Deficit financing in overlapping generation economies with habit persistence

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Abstract

In this paper, we study how deficit financing is affected by the introduction of habit formation in an otherwise standard Gale (JET, 1973) economy in which the government is a net lender and young agents are borrowing rather than saving. We find that the amount of deficit the government is able to float into the economy is lower when habits are present. This finding is due to the fact that habit persistence puts a cap on borrowing.

1 Introduction

Recently there has been renewed interest in Adam Smith's (1759) idea that habits may play a key role in consumption behavior. This is because habit formation can explain certain empirical findings that are difficult to reconcile using the traditional models in which utility is time-separable.[1] In this paper, we explore how deficit financing is affected by the introduction of habit formation in an otherwise standard Gale (1973) economy

in which the government is a net lender and young agents are borrowing rather than saving.

Overlapping generations (OG) models have long been a standard framework in the literature for examining fiscal policy. Within the OG setup, Lahiri and Puhakka (1998) introduce habit persistence in a conventional Gale (1973) economy. The authors find that this simple modification can affect the dynamics and the stability properties of the modified pure exchange economy. Habit persistence, by altering the saving behavior of the young, can induce higher savings compared to a standard economy and can also yield optimal savings that are a decreasing function of the interest rate. Moreover, the authors find that "the government is able to float higher deficits in

an economy with habit persistence relative to an economy without habits".[2]

We argue that this conclusion does not always hold. In particular, we show that under a scenario in which the optimal amount of private borrowing is positive and the gross rate of return on government loans is greater than one, steady state deficits under habits are smaller than deficits under no habits. Since an increase in the strength of habits lowers desired borrowing under habit persistence, the model predicts that the spread between deficit financing among the two specifications is an increasing function of the strength of habits.

2 Model

We consider a pure exchange OG model. Each generation is alive for two periods and has perfect foresight. Economic activity takes place over infinite discrete time. Each generation is endowed with w_1 units of the unique good when young and w_2 units when old. Utility is derived from consumption in both periods, c_1 and c_2. However, due to the presence of habit formation, utility of a given level of consumption when old depends on consumption when young.[3] Formally:

$$V(c_1, c_2) = log(c_1) + \beta log(c_2 - \gamma c_1) \tag{1}$$

where $\gamma \in [0, 1]$ measures the strength of habits in the instantaneous utility function and $\beta > 0$ is the discount factor. The importance of past consumption in determining the utility derived from the "effective" second period consumption, $c_2 - \gamma c_1$, is increasing with γ.

Each young generation maximizes utility subject to their budget constraints: $c_1 = w_1 + z_t$ when young and $c_2 = w_2 - R_t z_t$ when old, where z_t denotes private borrowing when young and R_t is the gross nominal interest rate at time t. Contrary to the piece of Lahiri and

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[1] For a survey on the role of habit persistence in solving economic puzzles, see Messinis (1999).

[2] Lahiri and Puhakka (1998), p.177.

[3] Specifically, the absolute level of consumption in the second period as well as the increase of second period relative to first period consumption are important. The more that was consumed when young, the more is required to derive the same level of utility in the following period.

Puhakka (1998) we model the case in which the young agents are observed borrowing rather than saving and they need to repay these liabilities once they become old.

Let us denote variables under habit persistence with a hat and those in the standard Gale (1973) economy with a star. The optimal borrowing function under habits is given by:

$$\hat{z}_t = -\frac{\beta w_1}{1+\beta} + \frac{w_2 - \gamma w_1}{(1+\beta)(R_t + \gamma)} \tag{2}$$

and under no habits is given by:

$$z_t^* = -\frac{\beta w_1}{1+\beta} + \frac{w_2}{(1+\beta)R_t} \tag{3}$$

We need to impose conditions on the parameters of the economy to insure that the indifference curves are downward sloping so that we are in the economically meaningful area.[4] The following condition simply emphasizes the fact that the endowments must lie above the point where the slope of the indifference curve is zero such that the marginal rate of substitution is negative:

$$\gamma < \frac{w_2}{(1+\beta)w_1} \tag{4}$$

The inequality above also implies that the borrowings are positive ($\hat{z}_t > 0$).

