

VIABILITY ANALYSIS FOR A STOCK-CAPITAL FISHERY MODEL

Othman Cherkaoui Dekkaki* and
Nadia Raissi

Department of mathematics,
University Mohammed V,
Faculty of Sciences, Rabat, Morocco

othman.dekkaki@um5s.net.ma (*corresponding author),
n.raissi@um5s.net.ma.

This work is based on C. Clark, F. Clarke and G. Munro fishery model, [1], where the dynamic is the evolution of both stock and capital controlled by the investment and the part of the capital dedicated to the harvest. The contribution consists of substituting the profit maximization objective by constraints on the states of the model. In this new formulation, we give conditions on the parameters of the model which guarantees the non-emptiness of the viability kernel, which means the determination of the biggest set of initial conditions on which investment and exploitation sustainable policies could be defined. At the center of this result, we find the viability theory introduced by Aubin [3], which consists of studying the existence of controls yielding admissible states. Thus, we build the viability kernel corresponding to the studied model, under the conditions cited above.

References

- [1] C.W. Clark, F.H. Clarke, G.R. Munro. (1979). *The Optimal Exploitation of Renewable Resource Stocks: Problems of Irreversible Investment*. *Econometrica*, Vol. 47, No. 1, pp. 25-47
- [2] C.W. Clark. (1990). *Mathematical Bioeconomics: The Optimal Management of Renewable Resources*, Wiley-Interscience.
- [3] Aubin, J.P., (1991). *Viability Theory*. Springer Verlag, Birkhauser.
- [4] Bn, C., Doyen, L., Gabay, D. (1998). *A Viability Analysis for a Bio-economic model*, Cahiers du Centre de Recherche Viabilit-Jeux-Contrle.
- [5] Jerry C., Raissi N. (2012). *A viability analysis for a stock/price model*, in AIP Conference Proceedings. Vol 1479. ;1343-1349.

*11th Conference on Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2020
Trento, Italy, February 4-7, 2020*

- [6] Sanogo, C., Rassi, N., Ben Miled, S., Jerry, C. (2013). *A viability analysis of fishery controlled by investment rate*. Acta Biotheor. 61 (3), 341-352.
- [7] Sanogo, C., Ben Miled, S., Raissi, N. (2012). *Viability analysis of multi-fishery*. Acta Biotheor. 60 (1-2), 189-207.
- [8] Mchich R, Auger P, Raissi N. (2005) *The stabilizability of a controlled system describing the dynamics of a fishery*. CRAS C.R.Biologies 328(4):337-350