

## habit persistence

This article reviews the concept of habit persistence and its application in macroeconomics and finance. Special attention is given to the role of habit persistence in explaining the equity premium puzzle, observed business-cycle fluctuations and inflation dynamics, and in generating a theory of counter-cyclical markups of prices over marginal costs.

Habit persistence, or ‘habit formation’ in its most common representation, is a preference specification according to which the period utility function depends on a quasi-difference of consumption. Specifically, if the utility function without habit formation is given by  $\sum_{t=0}^{\infty} \beta^t U(c_t)$ , where  $c_t$  denotes consumption in period  $t$ ,  $U$  denotes the period utility function, and  $\beta \in (0, 1)$  denotes the subjective discount factor, then the utility function with habit persistence is given by  $\sum_{t=0}^{\infty} \beta^t U(c_t - \alpha c_{t-1})$ . The parameter  $\alpha \in (0, 1)$  denotes the intensity of habit formation and introduces non-separability of preferences over time. Under habit persistence, an increase in current consumption lowers the marginal utility of consumption in the current period and increases it in the next period. Intuitively, the more the consumer eats today, the hungrier he wakes up tomorrow. It is in this sense that this type of preferences captures the notion of habit formation.

In the habit-forming preferences given above, past consumption represents the consumer’s stock of habit in period  $t$ . More general specifications allow for the stock of habit to be a function of possibly all past consumptions. In this case, the period utility function is given by  $U(c_t - \alpha S_{t-1})$ , where  $S_{t-1} = S(c_{t-1}, c_{t-2}, \dots)$  denotes the stock of habit in period  $t$ . Often, the stock of habit is assumed to follow an autoregressive law of motion of the form  $S_t = (1 - \delta)S_{t-1} + \lambda c_t$ . The parameter  $\delta$  governs the rate of depreciation of the stock of habit, and the parameter  $\lambda$  measures the sensitivity of the stock of habit to current consumption.

A common variant of the habit persistence model is to treat habits as external to the consumer. When habits are external, the stock of habit depends on the history of aggregate past consumption as opposed to the consumer’s own past consumption. Early formulations of the habit formation model, for example Pollak (1970), were cast in the external form. Since the work of Abel (1990), external habit formation has become known as ‘catching up with the Joneses’. The external form of habit persistence simplifies the optimization problem of the consumer because the evolution of the stock of habit is taken as exogenous by the individual.

Another variation of the habit formation model is relative habit persistence, which features a quasi-ratio of consumption rather than a quasi-difference of consumption, as the argument of the period utility function (Duesenberry, 1949; Abel, 1990).

### Habit persistence and the equity premium puzzle

Habit persistence has been proposed in financial economics as a possible solution to the equity premium puzzle first identified in the seminal work of Mehra and Prescott (1985). The equity premium puzzle is that, under the assumption of power utility and no habit persistence, observed excess returns of stocks over less risky assets, such as commercial paper, are too high to be consistent with actual consumption behaviour unless households are assumed to be extremely risk averse. At the heart of the equity premium puzzle

lies the low volatility of observed consumption growth. To see this, note that a risky asset commands a high rate of return if it provides poor insurance against consumption fluctuations by paying plenty in periods of high consumption growth and little in periods of low consumption growth. If fluctuations in consumption growth are small (as is observed in the data), then high returns on risky assets can be supported only if one assumes that even minute consumption fluctuations are very painful to consumers. In other words, one must assume that consumers are extraordinarily risk averse.

With this intuition in mind, one can readily see why habit persistence has the potential to solve the equity premium puzzle. Habit-forming consumers dislike variations in habit-adjusted consumption,  $c_t - \alpha S_{t-1}$ , rather than variations in consumption itself,  $c_t$ . A given percentage change in consumption produces a much larger percentage change in habit-adjusted consumption than in consumption itself. In this way, small fluctuations in consumption growth can generate large variations in habit-adjusted consumption growth and hence explain sizable excess returns on risky assets even for moderate values of the degree of risk aversion. Early studies of the ability of habit persistence to resolve the equity premium puzzle include Sundaresan (1989), Abel (1990), and Constantinides (1990). Subsequent work has refined the habit-formation model to account for additional asset-pricing puzzles, such as the risk-free-rate puzzle and the forecastability of excess returns (see, for example, Campbell and Cochrane, 1999).

