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Consumption with Liquidity Constraints and Habit Formation*

Aylin Seckin†

Résumé / Abstract

Dans un modèle intertemporel de consommation et d'épargne avec incertitude, contraintes de liquidité et formation d'habitudes, nous avons démontré que les habitudes peuvent être un coussin contre les contraintes de liquidités en poussant même un individu impatient vers un choix d'un montant de consommation moins élevé.

In an intertemporal consumption-saving model with uncertainty, liquidity constraints and habit formation, we have shown that habits can be a cushion against liquidity constraints by pushing even the impatient individual towards a choice of lower level of consumption.

Mots Clés : Formation d'habitudes, contrainte de liquidité, incertitude de revenu

Keywords: Habit formation, liquidity constraints, income uncertainty

JEL: E21, D91

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1. Introduction

Most recent intertemporal consumption-saving literature with liquidity constraints has not introduced yet habit-forming preferences into consumption, nor derived the theoretical implications of such an assumption on current consumption[1]. This is the first paper which allows for habit-forming preferences in consumption in an intertemporal consumption-saving model with liquidity constraints and income uncertainty. The motivation behind our analysis is to explore the effects of habit formation on consumption choices in this specific framework, and to argue for an additional for saving, which is induced by the very presence of habits. We will use a specific preference structure and derive the closed form solution for current consumption with habits and liquidity constraints. We will show that, with the presence of habit formation in consumption, liquidity constraint increases even more the current marginal utility of consumption, implying a lower level of consumption than the case with time-separable preferences. We will show that if

[1] The empirical study of Meghir and Weber (1996) presents a new test for liquidity constraints by considering at least two goods whose relative price does not change when liquidity constraints bind. By allowing that, they were able to differentiate empirically between the effects of non-separability across goods and liquidity constraints. However, they use a very general preference structure.

the liquidity constraint is binding, not only the current period but also all the future shadow prices of the liquidity constraint will affect current marginal utility of consumption.

In an earlier work, Seckin (1999) shows that due to a strong habit formation effect the individual becomes more patient, i.e. people postpone consumption. The stronger habit formation is, the less important income uncertainty. She has found a closed form solution for consumption with income uncertainty and habit formation where the precautionary saving term gets smaller the higher the strength of habit formation. Carroll, Overland and Weil (2000) simulate a habit-forming model and find similar result. Starting from that point, we argue that the same argument also holds true when facing liquidity constraints.

Consider a habit-forming individual, i.e. someone who cares about keeping smooth standards of living, but also facing liquidity constraint. This type of behavior leads the rational consumer to choose a consumption level which is lower than what would have been without habits. The reason is that, habits do not allow the individual to switch easily from one consumption level to another one. More specifically, jumps in consumption choices are not allowed and net consumption has to be positive at all times. This is said, the individual has to postpone consumption even more when facing liquidity constraints. Habits induce a differ-

ent type of saving that we call, *habitual saving.* We will show in particular that the stronger the habit-forming behavior of the individual, the less important will be current and expected future liquidity constraints. Due to the fact that the individual has habit formation in consumption, future shadow prices of liquidity constraint will be present and their effects will be lower the higher the strength of habits.

Habit formation has been used in several contexts in economics[2]. The implications of habit formation were first discussed in Duesenberry's work (1949). His proposition was that families are willing to sacrifice saving in order to protect their living standards. In the event of a fall in income, consumption will not fall proportionately, producing a ratchet effect.

Whereas time-separable preferences imply that current utility depends only on current consumption, time-non-separable preferences with habit formation imply that past real consumption patterns and levels form consumer habits which persist long enough to slow down the effects of current income changes on current consumption. For a given level of current expenditures, past purchases contribute to a habit stock. Hence, it is an increase of current consumption over and above the habit stock which raises current utility.

[2]Spinnewyn (1981) was the first who introduced rational habit formation.

Recently, several empirical papers in the consumption literature such as Constantinides (1990), Ferson and Constantinides (1991), Carroll, Overland and Weil (2000), Heaton (1995), Fuhrer and Klein (1998) find evidence for the role of habits in determining consumption.

This paper is organized as follows: Section 2 describes the dynamic optimization model of stochastic consumption with habit formation and liquidity constraints and discusses the results obtained. Section 3 concludes the paper.

2. The Model

In this model, we introduce habits into a consumption-saving model with liquidity constraints. Suppose that a representative consumer maximizes the lifetime utility subject to the budget constraint and to the period-by-period liquidity constraint.

$$Max_{c_t, A_{t+1}} \quad E_0 \sum_{t=0}^{\infty} \beta^t U(c_t - \alpha x_t) \tag{1}$$

$$\text{s.t. } A_{t+1} = (1+r)[A_t + y_t - c_t] \tag{2}$$

$$A_{t+1} \geqslant 0 \qquad t = 0, 1, 2... \tag{3}$$

where $\lim_{t\to\infty} A_t(1+r)^{-t} = 0$ and y_t is an uncertain income stream. $E_t(.)$ denotes expectations conditional on the information available at time t. The liquidity constraint is imposed for all periods. The discount factor is denoted by β and it is equal to $\frac{1}{1+\rho}$. We assume that the rate of interest r is equal to or less than the rate of time preference ρ, $r \leqslant \rho$[3]. Here we also include the case for impatient consumers, for whom the borrowing constraints are more relevant. Following Schechtman and Escudero (1977), the solution to the problem with no uncertainty and no habit formation would be to run down any initial assets, and then to set consumption equal to income. With uncertainty, Deaton (1991) shows that there will be dissaving when income is low and when it is high there will be saving.

