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Systems and Control Group - CIDMA

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Sala Sousa Pinto

A dynamically consistent discretization method for Goodwin Model

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Abstract

In economic theory the majority of macroeconomic models describing economic growth employ differential equations or sets of differential equations (see, among all, Solow [6] and Haavelmo [2]). Nevertheless, economic data are usually available in discrete time. Therefore, when attempting to apply these models it is often necessary to use their discrete form, i.e. difference equations. To this aim, more and more often authors propose and analyse discrete versions of the models originally built with the assumption of time continuity. Despite many standard numeric techniques and ready-made software, obtained discrete models do not always maintain model characteristics in continuous time and the long run behaviours of the discretized model could differ from the original one. In this work, we present a modification of non-standard discretization method related to the methodology proposed by Mickens [4, 5] and its revisions (see Kwessi *at al.* [3]) for converting economic models from continuous time to discrete time. Such a discretization method preserves the original dynamic properties of the continuous model, in the sense of equilibria, their stability and bifurcation characteristics. Furthermore, the discretization produces solution trajectories in qualitative and quantitative agreement with those of the continuous model. An example of economic model described by a system of nonlinear differential equations is studied: we applied the discretization method to the Goodwin model [1] and provided a comparative analysis for qualitative and quantitative long run behaviour of the continuous and discrete version of the system.

References

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