### Habit persistence and the business cycle

In the asset-pricing literature, most applications of habit persistence are conducted within the context of partial equilibrium settings, in which private consumption is assumed to be exogenous. This assumption is not inconsequential. Indeed, it has been shown that, once a general equilibrium approach is adopted, in which consumption decisions are endogenous, the ability of habit persistence to reconcile the behaviour of asset prices and consumption is diminished. This is because habit formation induces excess smoothness in consumption expenditure (Lettau and Uhlig, 2000). Boldrin, Christiano and Fisher (2001) show that habit formation can help explain salient aspects of asset prices and business cycles only in combination with severe inflexibilities in factor markets.

Habit persistence features prominently in the literature devoted to the estimation of medium-scale macroeconomic models (for example, Christiano, Eichenbaum and Evans 2005; Smets and Wouters, 2004). The goal of this literature is to build dynamic general equilibrium models capable of explaining the observed behaviour at business-cycle frequency of a large number of macroeconomic variables. To this end, this literature has brought together in a single model most of the theoretical advances in business-cycle theory since the mid-1980s. Thus, these models include not only habit persistence but also other rigidities such as investment adjustment costs, variable capacity utilization, sticky product and factor prices, money demand by households and firms, and imperfect competition in product and factor markets. In the data, the response of consumption to expansionary shocks of various natures is hump-shaped, with the peak response occurring several quarters after the innovation. Such a response is hard to replicate in the absence of habit formation. For in this case consumption has a tendency to peak immediately after the shock and then to decline to its long-run level.

In the applications of habit formation discussed thus far, it matters little whether habits are of the internal or external type. The distinction is of

importance in situations in which the consumer expects a regime shift of some nature in the future. A case in point is the consumption dynamics associated with temporary exchange-rate-based inflation stabilization programmes. Exchange-rate-based stabilization programmes, or currency pegs, constitute the most commonly used policy to control high inflation in emerging-market countries. It is well documented that, in response to the announcement of a currency peg, consumption rises initially, reaches a peak and then declines. Importantly, the observed eventual decline in consumption typically takes place before the currency peg is abandoned. Habit formation, be it of the internal or external type, can explain the observed gradual increase in consumption after the implementation of the stabilization plan (Uribe, 2002). However, Uribe shows that the observed contraction in consumption that begins well before the collapse of the stabilization programme can be rationalized with internal habit formation but not with the external form of habits. In effect, maintaining a high consumption habit after the collapse of the stabilization programme is expensive because high inflation acts as a tax on consumption expenditures. When consumers internalize the habitual nature of consumption they start reducing their stock of habit – by cutting back consumption – before the price of consumption increases to mitigate the transition to a lower stock of habit. By contrast, when consumers do not internalize the habitual nature of their consumption, they continue to take advantage of the temporarily low price of consumption until the last day of the stabilization programme.

### Deep habits

All of the models of habit persistence discussed thus far in this article assume that habits are formed at the level of a single aggregate consumption good. An important consequence of this assumption is that the introduction of habit formation alters the propagation of macroeconomic shocks only in so far as it modifies the consumption Euler equation and possibly the household's labour supply schedule. Ravn, Schmitt-Grohé and Uribe (2006), hereafter RSU, propose a general equilibrium model of habit formation on a good-by-good basis. They refer to this type of habit formation as 'deep habits'. They have in mind environments in which consumers can form habits separately over narrowly defined categories of goods, such as clothing, vacation destinations, music, and cars.

