RESEARCH NOTE

A DYNAMIC MODEL OF INCOME VELOCITY FOR CHINA'S PRO-GROWTH MONETARY POLICY

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ABSTRACT

China's pro-growth monetary policy not only has the ability to influence the level of national income but also has an inflationary impact on the economy. Thus pro-growth monetary policy through output and price effect might raise the question of dynamic stability of income velocity. In a dynamic model with pro-growth monetary policy, the question of stability of income velocity is theoretical ambiguity.

Keywords: Income Velocity, China's Pro-growth Monetary Policy.

JEL Classification: E51, P24

Introduction

China has become a world engine of growth, with its economy registering an average growth rate of 9.6% year for the period 1979-2015.The outstanding characteristic of China's pro-growth monetary policy is that it has allowed the economy to operate at a high level of recorded activity over prolonged periods, resulting in a rapid rate of growth of net material product and industrial output in

particular (Brada and King 1986; Chen et al. 2016). Money is frequently described as being a passive adaptor to the macroeconomy with little independent influence on economic activity in the central planning economies (Hodgeman 1960; Gravy 1964; Kornai 1986). However, China's pro-growth monetary policy not only has the ability to influence the level of national income but also has an inflationary impact on the economy.[1] Thus pro-growth monetary policy might raise the question of the dynamic stability of income velocity. This problem is of considerable interest in the literature.

The main purpose of this paper is to investigate the dynamic behavior of income velocity in China where pro-growth monetary policy has prevailed. The general framework is rather similar to the classical dynamic models of Cagan (1956) and Dutton (1971). The remainder of this paper proceeds as follows. The dynamic model of income velocity for pro-growth monetary policy is presented in the next section. The penultimate section examines the dynamic stability of equilibrium, with the final section presenting the conclusions drawn from this study.

The Dynamics of Income Velocity

The following model is derived from the classical works of Cagan (1956) and Dutton (1971). The stability of income velocity is considered to be a basic tenet of the central planning system in China, and can be written as

$$lnV = \ln \left(\frac{Y}{M}\right) \tag{1}$$

where V is income velocity, M is the tock of money, and Y is the national income in nominal terms. Under pro-growth monetary policy, changes in the rate of national income are so great that their output and price effects completely dominate the effect of changes in the other variables. Therefore, the income velocity depends upon the expected rate of change in the national nominal income ($\dot{Y}^e$), and is of the form:

$$lnV_t = \ln \left(\frac{Y}{M}\right)_t = \alpha_0 + \alpha_1 \dot{Y}_t^e \quad \alpha_1 > 0 . \tag{2}$$

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[1] At some optimal point increases in pro-growth monetary policy might lead to a decline in output (Hunter 1961; Keren 1972).

$\dot{Y}_t^{\,e}$ is formed according to the adaptive expectations hypothesis, which states that $\dot{Y}_t^{\,e}$ is the weighted average of the present level of $\dot{Y}$ and the previous anticipated level of $\dot{Y}$. That can also be written as

$$\dot{Y}_t^e = \dot{Y}_{t-1}^e + \beta\left(\dot{Y}_t - \dot{Y}_{t-1}^e\right) 0 < \beta < 1. \tag{3}$$

Thus, the rate of change of the expected rate of national income can be written as

$$\frac{d\dot{Y}_t^e}{dt} = \beta\left(\dot{Y}_t - \dot{Y}_{t-1}^e\right) \tag{4}$$

The condition for the long-run equilibrium rate of income is derived as follows. Differentiating the income velocity equation (2) with respect to time yields:

$$\frac{d\ln V}{dt} = \frac{d\ln(\frac{Y}{M})}{dt} = \alpha_1 \frac{d\dot{Y}^e}{dt} \tag{5}$$

If for convenience we drop the time notation, then equation (5) can be rewritten as

$$\dot{V} = \dot{Y} - \dot{M} = \alpha_1 \frac{d\dot{Y}^e}{dt} \tag{6}$$

By substituting equation (4) into equation (6) and solving for $\dot{Y}$ we obtain

$$\dot{Y} = \frac{\dot{M} - \alpha_1 \beta \dot{Y}^e}{1 - \alpha_1 \beta} \tag{7}$$

The long-run equilibrium condition requires that

$$\frac{d\dot{Y}^*}{dt} = \frac{1}{1 - \alpha_1 \beta} \cdot \frac{d\dot{M}}{dt} + \frac{\alpha_1 \beta}{1 - \alpha_1 \beta} \cdot \frac{d\dot{Y}^e}{dt} \tag{8}$$

where $\dot{Y}^*$ is the long-run equilibrium rate of national income. Since money remains subservient to the planned control of the economy, China's state-owned enterprises respond to central instructions and not to monetary criteria. Therefore, the rate of change in the money supply is assumed to be constant, that is, $\frac{d\dot{M}}{dt} = 0$ and $\alpha_1 \beta \neq 0$. To satisfy the long-run equilibrium condition of $\frac{d\dot{Y}^e}{dt} = 0$, we must have $\dot{Y}^e = \dot{Y}$ and $\dot{M} = \dot{Y}$ in equations (4) and (6), respectively. To obtain the long-run equilibrium rate of income $\dot{M} = \dot{Y}^e = \dot{Y}^*$ must hold.

The Dynamic Stability of Equilibrium

Now we may consider dynamic stability. Since the real production is set by the China's centrally planned authorities, the growth rate of the money supply must also be planned so as to achieve the annual and longer-term macroeconomic goals. Therefore, an acceleration of the rate of growth of national income requires an acceleration of the rate of growth of the money supply.

Next, we consider the long-run equilibrium equation (8). Suppose an exogenous supply shock results in a rise in the rate of national income to $\dot{Y}_1 > \dot{Y}^*$. Now we have $\dot{Y} > \dot{Y}^e$, and hence $\frac{d\dot{Y}^e}{dt} > 0$, the sign of $\frac{d\dot{Y}_1}{dt}$ depending upon $\alpha_1\beta$. As we know that $\alpha_1\beta > 1$, then $\frac{\alpha_1\beta}{1-\alpha_1\beta} < 0$, and $\frac{d\dot{Y}_1}{dt} > 0$. We have found that the rate of national income rises when it is greater than $\dot{M}$, and declines when it is less than $\dot{M}$ and $\frac{d\dot{Y}^e}{dt} < 0$. The rate of income $\dot{Y}^* = \dot{M}$ is divergent and the oscillation explosive. However, if $0 < \alpha_1\beta < 1$, then $\frac{\alpha_1\beta}{1-\alpha_1\beta} > 0$, and $\frac{d\dot{Y}_1}{dt} < 0$, in which case the rate of income declines when it is greater than $\dot{M}$, and increases when it is less than $\dot{M}$. Thus, the rate of income is a stable equilibrium rate.

Concluding Remarks

In conclusion, the essence of the above discussion is that $\dot{Y}^e$ is a variable that is significant in explaining income velocity in China. Under pro-growth monetary policy, the question of dynamic stability is theoretically ambiguous.

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