MATH 6205 - Numerical Methods for Financial Derivatives
Fall 2018

Purpose:

The objective of this Python program is to compute the prices of European calls and puts using Fourier transform techniques. Geometric Brownian Motion as the underlying diffusion process for the Stock price. Under risk neutral evaluation, the Brownian Motion is transformed in such a way that we can make use of Fourier transform provided the characteristic function is known. The pricing integrals using the Fourier transform and inverse Fourier transform are derived and then the summation is approximated using the Trapezoidal rule. Half frequency domain and Full frequency domain are used to compute the option prices. The algorithm gives us the European call or put option prices based on the dampening factor(alpha) give. For a positive alpha, it gives us the European call option price where for negative alpha, we will get the European put option price. The input parameters required are provided by the user.

Output:

```
In [33]: runfile('/Users/khan/Desktop/Sem-III/MATH 6204/main.py', wdir='/Users/khan/
Desktop/Sem-III/MATH 6204')
Reloaded modules: hw7_Mohammed_Ameer_Khan

                   2.5        5.0        10.0
Call Prices  31.842953  31.842953  31.842953


                -2.5       -5.0       -10.0
Put Prices  7.917966  7.917966  7.917966
```

Analysis:

The Fourier transform techniques are used to calculate the prices of European call and put options. The main observation here is that the option prices for both European call and put are not changing with respect to the dampening factor(alpha) or with respect to the frequency domain. We also removed the last term in the summation, but the values did not change at all. The prices of the put options after scaling for the strike prices has increased dramatically and even reached infinity for an alpha value of -10. The prices of the call options did not change at all with the varying alphas.