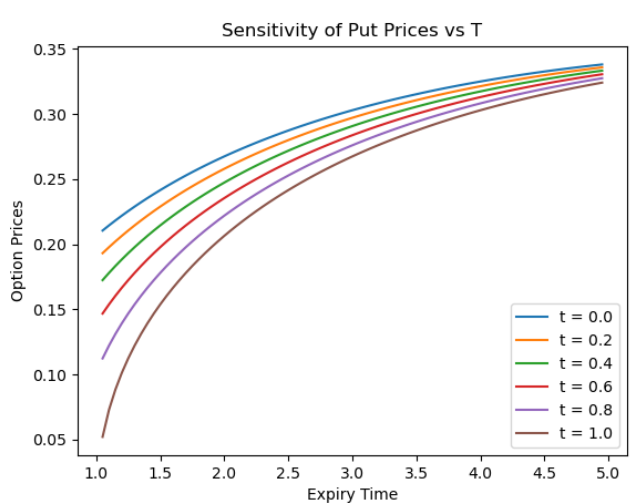
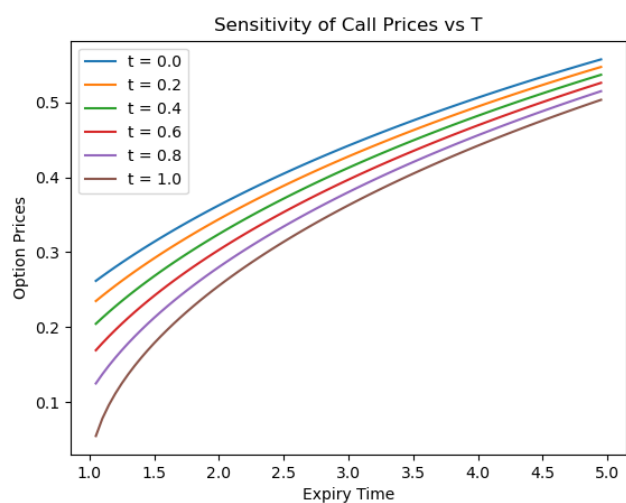
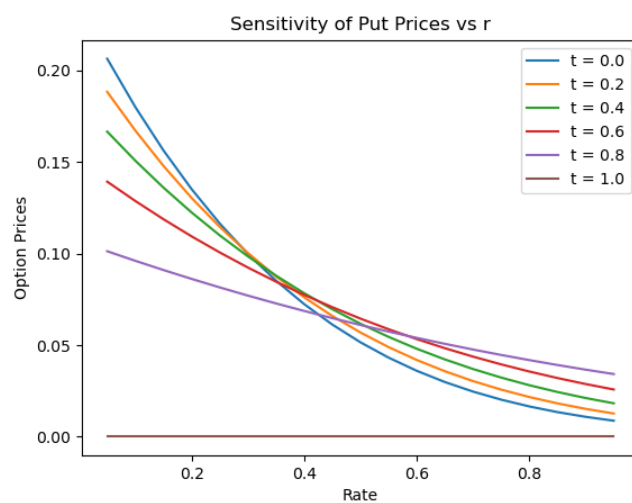
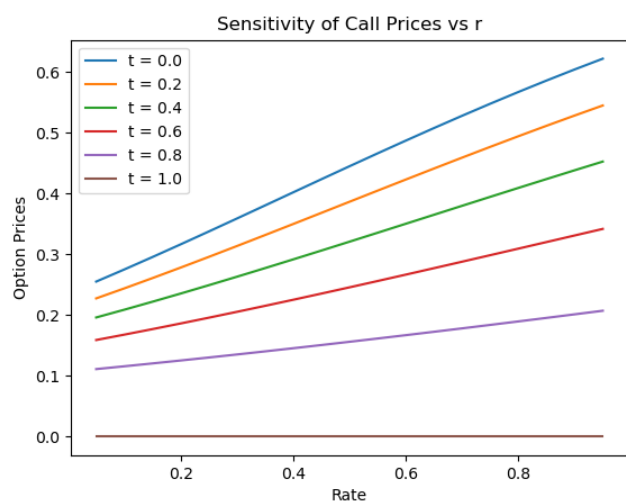
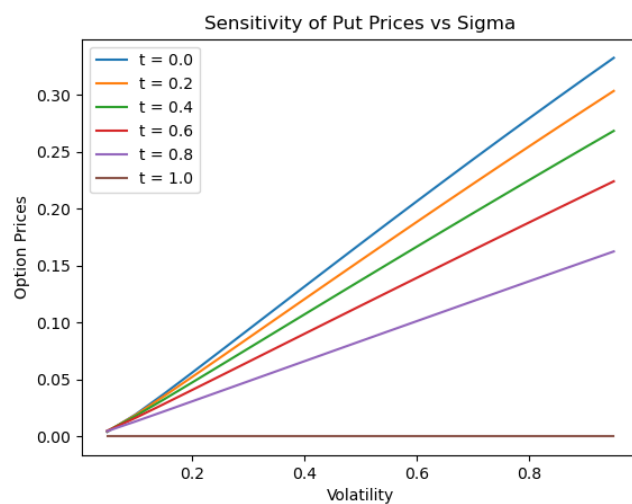
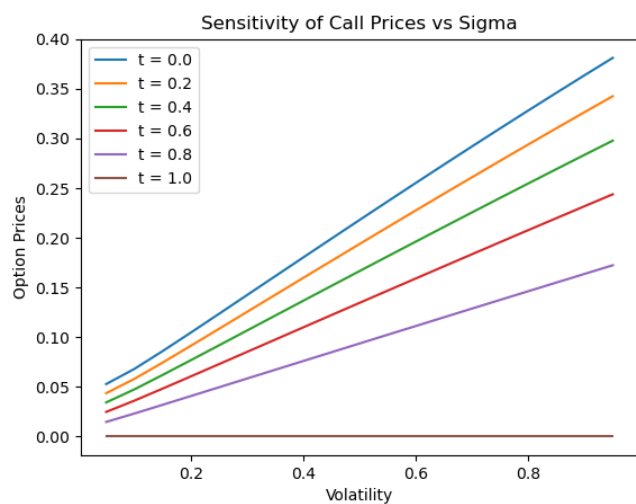
$P(t,s)$  as a smooth surface: -