Now let us consider the government budget constraint. If the government is lending to the public, then we have:

$$d_t + R_{t-1}l_{t-1} = l_t; \tag{5}$$

where l_t denotes the beginning of the period t government lending as in Sargent (1987), d_t represents the real deficit, and R_t is the return on government debt or loans. To study the maximum feasible government deficit at the steady state, a stationarity assumption on deficit is made such that $d_t = d$, $\forall t$. Asset market equilibrium requires $l_t = -z_t$, $\forall t$, where z_t denotes optimal borrowing. The maximum sustainable steady state deficit is obtained by choosing a rate of return R such that $d(R) = (R-1)z(R)$ is maximized. Note that there are two potential scenarios for which the maximum sustainable steady state deficit is positive: (i) positive savings by households ($z(R) < 0$) and returns on government debt smaller than one, and (ii) positive borrowing by households and returns on government loans greater than one.

Here, following Farmer (1986) and De la Croix and Michel (2002), we consider a situation where there is deficit but the government is still a net lender such that households have positive private borrowings and $R_t > 1$.

The steady state deficit under habits and no habits can be expressed as follows:

$$\hat{d} = (R-1)\hat{z}_t = (1-R)\left[\frac{\beta w_1}{1+\beta} - \frac{w_2 - \gamma w_1}{(1+\beta)(R_t + \gamma)}\right]$$

$$d^* = (R-1)z_t^* = (1-R)\left[\frac{\beta w_1}{1+\beta} - \frac{w_2}{(1+\beta)R_t}\right].$$

We can check that $d^* > \hat{d}$. Analytically, the difference in deficit financing between the two

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[4]Formally, we need to check that $\frac{dc_2}{dc_1} = -\frac{\frac{\partial V(c_1, c_2)}{\partial c_1}}{\frac{\partial V(c_1, c_2)}{\partial c_2}} < 0$.

cases is given by:

$$d^* - \hat{d} = \frac{\gamma(R-1)(w_2 + Rw_1)}{R(\gamma + R)(1 + \beta)} > 0 \quad \forall R > 1$$

Furthermore, this gap increases with the strength of habits:

$$\frac{\partial(d^* - \hat{d})}{\partial \gamma} = \frac{(R-1)(w_2 + w_1 R)}{(R + \gamma)^2(1 + \beta)} > 0$$

The intuition is straightforward: an increase in the strength of habits typically increases optimal individual savings, whereas in our case it actually decreases borrowings. Thus the spread between the two deficits becomes larger as γ increases. Clearly, the strength of habits are very important in determining the maximum deficit financing that a government can support.

3 Conclusion

In this paper, we study deficit financing in a two period OG economy with habit persistence. We show that when young households borrow and the government is a net lender (but still runs a positive deficit every period), then the deficit in a standard economy is higher than the one in a framework with habit persistence.

References

[1] De la Croix, D., and P. Michel. (2002) *A Theory of Economic Growth, Dynamics, and Policy in Overlapping Generations*. Cambridge U.K.: Cambridge University Press.

[2] Farmer, R. (1986) "Deficits and Cycles," *Journal of Economic Theory*, 40, 77-88.

[3] Gale, D. (1973) "Pure Exchange Equilibrium of Dynamic Economics Models," *Journal of Economic Theory*, 6, 12-36.

[4] Lahiri, A., and M. Puhakka. (1998) "Habit Persistence in Overlapping Generations Economies Under Pure Exchange," *Journal of Economic Theory*, 78, 176-186.

[5] Messinis, G. (1999) "Habit Persistence and the Theory of Addiction," *Journal of Economic Surveys*, 13, 417-442.

[6] Sargent, T. (1987) *Dynamic Macroeconomic Theory*. Cambridge, MA: Harvard University Press.

[7] Smith, A. (1759) *The Theory of Moral Sentiments*. Indianapolis, IN: Liberty Press.