Destabilizing a stable crisis: Employment persistence and government intervention in macroeconomics

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ABSTRACT

The basic Keen model is a three-dimensional dynamical system describing the time evolution of the wage share, employment rate, and private debt in a closed economy. In the absence of government intervention this system admits, among others, two locally stable equilibria: one with a finite level of debt and nonzero wages and employment rate, and another characterized by infinite debt and vanishing wages and employment. We show how the addition of a government sector, modelled through appropriately selected functions describing spending and taxation, prevents the equilibrium with infinite debt. Specifically, we show that, by countering the fall in private profits with sufficiently high government spending at low employment, the extended system can be made uniformly weakly persistent with respect to the employment rate. In other words, the economy is guaranteed not to stay in a permanently depressed state with arbitrarily low employment rates.

1. Introduction

Among the many unintended consequences of the financial crisis of 2007–08, a pleasantly surprising one was the emergence of a Minsky revival. From Wall Street analysts to major newspapers to repentant mainstream economists, the ideas of Hyman Minsky attracted widespread interest because of the prescient and precise way in which they helped explain unfolding events. The term "Minsky crisis" was quickly coined to describe the processes leading up to the observed financial fragility and its consequences for the real economy. As highlighted by

Wray (2011) in the New Palgrave Dictionary entry explaining the term, at the core of Minsky's analysis is the role of institutional ceilings and floors in stabilizing the inherently explosive dynamics of capitalist economies. The purpose of this paper is to investigate these stabilizing effects using the modern tools of persistence theory for dynamical systems.

Mathematical formalizations of Minsky's ideas are not exactly abundant, but are nonetheless identifiable as a growing strand in the economics literature. A useful survey up to 2005 is presented in Dos Santos (2005) and more recent contributions include Ryoo (2010) and Chiarella and Guilmi (2011). The vast majority of papers in this area, however, focus on the dynamic relationships that can lead to instability and explosive behaviour for the underlying variables, with the role of government somewhat restricted to playing second fiddle, say through regulation or by issuing bonds that can enter the portfolio decisions of more

active players, such as firms and households. For example, as explained in Dos Santos (2005), because government policy is not specified in a sufficiently complete way in the influential early paper by Taylor and O'Connell (1985), the consequences of several "hidden" hypotheses that are necessary for stock-flow consistency issues are not fully analyzed. By contrast, we model government intervention explicitly and thoroughly analyze its relationships with the other dynamic variables in the economy.

After setting up a simplified yet sufficiently general closed system of accounts for households, firms, banks and the government sector in Section 2, we start by reviewing the special case of a model proposed in Keen (1995). In the absence of a government sector, the Keen model consists of the three-dimensional system (14) describing the dynamics of wages, employment rate and private debt. Its key insight is that, in boom times when profits are high, capitalists can choose to invest more than their profits by borrowing from the banking sector. If profits are low, on the other hand, capitalists might also want to invest less than their profits to pay down debt, thereby engaging in the familiar debt-deflation dynamics described in Fisher (1933). As shown in Grasselli and Costa Lima (2012), this behaviour by capitalists leads to the possibility of two very distinct equilibria recalled in Section 3.1: a "good equilibrium" characterized by finite private debt and nonzero wage share and employment rate, and a "bad equilibrium" characterized by infinite private debt and vanishing wage share and employment rate. Moreover, for typical parameter values, both equilibria are locally stable.

As emphasized throughout Minsky (1982), the debt-deflation mechanism can be halted by government intervention, since it follows from Kalecki's profit equation that government spending increases firm profits. We formalize this insight by introducing government expenditures, subsidies, and taxation into the Keen model in Section 2.2. Government intervention had already been proposed in Keen (1995), albeit in a different functional form. The key variable for firm behaviour is the profit share of output π given in (30), which depends on government policy only through subsidies and taxations, but not through expenditures, since the latter is part of total output. After isolating the core variables in the model from those whose evolution can be obtained separately, we are left with the five-dimensional system described by (32) for wage share, employment rate, stimulative subsidies and taxation, and profit share.

We perform local analysis for this system in Section 3. As before, we find a finite-value "good equilibrium" associated with non-zero wage share and employment rate and finite private debt. All other finite-value equilibria turn out to be related to vanishing wage shares, but none is locally stable for typical parameter values. We next move to the characterization of "bad equilibria", that is, those associated with collapsing profit shares even in the presence of government intervention. We find in Proposition 1 that provided the size of government subsidies in the vicinity of zero employment rates is large enough, all of these bad equilibria are either unstable or unachievable, even when the local stability condition for the corresponding bad equilibrium in the model without government is satisfied. In other

words, government intervention successfully destabilizes an otherwise stable equilibrium point associated with an economic crisis.

Our main results are contained in Section 4. Persistence theory (see Smith and Thieme, 2011) studies the long term behaviour of dynamical systems, in particular the possibility that one or more variables remain bounded away from zero. Typical questions are, for example, which species in a model of interacting species will survive over the long term, or whether it is the case that in an endemic model an infection cannot persist in a population due to the depletion of the susceptible population. In our context, we are interested in establishing conditions in economic models that prevent one or more key economic variables, such as the employment rate, from vanishing. After preliminary technical results for profit levels in Propositions 2 and 3, we prove in Proposition 4 that under a variety of alternative mild conditions on government subsidies, the model describing the economy is uniformly weakly persistent with respect to the employment rate λ. The relevant precise definitions of persistence are reviewed in Appendix C, but the meaning of this result is easy enough to convey: we can guarantee that the employment rate does not remain indefinitely trapped at arbitrarily small values. This is in sharp contrast with what happens in the model without government intervention, where the employment rate is guaranteed to converge to zero and remain there forever if the initial conditions are in the basin of attraction of the bad equilibrium corresponding to infinite debt levels. Furthermore, as with any persistence result, Proposition 4 is a global one: no matter how disastrous the initial conditions are, a sufficiently responsive government can bring the economy back from a state of crises associated with zero employment rates. We end the paper with numerical examples illustrating these results in Section 5.

2. Derivation of the model

We consider the closed system of accounts shown in Table 1, where each entry represents a time-dependent quantity and a dot corresponds to differentiation with respect to time. As usual, balance sheet items are stocks measured in units of account, whereas both transactions and flow of funds items as flows measured in units of account per unit of time. For example, going down the first column, $M_h \equiv M_h(t)$, $r_{M_h} M_h \equiv r_{M_h}(t) M_h(t)$, and $\dot{M}_h \equiv \dot{M}_h(t)$ denote, respectively, the amount, the flow of interest payments, and the rate of change associate with deposits held by households at time t.

We see from Table 1 that the entire economy is subdivided in the Households, Firms, Banks, and Government sectors. Their balance sheet structure is fairly simple: the assets of households are bank deposits M_h and government debt B; the assets of firms are bank deposits M_f and capital goods K and they have liabilities in the form of bank loans L; banks have total deposits $M = M_h + M_f$ as their only liabilities and loans L as their only assets; government debt B is the only liability of the government sector. The empty cells in Table 1 represent the following simplifying assumptions: households do not take out bank loans; the government sector does not keep bank deposits or make bank loans;