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The optimal MFG switching strategy of prevention efforts for COVID-19. (Chinese. English summary) [Zbl 07403691]

Summary: By the empirical analysis of the open data on COVID-19 in the America, this paper proposes a stochastic dynamic infection model for the regions in America during the pandemic period of COVID-19. To solve when to “open” or “restrict” the economic and social activities, we construct a multi-regional optimal prevention and control switching Nash equilibrium strategy based on maximizing the expected utility with mean-field interactions. Then, we consider the infection population model for the representative region and solve the corresponding optimal prevention and control switching strategy under the infinite number of regions. Meanwhile, we prove that this strategy is an $\epsilon$-Nash equilibrium for finite regions when the number of regions tends to infinity. By comparing and analyzing the optimal switching boundaries under different process states, we give specific suggestions on when and how to adjust the prevention efforts.

MSC:
91A10 Noncooperative games
91A16 Mean field games (aspects of game theory)
92D30 Epidemiology

Keywords:
COVID-19; infectious disease model; optimal switch problem; Nash equilibrium; mean field game

Full Text: DOI