Since the preferences are time-non-separable in consumption, the current utility will depend not only on current consumption but also on the last period's consumption level, c_{t-1}, which represents the habit stock for the current period t[4].

[3]The standard empirical life-cycle literature is premised on the supposition that $r < \rho$.

[4]The habit formation parameter α measures the strength of the habit stock on current utility and it is between zero and one. Let us define habit stock x_t as a weighted average of all past consumptions and can be defined as:

$$x_t \equiv (1-\zeta)\sum_{j=0}^{\infty} \zeta^j c_{t-1-j}$$

where weights add to one with $(1-\zeta)$ being the depreciation parameter of habits, $0 \leqslant \zeta \leqslant 1$. When the depreciation of habits is equal to one, $(\zeta = 0)$, i.e., the case where past values of consumption before c_{t-1} do not affect the habit stock, we have a model which reflects one-

The individual makes decision about next period assets $A_{t+1}$and current consumption c_t subject to the budget constraint and the liquidity constraint.

We can formulate the problem in a dynamic programming framework.

$$\begin{aligned} V(A_t, c_{t-1}, y_t) &= Max_{c_t}\ U(c_t - \alpha c_{t-1}) \\ &\quad +\beta E_t V((1+r)[A_t + y_t - c_t], c_t, y_{t+1}) \\ &\quad +\mu_t(1+r)[A_t + y_t - c_t] \end{aligned} \tag{4}$$

where μ_t is the Lagrange multiplier associated with the liquidity constraint.

The Euler equation for consumption is:

$$\begin{aligned} &U'(c_t - \alpha c_{t-1}) - \alpha\beta E_t U'(c_{t+1} - \alpha c_t) = \\ &\beta(1+r)E_t[U'(c_{t+1} - \alpha c_t) - \alpha\beta U'(c_{t+2} - \alpha c_{t+1})] \\ &+(1+r)\mu_t \end{aligned} \tag{5}$$

period habit formation, i.e. $x_t = c_{t-1}$. For simplicity, we will assume this one-period habit formation model. The results of the model for one-period habit formation hold for the more general form of habits as well.

Define $\widehat{c}_t$ as the effective (net) consumption,

$$\widehat{c}_t = c_t - \alpha c_{t-1}$$

we can also write an expression for the general case:

$$U'(\widehat{c}_t) = \beta(1+r)E_t U'(\widehat{c}_{t+1}) + (1+r)\mu_t + (1+r)E_t \sum_{\tau=1}^{\infty}(\alpha\beta)^{\tau}\mu_{t+\tau} \qquad (6)$$

The equation (6) says that the current marginal utility of net consumption is equal to the discounted expected future marginal utility of net consumption, current shadow price of the liquidity constraint and the weighted sum of all expected future shadow prices. This last term is the evidence of the joint relationship of the habits and liquidity constraint. More specifically, we have shown that through habit formation parameter α, past consumption levels will have an effect on the expected future shadow price of the liquidity constraint starting from period $t+1$. The stronger the habits, i.e. the greater the parameter ($\alpha \gg 0$), the less important expected future shadow prices. Thus, habits induce an additional saving term, which is different from the one against income uncertainty, and then the importance of liquidity constraints becomes trivial[5]. Since consumption is post-

[5] See Seckin (1999).

poned, it will be less likely for the individual to be hit by liquidity constraints in the future as well, i.e. habits can be a cushion against liquidity constraints by providing even the impatient individual with the desire to postpone consumption.

Now, let us consider the special case of quadratic preferences. Assuming a quadratic utility function:

$$U(\widehat{c}_t) = \nu_0 + \nu_1 \widehat{c}_t - \frac{1}{2}\nu_2 \widehat{c}_t^2 \tag{7}$$

Solving for $\widehat{c}_t$:

$$\begin{aligned} \widehat{c}_t &= \beta(1+r)E_t\widehat{c}_{t+1} - \frac{(1+r)}{\nu_2}\mu_t - \frac{(1+r)}{\nu_2}E_t\sum_{\tau=1}^{\infty}(\alpha\beta)^\tau \mu_{t+\tau} \\ &\quad -\frac{\kappa}{(1-\alpha\beta)} \end{aligned} \tag{8}$$

where

$$\kappa = \frac{\nu_1}{\nu_2}[\beta(1+r)][1-\alpha\beta].$$

The presence of liquidity constraints with habit formation in consumption increases the current marginal utility of consumption, implying a lower level of consumption than the case without habits. Due to habit formation, whenever the liquidity constraint is binding, not only the current but all the expected future

shadow prices will affect current consumption decisions. Thus, habits induce an additional saving that we call *habitual saving*.

Habits make the individual to postpone consumption in order to secure smooth flow of consumption. If there were no habit-forming behavior, the individual would not care about the effects of expected future liquidity constraints. Hence, habit formation leads even the impatient individual to choose a lower consumption level.

3. Conclusion

The introduction of habit formation rationalizes a new form of saving, additional to the one against income uncertainty, that we call *habitual saving.* Therefore, the stronger the habit-forming behavior of the individual, the less important will be current and expected future liquidity constraints. Hence, habits can be a cushion against liquidity constraints by pushing the impatient individual towards a choice of lower level of consumption.

Comparing to the previous literature, this is the first paper to incorporate habit formation into the intertemporal consumption-saving model with liquidity constraints. This work suggests an alternative model towards a better understanding the effect of liquidity constraints on individual consumption.

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