**Problem Set#2**

1. **Option Pricing via FFT Techniques**
2. **Exploring FFT Technique Parameters**
3. Here’re some results of the prices using different alpha:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Alpha** | 0.01 | 0.05 | 0.1 | 0.5 | 1 | 5 | 20 |
| **Price** | ﻿25.4065 | ﻿21.2688 | ﻿21.2688 | ﻿21.2688 | ﻿21.2688 | ﻿21.2688 | ﻿21.2688 |

By choosing N=14 and B=250, wo can see that the call prices are stable starting from alpha = 0.05 to alpha = 20.

**(ii)** Changing the N and B values and setting alpha as **1**, we can create a 3-D plot to depict their relations:

图表, 表面图

描述已自动生成图表, 表面图

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From the plot we can conclude that, the call option prices tend to be stable when Ns in the range from 9 to 14, B in the range from 75 to 250. And according to the efficiency plot, we can get that N=9 , B= 100

**(iii)** Holding all others constant as above, change strike price to 260, and repeat what we do in (ii), we can also get the plot below:

图表, 表面图

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From the plot above, we can conclude that the value plot is really similar to the former one. Then the best value is N = 9 and B = 200, there’s a bit of different but not so hugely from the above one.

1. **Exploring Heston Parameters**
2. The plot shown below**:**

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**(ii)** Setting strike price as 150, I plot the curve of expiry and the implied volatility:

图表

低可信度描述已自动生成

**(iii)** First, changing kappa value, we get the plots below:

图表, 直方图

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By increasing the kappa value, both the skew and term structure are increasing, while the term structure has been influenced more significantly, it seems that this structure turns from smile to a skew.

Second, changing sigma value we can get the plot below:

图表

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By increasing the sigma value, the term structure apparently decreases. However, it’s hard to describe the skew structure trend. In other words, skew structure tends to have a inverse-peak curve as the sigma increasing.

Third, changing the rho value we can get the plots below:

图表, 折线图

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By increasing rho, the skew structure tends to shift downsides and the term structure shifts down as well. The term structure still keep a smile shape while the skew looks like a bit more skew.

Forth, by changing theta we can get the plot below:

图表, 直方图

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描述已自动生成

Obviously, increase the theta value, both of the skew and term structure shifts upwards. To be specific, the term structure turns to be steeper.

Finally, we change the V0:

图表, 折线图

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描述已自动生成

By increasing v0, both of the structures shift upwards with the more steep tendency or slope, and the term structure looks like a bit more ‘skew’.