MFE 405 Project 6
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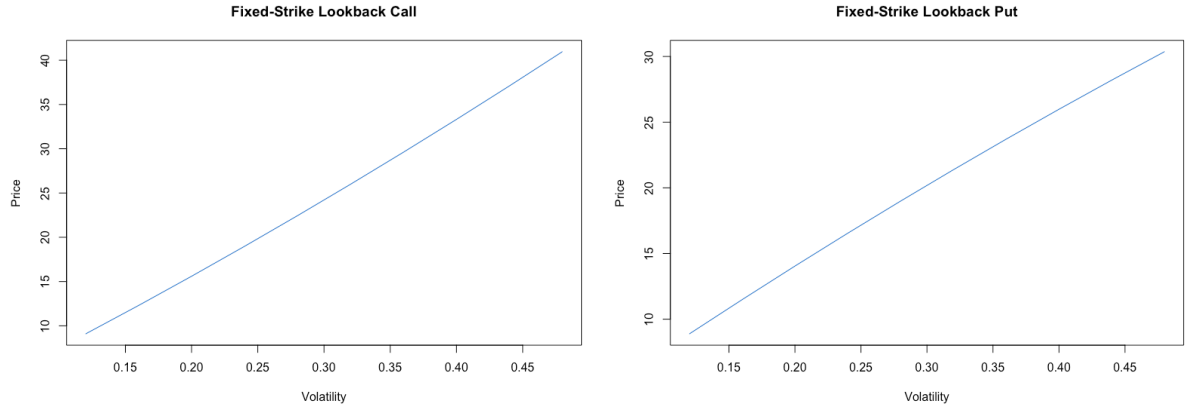
1. Fixed Strike Lookback Options

We can use a similar Monte Carlo simulation method to estimate the prices of the fixed strike lookback call and put options. The difference is that for each simulated stock path, we need to take account of the maximum/minimum price the path reaches in its lifespan and use that price to calculate the payoff. Using the provided parameters and the range of volatilities, we can estimate the prices of such call and put options, with its movement according to changes in volatility illustrated in the plots below:

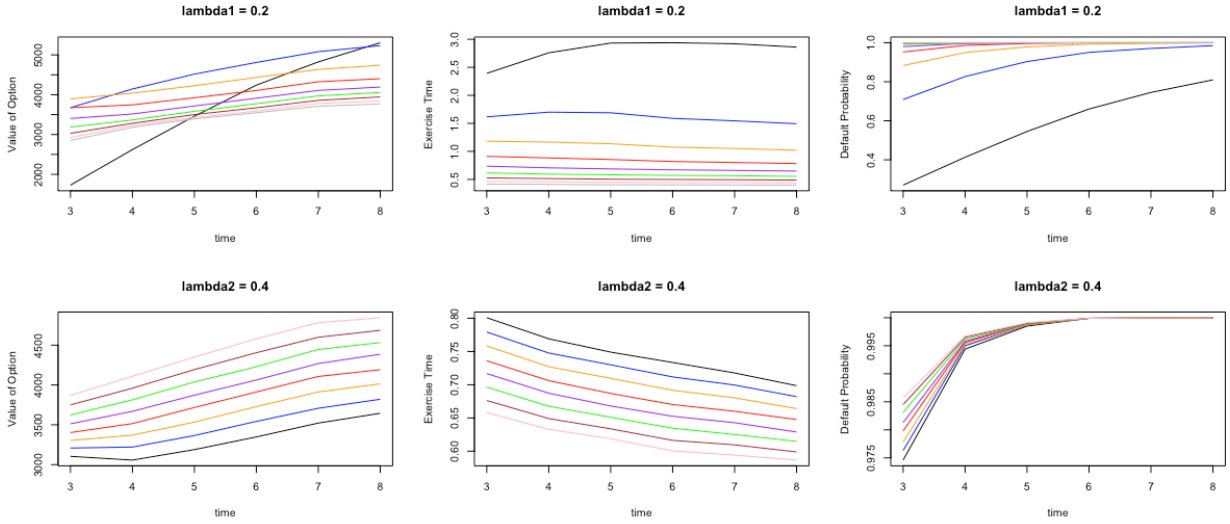


As we see, similar to other options, as volatility increases, the values of the options increase as well.

2. Jump-Diffusion Process

We can simulate the jump-diffusion process of the collateral in many different ways. In my implementation, I utilize the "Timeline" method, where I simulate jump times in each path by using a Poisson distribution. I also use the "Timeline" method to find the first stopping time of S, as a simulation of an adverse event causing default of the loan. I divide the periods of the loan into monthly parts and simulate paths with such number of periods. Using all the given parameters, I compute the value of the default option with given default parameters to be **$3717.05**, the default probability **99.89%**, and the expected exercise time of **0.69**.

Now, I compute these values for different ranges of λ_1 and λ_2, producing the plots below:



In the plots, black corresponds with the lowest λ value, increasing with blue, orange, red, purple, green, brown, with grey and pink being the highest λ values. We can see that lower λ values correspond to lower option values, and as the loan's time to maturity increases, the default option increases in value. The expected exercise time is later for lower λ values, with the exercise time decreasing as time increases for when λ_2 is constant. The default probability increases as time increases for all λ values, and the default probability is lowest for low λ values. The probability eventually converges to 100% as time to maturity increases.