## Ques – 4

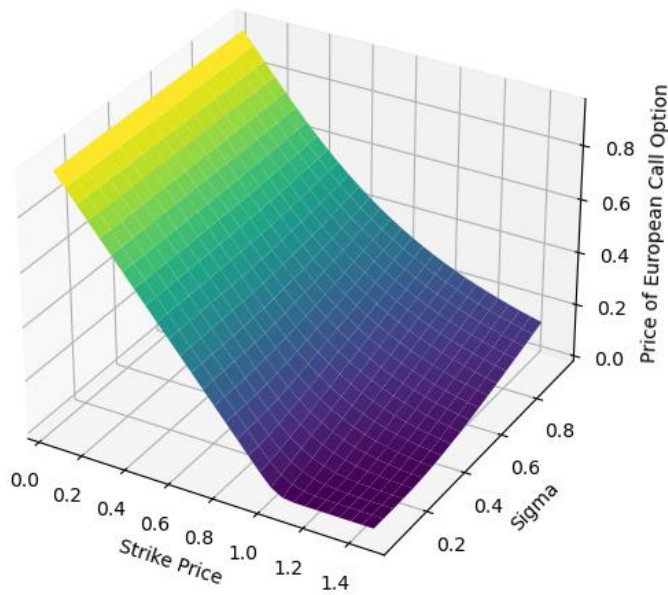
The sensitivity of call and put prices with different factors one at a time can be visualized as follows: -



