Structural Change and Economic Dynamics 30 (2014) 68–85

Contents lists available at ScienceDirect

Structural Change and Economic Dynamics

journal homepage: www.elsevier.com/locate/sced

Keynesian systems with rigidity and flexibility of prices and inflation–deflation expectations☆

Hiroki Murakami*

Graduate School of Economics, University of Tokyo, 7-3-1, Hongo, Bunkyo-ku, Tokyo, Japan

ARTICLE INFO

Article history:
Received 3 April 2013
Received in revised form 2 November 2013
Accepted 1 February 2014
Available online 19 February 2014

JEL classification:
E12
E21
E22
E31
E32
E41
E44

Keywords:
Keynesian economics
Bifurcations
Business cycles
Nonlinear analysis

ABSTRACT

In this paper, by utilizing the Poincaré–Bendixson theory and the Hopf bifurcation theory, we analyze both rigid-price and flexible-price nonlinear disequilibrium Keynesian macroeconomic systems, prove the existence of a persistent business cycle and derive the conditions for global asymptotic stability of the equilibrium. Consequently, we find that a Hopf bifurcation occurs for a lower value of the quantity adjustment parameter in the flexible-price system than in the rigid-price one and that inflation expectation effects may easily destabilize the economic system. Furthermore, we reveal that global asymptotic stability of the flexible-price system is unlikely to be achieved.

© 2014 Elsevier B.V. All rights reserved.

1. Introduction

As has long been argued, Keynes' analysis in his *General Theory* (1936) was based upon Marshallian static approach, but his main concern was in unemployment (disequilibrium) dynamics (at least, in his "ordinary discourse," Keynes tried to describe unemployment dynamics), and some economists have stressed that the Keynesian economics should be regarded as economics of "disequilibrium dynamics," rather than "equilibrium statics."[1] Indeed, Tobin (1975) pointed out that Keynes' principle of effective demand should be rebuilt upon disequilibrium dynamics, not upon (comparative) statics, and the following statements were made by Tobin (1975):

> Very likely Keynes chose the wrong battlefield. Equilibrium analysis and comparative statics were the tools to which he naturally turned to express his ideas, but they

☆ The author is grateful to two anonymous referees for helpful comments and useful suggestions. Possible remaining errors are solely the responsibility of the author.

* Tel.: +81 358415543.
E-mail address: leafedclover@gmail.com

[1] For example, Patinkin (1965), Clower (1960), Clower (1965), Leijonhufvud (1968), Tobin (1975), and Tobin (1993) are included in such economists.

http://dx.doi.org/10.1016/j.strueco.2014.02.002
0954-349X/© 2014 Elsevier B.V. All rights reserved.

were probably not the best tools for his purpose. (Tobin, 1975, p. 195)

The real issue is not the existence of a long-run static *equilibrium* with unemployment, but the possibility of protracted unemployment which the natural adjustments of a market economy remedy very slowly if at all. . .. The phenomena he [Keynes] described are better regarded as disequilibrium dynamics. Keynes's comparative statics were an awkward analytical language unequal to the shrewd observations and intuitions he was trying to embody. (Tobin, 1975, pp. 195–196)

On the other hand, as Kaldor (1940), Hicks (1950) and Goodwin (1951) showed, nonlinear analysis is necessary to yield persistent cycles in business cycle models, because in linear analysis, the amplitude of fluctuations becomes either diminishing or explosive with the passage of time. In fact, Goodwin (1951) stated as follows:

By dropping the highly restrictive assumption of linearity we neatly escape the rather embarrassing special conclusions which follow. Thus, whether we are dealing with difference or differential equations, so long as they are linear, they either explode or die away with the consequent disappearance of the cycle of the society. . .. Therefore, economists will be led, as natural scientists have been led, to seek in nonlinearity an explanation of the maintenance of oscillations. (Goodwin, 1951, pp. 1–2)

Linear systems are comparatively easy to investigate and they may provide useful results in local stability analysis, but to describe persistent cycles in economic models, we cannot help relying upon nonlinear analysis. Also, since the Keynesian economics often emphasizes sudden changes in expectations on the future profit as factors of economic fluctuations, nonlinearity of functions, especially of the investment function, is needed to explain this phenomenon.

