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ON THE UNIQUENESS OF THE NASH EQUILIBRIUM IN STOCHASTIC GAMES OF CAPITAL ACCUMULATION ON A GRAPH

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ABSTRACT. The main purpose of this work is the study of the application of controlled random fields given on a finite non-oriented graph described in [1], to the problem of the uniqueness of the Nash-equilibrium for stochastic capital accumulation games with many players. The players are located at the vertices of the interaction graph Γ , the edges represent the connections between the players. We assume that the decisions of the players are synchronized using a standard assumption of decision making in discrete time sequential games.

The problem of the existence of the Nash equilibrium for this type of games is considered in the work [2]. In order to show the existence of a single equilibrium, additional conditions on transitional probabilities and utility functions apply.

The direct impetus for writing this article was the work of Balbus, Nowak [3] and Wiećek [4] based on the results of Amir [5]. In this paper we summarize the results of Balbus, Nowak [3] and Wiećek [4] on a multidimensional model: players are concentrated at the vertices of a finite graph that determines their local interaction. Such a generalization makes it possible to use in real economic models with "neighborhood dependence" (for example, see [6]) for describe the process of capital accumulation.

Keyword: Markov decision process, stochastic game, Nash equilibrium, capital accumulation, random fields, local interaction.

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REFERENCES

- [1] R.K. Chornei, H. Daduna, P.S. Knopov, Control of Spatially Structured Random Processes and Random Fields with Applications, Springer Science + Business Media, Inc., 2006.
- [2] R.K. Chornei, On the Nash equilibrium in stochastic games of capital accumulation on a graph, In: J. Kacprzyk (ed.) Advances in Intelligent Systems and Computing, Annals of the International Conference on Data Science and Intelligent Analysis of Information'2018, Springer [In print].
- [3] L. Balbus, A.S. Nowak, Construction of Nash equilibria in symmetric stochastic games of capital accumulation, Math. Meth. Oper. Res., 60, 267-277, 2004.

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- [4] P. Wiecek, Continuous convex stochastic games of capital accumulation, In: A.S. Nowak, K. Szajowski (eds.) *Advances in Dynamic Games*, Annals of the International Society of Dynamic Games, 7, 111-125, Birkhäuser, 2005.
- [5] R. Amir, Continuous stochastic games of capital accumulation with convex transitions, *Games Econ. Behavior*, 15, 111-131, 1996.
- [6] P.A. David, D. Foray, Percolation structures, Markov random fields. The economics of edi standards diffusions, In: Pogorel (ed.) *Global telecommunications strategies and technological changes*, North-Holland, Amsterdam, 1993, First version: Technical report, Center for Economical Policy Research, Stanford University, 1992.