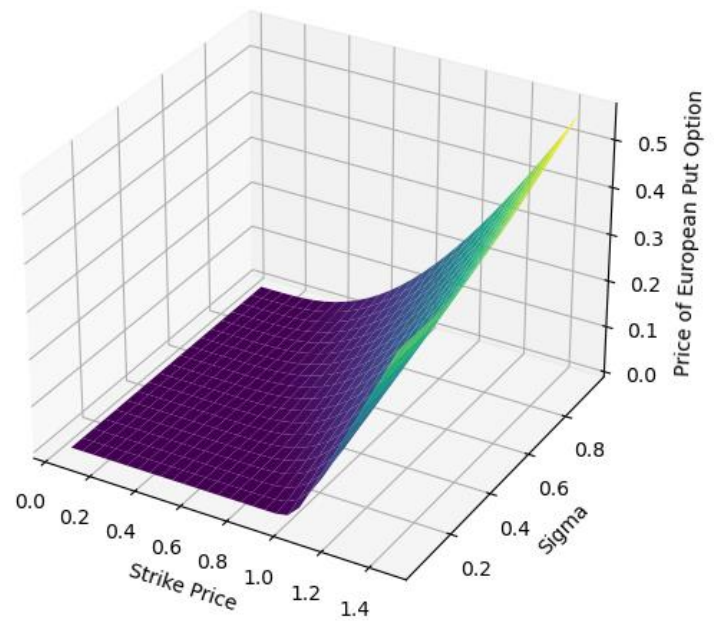


The sensitivity of call and put prices with different factors two at a time can be visualized as follows: -

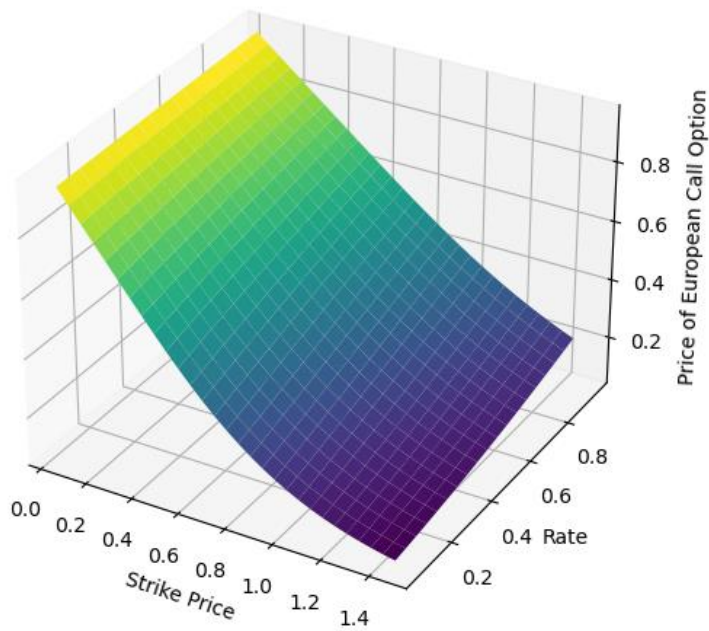
Surface Plot of Call Option Prices vs K and sigma



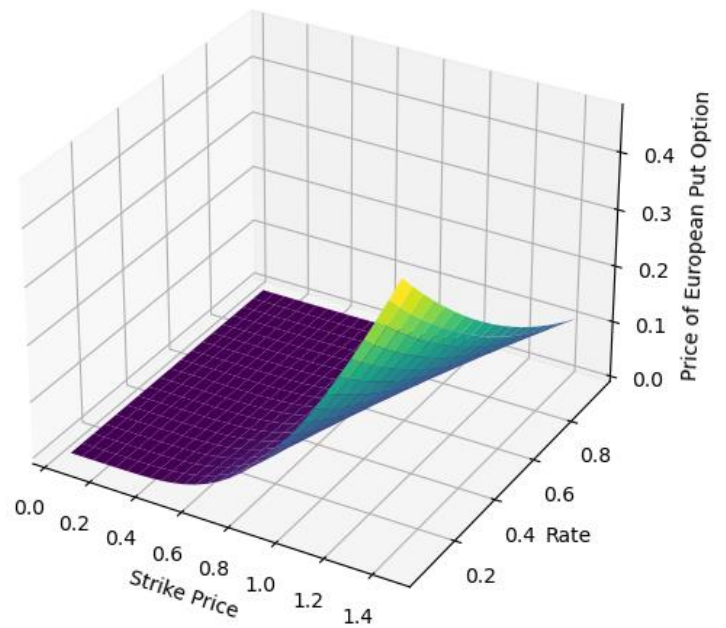
Surface Plot of Put Option Prices vs K and sigma



