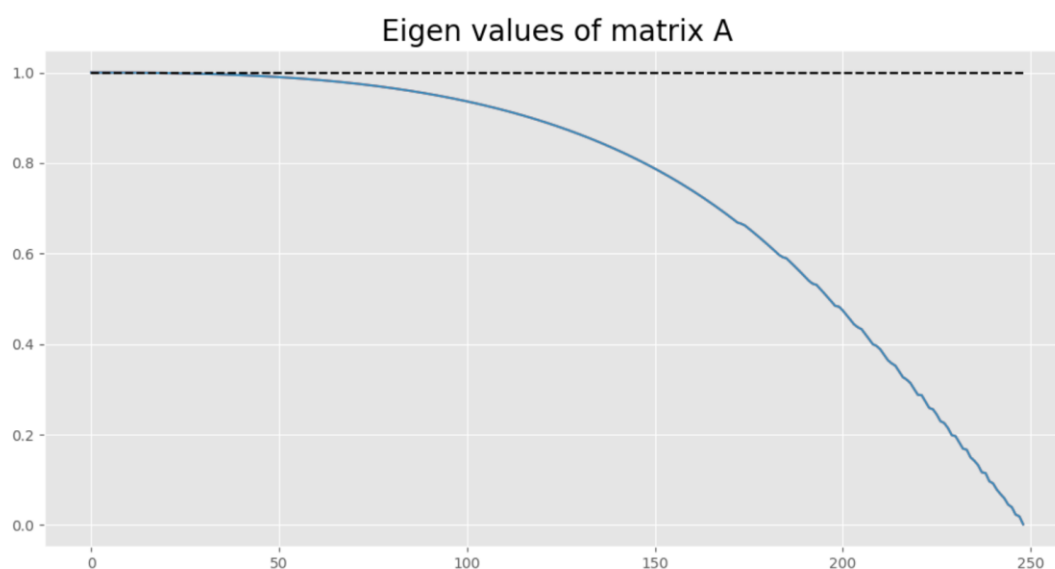


MF 796 Assignment 6

Xinyu Guo
xyguo@bu.edu
U03375769

Problem 1

1. This is because two American calls with different strike prices could be executed at different times, and more importantly, we do not have the right to execute the short call. On the contrary, if we want to early exercise an American call spread, it's equivalent to early exercising both corresponding American calls simultaneously.
2. I got the risk free rate from FRED. The close rate of March 4, 2020 is 0.72%.
3. We could calculate the implied volatility of the two calls respectively, and uses the average of them as our input parameter of volatility.
4. Here, I set s_{max} as 600, M as 250, N as 1000 (Accordingly, $h_s = 2.4$). Since it is barely possible for the price to reach 600 this year, 600 is high enough to be set as the top boundary for the explicit schema. And these parameters satisfy the stability condition, as we can see in the following.
5. The absolute value of eigenvalues of matrix A can be seen in the following plot:



As we can see, all of the absolute value of the eigenvalues of matrix A is smaller than 1. Thus, the parameters satisfy the stability condition.

6. We can derive the price of call spread using linear interpolation. Thus, Price of the call spread without the right of early exercise on Mar 4th is 2.2.
7. When the call spread could be exercised earlier, the price is 4.07.

8. The premium is 1.87. I think this premium is reasonable since the early exercise should give the option a positive premium, which covers the benefit of early exercise.