

A Multigrid Strategy for Calibrating Financial Models

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Abstract

For asset pricing purposes, ‘calibrating’ a model means to choose unobservable input parameters so that some output of the model matches some observed data. This practice is ubiquitous in financial engineering, financial economics, and macroeconomics, where an increasing number of models are being developed that must be solved numerically. It is for such models that we introduce a numerical method to perform solution and calibration in one shot. A multigrid technique is used to reduce the computational burden so that calibration is only two to three times as expensive as simply computing the model’s solution for a given set of parameters. We illustrate this method by solving a portfolio choice problem with labor income and an optimal retirement decision. We also present a detailed analysis of a simple optimal stopping problem in two dimensions and discuss a probabilistic interpretation of some pseudo-differential operators that feature prominently in the numerical analysis.

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