Surface Plot of Call Option Prices vs K and r

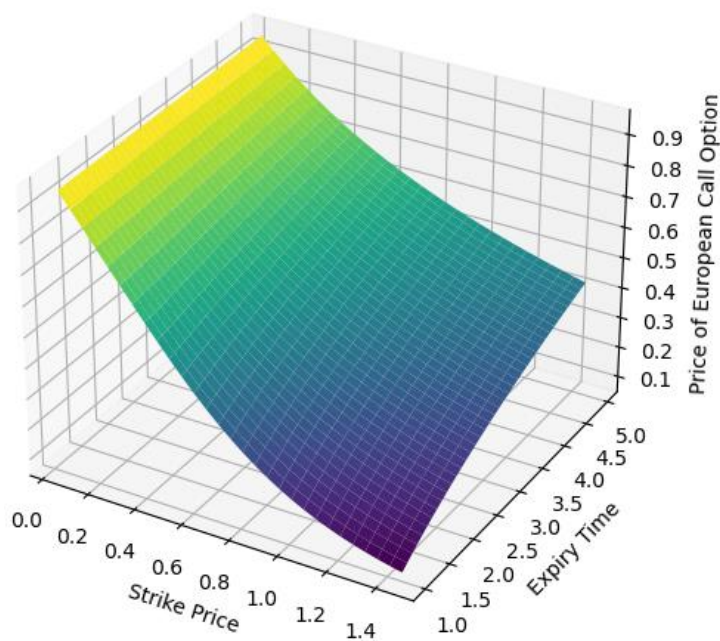


Surface Plot of Put Option Prices vs K and r

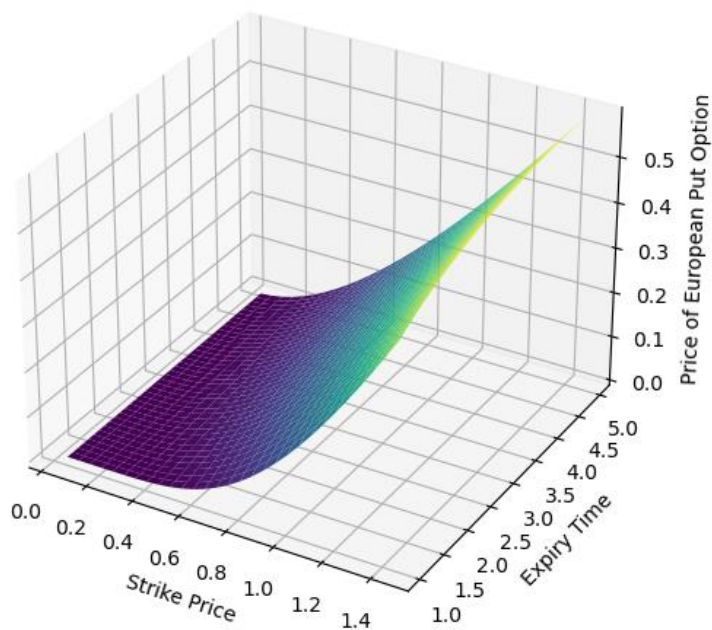




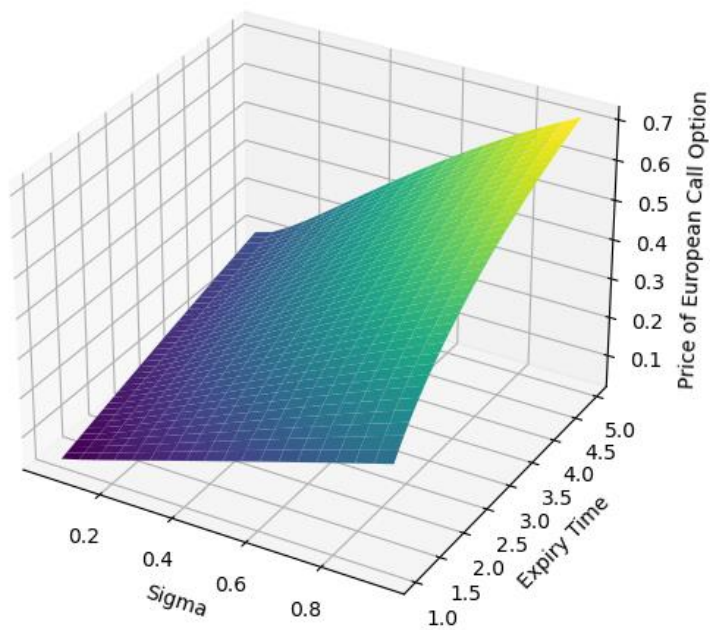