The assumption that agents can form habits on a good-by-good basis has two important implications for macroeconomic dynamics. First, the demand side of the macroeconomy – in particular the consumption Euler equation – is indistinguishable from that pertaining to an environment in which agents form habits over a single aggregate good. Second, and more significantly, the assumption of deep habit formation alters the supply side of the economy in fundamental ways. Specifically, when habits are formed at the level of individual goods, firms take into account the fact that the demand they will face in the future depends on their current sales. This is because higher consumption of a particular good in the current period makes consumers, all other things equal, more willing to buy that good in the future through the force of habit. Thus, when habits are deeply rooted, the optimal pricing problem of the firm becomes dynamic.

RSU embed the deep-habit-formation assumption in an economy with imperfectly competitive product markets. This combination results in a model of endogenous, time-varying markups of prices over marginal cost. A central result of RSU's work is that in the deep habit model markups behave

counter-cyclically in equilibrium. In particular, expansions in output driven by demand shocks are accompanied by declines in markups. This implication of the deep-habit model is in line with the existing empirical literature. In addition, RSU show that, because of the strong counter-cyclical movements of markups, the deep-habit theory is capable of explaining increases in wages and consumption in response to a positive demand shock as is observed in the data. This latter empirical regularity has proved difficult to explain with standard models of the transmission of demand shocks.

In the deep-habit model it is of great consequence whether habits are internal or external. RSU show that the firm's pricing problem is time consistent under external habit persistence but time inconsistent under internal habit persistence.

**Stephanie Schmitt-Grohé and Martin Uribe**

### See also

< xref = xyyyyyy > behavioural macroeconomics;  
 < xref = C000548 > consumption externalities;  
 < xref = E000108 > equity premium puzzle.

### Bibliography

- Abel, A. 1990. Asset prices under habit formation and catching up with the Joneses. *American Economic Review* 80, 38–42.
- Boldrin, M., Christiano, L. and Fisher, J. 2001. Habit persistence, asset returns, and the business cycle. *American Economic Review* 91, 149–66.
- Campbell, J. and Cochrane, J. 1999. By force of habit: a consumption-based explanation of aggregate stock market behavior. *Journal of Political Economy* 107, 205–51.
- Christiano, L., Eichenbaum, M. and Evans, C. 2005. Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of Political Economy* 113, 1–45.
- Constantinides, G. 1990. Habit formation: a resolution of the equity premium puzzle. *Journal of Political Economy* 98, 519–43.
- Duesenberry, J. 1949. *Income, Saving, and the Theory of Consumer Behavior*. Cambridge, MA: Harvard University Press.
- Lettau, M. and Uhlig, H. 2000. Can habit formation be reconciled with business cycle facts? *Review of Economic Dynamics* 3, 79–99.
- Mehra, R. and Prescott, E. 1985. The equity premium: a puzzle. *Journal of Monetary Economics* 15, 145–61.
- Pollak, R. 1970. Habit formation and dynamic demand functions. *Journal of Political Economy* 78, 745–63.
- Ravn, M., Schmitt-Grohé, S. and Uribe, M. 2006. Deep habits. *Review of Economic Studies* 73, 195–218.
- Smets, F. and Wouters, R. 2004. Shocks and frictions in US business cycles: a Bayesian DSGE approach. Mimeo. European Central Bank.
- Sundaresan, S. M. 1989. Intertemporally dependent preferences and the volatility of consumption and wealth. *Review of Financial Studies* 2, 73–89.
- Uribe, M. 2002. The price-consumption puzzle of currency pegs. *Journal of Monetary Economics* 49, 533–69.

### Index terms

asset pricing  
 business-cycle fluctuations

habit persistence

5

currency pegs  
deep habits  
equity premium puzzle  
Euler equation  
habit persistence  
imperfect competition  
inflation dynamics  
investment adjustment costs  
partial equilibrium  
risk aversion  
sticky prices  
variable capacity utilization

**Index terms not found:**

asset pricing  
sticky prices