

# A game-theoretical model of debt and bankruptcy

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## Abstract

We study a game-theoretical model of debt and bankruptcy where the average interest rate  $\alpha$  payed on debt for the borrower, depending on the bankruptcy risk  $\rho$ , is charged by a pool of risk-neutral lenders. It is assume that lenders will lose their investment if bankruptcy occurs. We consider the Nash equilibrium feedback solution for a simple model of the optimal control problem for the borrower:

$$\text{Minimize} \quad E \left[ \int_0^{T_b} e^{-rt} L(u(t)) dt + B \cdot e^{-rT_b} \right]$$

subject to the evolution equation of the total debt  $x$

$$\dot{x}(t) = \alpha(x(t)) \cdot x(t) - u(t)$$

where the payment rate  $u$  is the control variable,  $L(u)$  is the cost to the borrower for implementing the control  $u$ ,  $B$  is the bankruptcy cost to the borrower and the random variable  $T_b$  denotes the bankruptcy time.