

PDE and PIDE models for pension plans without and with early retirement option

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Resumo/Abstract:

Sometimes in defined benefit pension plans the amount received by the member depends on certain average salary. Assuming a stochastic diffusion model for the salary evolution, we have recently addressed the mathematical analysis and numerical solution of PDE and PIDE models. In the the case without early retirement option, the value of the pension plan is the solution of an initial-boundary value problem associated to a Kolmogorov PDE while when early retirement is possible, an obstacle problem is posed. Moreover, in some cases a jump-diffusion model for the salary seems to be more realistic, so that a partial integro-differential equation (PIDE) model arises. After posing the models, we propose some appropriate numerical methods to solve the PIDE and PDE problems. These methods mainly consist on Lagrange-Galerkin for the full discretization combined with the explicit treatment of the integral term in the case of the PIDE. For the obstacle problem, the ALAS algorithm is proposed. Finally, we compare the numerical results with those ones obtained with different Monte Carlo techniques.

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