Thus, to sum up the claims above, we can conclude that the Keynesian analysis of business cycles and economic fluctuations must be formalized on *nonlinear disequilibrium* models. The business cycle model proposed by Kaldor (1940) is among the earliest nonlinear disequilibrium models in the Keynesian economics. Yasui (1953), Ichimura (1955) and Morishima (1958) gave mathematical formalizations to Kaldor's nonlinear model and examined mathematical properties of Kaldor's model by employing some theorems on theory of oscillators, especially the theorem by Levinson and Smith (1942, pp. 384–385 Theorem I or p. 398 Theorem IV).[2] Their contributions may provide useful insights on the possibility of applications of the theory of oscillators to economics, but the Levinson–Smith theorem requires some strong hypotheses such as assumptions as to the shape of the functions (e.g. the symmetry requirement) and they all introduced some linearity to apply this theorem. In this respect, their analyses sacrificed generality.[3] By taking another approach, the Poincaré–Bendixson theory, Chang and Smyth (1971) investigated Kaldor's model and derived the conditions for the existence of a stable limit cycle (a persistent business cycle). In the Chang–Smyth analysis, it is unnecessary to introduce any linearity of the functions or to impose those strong assumptions mentioned above which the Levinson–Smith theorem requires. In this sense, it can be said that the Poincaré–Bendixson theory may provide more general results than the theory of oscillators.[4] Moreover, the preceding literatures such as Asada (1987) introduced the LM equation (the money market equilibrium condition) in the Chang–Smyth model to take account of the monetary side.

However, all the preceding studies have some flaws in both economic and mathematical senses. First, they supposed that actual capital formation (net increase or decrease in capital stock) is always equal to *ex ante* net investment even though they distinguished *ex ante* and *ex post* investment. From an economic point of view, it is not appropriate as a true model because an inventory adjustment is completely ignored in this formulation. Second, mathematically, all of the literatures did not give appropriate mathematical treatment as to the existence and uniqueness of a solution path of their differential equation systems, and as for the existence and uniqueness of an equilibrium point of their systems, it was not proved but assumed. Furthermore, from a technical point of view, though all the preceding works such as Chang and Smyth (1971), Asada (1987) and Semmler (1987) made use of Olech's theorem (1963, p. 395, Theorem 4) to prove the global asymptotic stability of the equilibrium in their models, Olech's theorem is not applicable to their proofs because the domains of their models are (some subset of) the nonnegative quadrant $\mathbf{R}^2_+$, not $\mathbf{R}^2$.[5] Because of these flaws, it is worthwhile to re-formalize a more general macroeconomic system of Keynes–Kaldor type and re-examine the system rigorously.

There are the two main purposes in this paper. One is to present more general nonlinear disequilibrium macroeconomic systems under both rigid-price and flexible-price situations, based upon Keynes (1936) and Kaldor (1940), and rigorously prove the existence of a stable limit cycle (or a periodic orbit) and the global asymptotic stability of the equilibrium in both situations. The other is to examine the destabilizing effects of flexibility of prices and inflation–deflation expectations to challenge the orthodox assertion that the price flexibility is contributory to the economic stability. Technically, our analysis in this paper will

[2] We would like to thank a referee for advising us to refer to these preceding literatures.

[3] Morishima (1958) derived other sufficient conditions for existence of a periodic orbit without using the Levinson–Smith theorem. However, he introduced the linearity of the consumption function.

[4] Indeed, Levinson and Smith (1942) employed the Poincaré–Bendixson theorem to prove their theorem (Levinson and Smith, 1942, pp. 386–391, Proof of Theorem I). In this respect, the Levinson–Smith theorem may be regarded as a derivative of the Poincaré–Bendixson theorem. To pursue generality, we shall rely upon the Poincaré–Bendixson theory rather than theory of oscillators, in Section 2 of this paper.

[5] Ito (1978) discussed the positivity constraint of variables in the Olech theorem.

Download English Version:

https://daneshyari.com/en/article/988544

Download Persian Version:

https://daneshyari.com/article/988544

Daneshyari.com