Surface Plot of Call Option Prices vs K and T



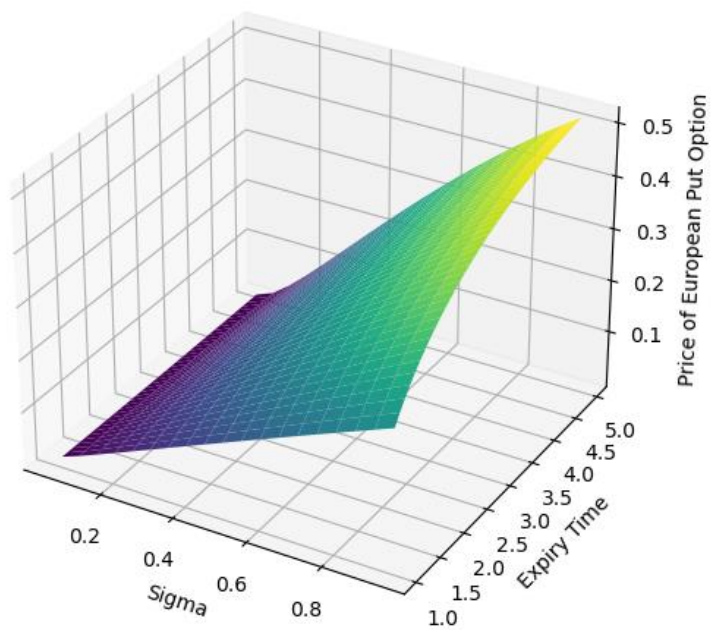
Surface Plot of Put Option Prices vs K and T



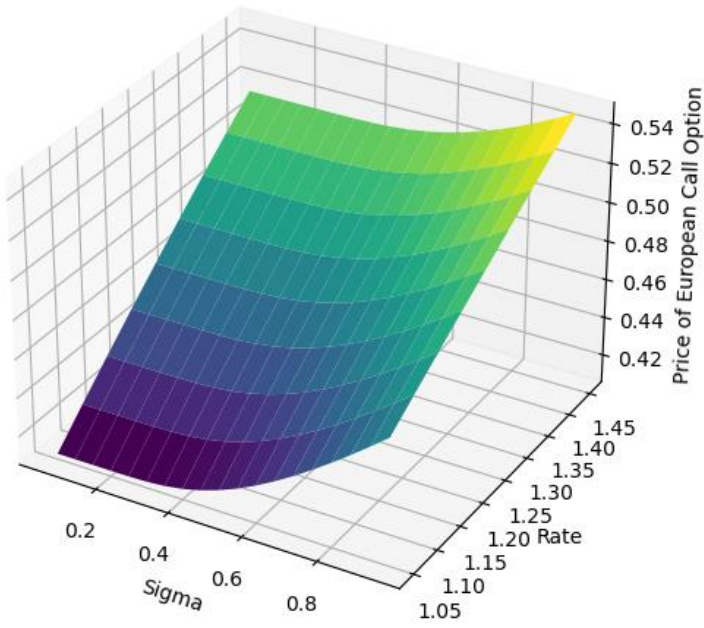
Surface Plot of Call Option Prices vs sig and T



