Finite Differences: Non-Equidistant Grids

Equidistant grids can waste many nodes in areas where the solution is rather flat. Frequently this happens with options far out of the money. This situation calls for flexible grids having large mesh length for regions with $V \approx 0$ and small mesh length where the solution V has significant gradients. This is the ideal scenario for finite element methods. But also for finite differences the effort of introducing variable grid sizes improves the efficiency. This holds in particular in the two-asset case.

The figure shows $V(S_1, S_2, 0)$ for a butterfly option, calculated with non-equidistant grid. Notice the area where both S_1 and S_2 are large, and the grid is very different from the areas where either S_1 or S_2 are small.