Electronic circuit emulation and numerical simulation of a fractional nonlinear macroeconomic dynamic model

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Abstract

A fractional nonlinear macroeconomic dynamic model is simulated using electronic circuits emulation in Cadence OrCAD package. Coupled nonlinear differential equations of arbitrary orders (integer and fractional orders) are implemented with electronic circuits by means of analogical integrators, adders, multipliers and the fractance circuits units with capacitors/resistors lattices. The $\frac{1}{s^{\alpha}}$ term that represents a fractional integration in Laplace domain is approximated using a s-domain transfer function with zeros and poles adjusted in frequency domain. The resistors and capacitors values are determined and the respective electronics schematics circuits are developed and simulated. Results obtained through electronic circuits emulation are compared with numerical simulations previously achieved and reported in the literature involving the aforementioned system. These results are very similar and present consistent behaviours in both approaches.

References

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