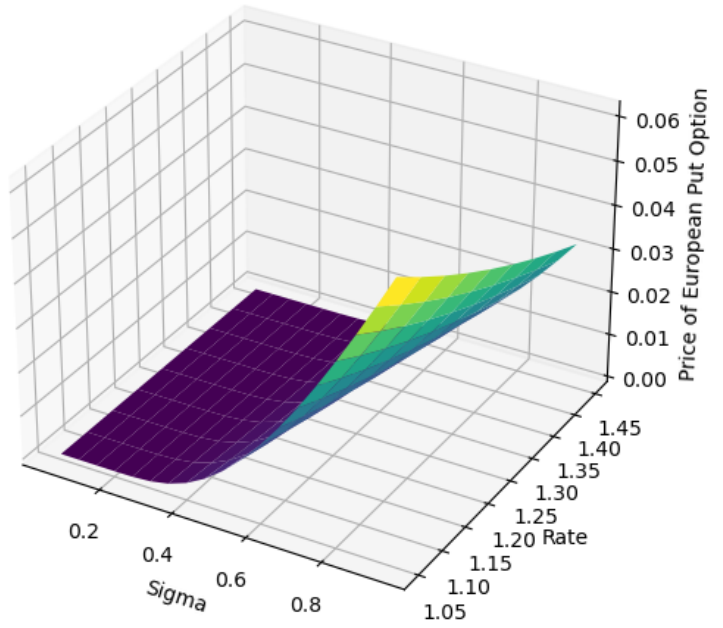
Surface Plot of Put Option Prices vs sig and T



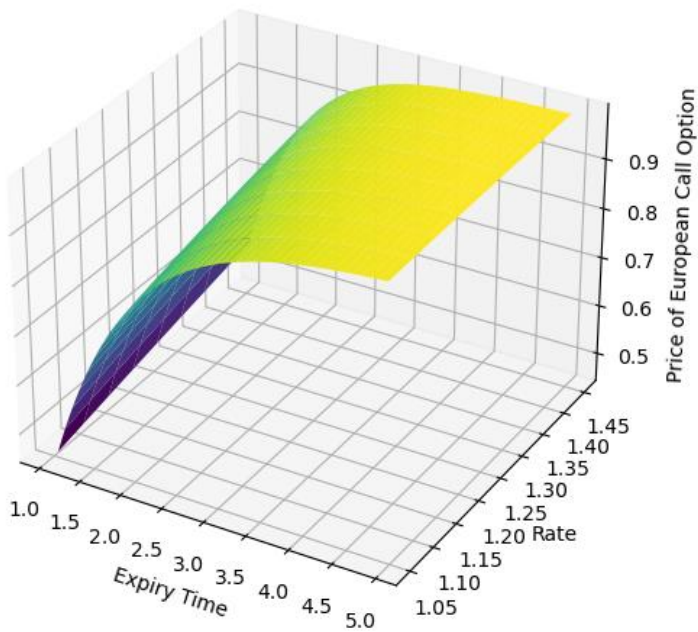
Surface Plot of Call Option Prices vs sig and r



Surface Plot of Put Option Prices vs sig and r



Surface Plot of Call Option Prices vs T and r



Surface Plot of Put Option Prices vs T and r

