

The computation time of the FDM is approximately 3.2171 seconds, whereas the PINN takes approximately 42.6876 seconds to run. The performance of the PINN on pricing an American Call suffers similar issues as in the previous case. The corner is nowhere to be found, and errors are maximized halfway to expiration. However, the general shape of the solution curve follows closely to the FDM solution.

Though we also have the results of our GMIB VA, we unfortunately did not have a benchmark to test our model against. Our PINN solution made certain assumptions and simplifications (such as the assumption of continuous time anniversary dates, the assumption that policyholders would stay alive during the duration of their contract, and no death benefit) that makes it difficult to compare against [3]. However, we can show that our models predictions are in line with the results that we would expect.

The first model which shown below had the following parameters:  $r^{gua} = 2.5\%$ ,  $r^{act} = 4\%$ ,  $\alpha^A = 2.5\%$ ,  $\alpha^G = 2\%$ ,  $\sigma = 35\%$ ,  $\omega = 85$  years,  $x_0 = 60$  years,  $T = 15$  years

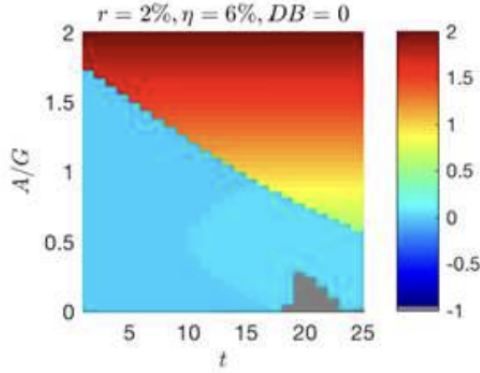


Figure 11: GMIB VA  
FDM Solution in 2D

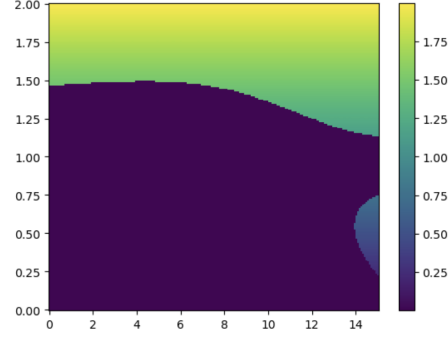


Figure 12: GMIB VA  
PINN Solution in 2D

The second model shown had the following parameters:  $r^{gua} = 5\%$ ,  $r^{act} = 3.5\%$ ,  $\alpha^A = 2\%$ ,  $\alpha^G = 1\%$ ,  $\sigma = 20\%$ ,  $\omega = 85$  years,  $x_0 = 65$  years,  $T = 10$  years

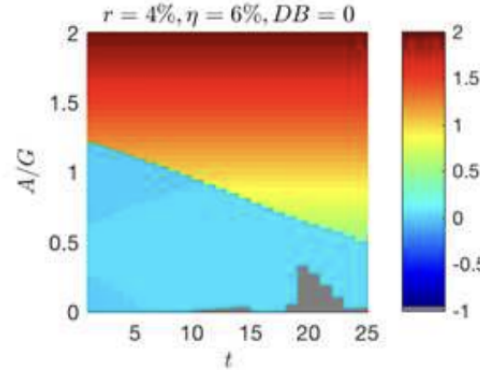


Figure 13: GMIB VA  
FDM Solution in 2D

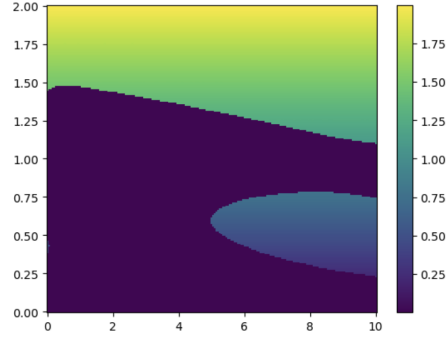


Figure 14: GMIB VA  
PINN Solution in 2D