

Step method for a functional-differential equation from mathematical economics

ANTON S. MUREȘAN

ABSTRACT.

The following equation appears in the price theory and in the dynamics of economical systems:

$$x'(t) = [f(x(t)) - g(x(t-h))]x(t), \quad t \in [0, T], \quad h > 0,$$

where f and g are given continuous functions, $f, g \in C(\mathbb{R}_+, \mathbb{R})$. We use an abstract model of the step method (see I. A. Rus [14]) to obtain existence and uniqueness results for the solution of a problem for this equation.

REFERENCES

- [1] Belair, J. and Mackey, M. C., *A model for the regulation of mammalian platelet production*, Ann. N.J. Acad. Sci. **504**(1987), 280–282
- [2] Belair, J. and Mackey, M. C., *Consumer memory and price fluctuations in commodity markets: An integro-differential model*, J. Dyn. Diff. Eqs. **3** (1989), 299–325
- [3] Farahani, A. M. and Grove, E. A., *A simple model for price fluctuation in a single commodity market*, Contemporary Math. **129** (1992), 97–103
- [4] Hirsch, M. W. and Pugh, C. C., *Stable manifolds and hyperbolic sets*, Proc. Symp. Pure Math. **14** (1970), 133–163
- [5] Mackey, M. C., *Commodity price fluctuations: price dependent delays and nonlinearities as explanatory factors*, J. Econ. Th. **48** (1989), 497–509
- [6] Mureșan, A. S., *On some models of price fluctuations in a market economy*, Studia Univ. Babeș-Bolyai, Mathematica **2** (1993), 15–20
- [7] Mureșan, A. S., *Commodity price fluctuations with delays and nonlinearities*, APLIMAT, Slovakia, J. Appl. Math. **1** (2008), 365–370
- [8] Mureșan, A. S. and Iancu, C., *A new model of price fluctuation for a single commodity market*, Sem. Fixed Point Theory **3** (2002), 277–280
- [9] Otrocol, D., *Lotka-Volterra system with two delays via weakly Picard operators*, Nonlinear Analysis Forum, **10** (2005), 193–199
- [10] Rus, I. A., *Picard operators and applications*, Babeș-Bolyai University of Cluj-Napoca, Preprint **3** (1996)
- [11] Rus, I. A., *A fibre generalized contraction theorem and applications*, Mathematica Tome 41(64), **1** (1999), 85–90
- [12] Rus, I. A., *Generalized contractions and applications*, Cluj University Press, Cluj-Napoca, 2001
- [13] Rus, I. A., *Picard operators and applications*, Scientiae Mathematica Japonica **58** (2003), 191–219
- [14] Rus, I. A., *Abstract models of step method which imply the convergence of successive approximations*, Fixed Point Theory **9** (2008), 293–307
- [15] Șerban, M. A., *Fibre φ -contraction*, Studia Univ. Babeș-Bolyai, Math. **44** (1999), 99–108
- [16] Tarța, A. A., *Functional-differential equations that appear in price theory*, Fixed Point Theory, Cluj-Napoca, **3** (2002), 375–380
- [17] Wazewaska-Czyżewska, M. and Lasota, A., *Mathematical problems of the dynamics of a system of red blood cells*, (Polish), Math. Stoc. **6**, **3** (1976), 23–40

“BABEȘ-BOLYAI” UNIVERSITY
FACULTY OF ECONOMIC SCIENCES AND BUSSINESS ADMINISTRATION
DEPARTMENT OF STATISTICS, FORECAST AND MATHEMATICS
58-60 T. MIHALI ST., 400591 CLUJ-NAPOCA, ROMANIA
E-mail address: asmuresan@yahoo.com

Received: 24.10.2008; In revised form: 21.01.2009; Accepted: 10.05.2009
2000 Mathematics Subject Classification. 34K15, 47H10, 90B24, 90B62.

Key words and phrases. *Functional-differential equation, price fluctuation, equilibrium price, mathematical economics, step method.*