Semmler, W. W.; **Sieveking, M.**
Critical debt and debt dynamics. (English) Zbl 1136.91541
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Summary: We study the debt dynamics and sustainable debt for an open economy which borrows from abroad in order to finance consumption. To service the debt the country may exploit a renewable resource. We show that there is for every resource stock R a critical level $B^*(R)$ of debt above which debt tends to infinity but below which it may be steered to zero. We demonstrate how to compute $B^*(R)$ using an ODE of steepest descent. If the economy maximizes a discounted integral of utility depending on consumption and the resource stock, the critical debt $B^*(R)$ may be reached in finite time. In such a situation slight perturbations of the optimal consumption lead to insolvency. The maximum principle ceases to be valid in this case.

MSC:

91B64 Macroeconomic theory (monetary models, models of taxation)
91B28 Finance etc. (MSC2000)

Full Text: DOI

References:

[1] Barro, R.; Mankiw, N.G.; Sala-i-Martin, X., Capital mobility in neoclassical models of growth, American economic review, 85, 1, 103-116, (1995)

[2] Beltratti, A., Chichilnisky, G., Heal, G., 1993. Sustainable growth and the green golden rule. National Bureau of Economic Research, Working paper series no. 4430. · Zbl 0900.90122

[3] Beltratti, A., Chichilnisky, G., Heal, G., 1994. The environment and the long run: a comparison of different criteria. Ricerche Economiche 48. · Zbl 0826.90019

[4] Berkovitz, L.D., 1974. Optimal Control Theory. Springer, Heidelberg. · Zbl 0295.49001

[5] Bhandari, J.S., Haque, N., Turnovsky, S., 1990. Growth, external debt and sovereign risk in a small open economy. IMF Staff Papers, Vol. 37, no. 2.

[6] Blanchard, O.J., 1983. Debt and current account deficit in Brazil. In: Armella, P.A., Dornbusch, R., Obstfield, M. (Eds.), Financial Policies and the World Capital Market: The Problem of Latin American Countries. University of Chicago Press, Chicago, pp. 187-197.

[7] Blanchard, O.J., Fischer, S., 1989. Lectures in Macroeconomics. MIT Press, Cambridge.

[8] Brock, W.A., Malliaris, A.G., 1996. Differential Equations Stability and Chaos in Dynamic Economics. North-Holland, Amsterdam. · Zbl 0693.90001

[9] Clark, C.W., 1990. Mathematical Bioeconomics: The Optimal Management of Renewable Resources. Wiley, New York. · Zbl 0712.90018

[10] Cohen, D.; Sachs, J., Growth and external debt under risk of debt repudiation, European economic review, 30, 3, 529-560, (1986)

[11] Dasgupta, P., Eastwood, R., Heal, G., 1978. Resource management in a trading economy. Quarterly Journal of Economics, May, 297-306. · Zbl 0387.90047

[12] Feichtinger, G., Novak, A., 1991. A note on the optimal use of environmental resources by an indebted country. Journal of Institutional and Theoretical Economics 147, 547-555.

[13] Feldstein, M.S., Horioka, C., 1980. Domestic savings and international capital flows. Economic Journal 90, 314-329.

[14] Krugman, P., 1992. Currencies and Crises. MIT Press, Cambridge.

[15] Milesi-Ferretti, G.M., Razin, A., 1996. Current account sustainability: selected east Asian and Latin American experiences. NBER working paper no. 5791.

[16] Milesi-Ferretti, G.M., Razin, A., 1997. Sharp reduction in current account deficits. An empirical analysis. NBER working paper no. 6310.

[17] Nishimura, K.; Ohyama, M., External debt cycles, Structural change and economic dynamics, 6, 215-236, (1995)

[18] Piccinini, L.C., Stampacchia, G., Vidossich, G., 1984. Ordinary Differentialequations in IR. Springer, Berlin (Chapter III). · Zbl 0535.34001

[19] Plourde, C.G., A simple model of replenishable resource exploitation, American economic review, 60, 518-522, (1970)

[20] Ramsey, F., A mathematical theory of savings, Economic journal, 38, 5343-5559, (1928)

[21] Rauscher, M., The optimal use of environmental resources by an indebted country, Journal of institutional and theoretical economics, 146, 500-517, (1990)

[22] Sachs, J., The current account in the macroeconomic adjustment process, Scandinavian journal of economics, 84, 2, 147-159, (1982)

[23] Sen, P., Imported input price and the current account in an optimizing model without capital mobility, Journal of economic dynamics and control, 15, 1, 91-103, (1991)

[24] Sieveking, M.; Semmler, W., The present value of resources with large discount rates, Applied mathematics and optimization: an international journal, 35, 283-309, (1997) · Zbl 0881.49002

[25] Sieveking, M., Semmler, W., 1997b. Using vector field analysis for studying debt dynamics, paper prepared for the 1998 North American Winter Meeting of the Econometric Society, Chicago, January 1998. · Zbl 0881.49002

[26] Sieveking, M., Semmler, W., 1998. Multiple equilibria in dynamic optimization: an algorithm to detect optimal and non-optimal equilibria. Paper prepared for the Conference on Computing in Economics, Finance and Engineering, Cambridge University, July, 1998.

[27] Swensson, L.E.O.; Razin, A., The terms of trade and the current account: the harberger – laursen-metzler effect, Journal of political economy, 91, 11, 97-125, (1983)