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Consumption theory with reference dependent utility

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ABSTRACT

This paper presents a closed form consumption function for an individual when his utility depends both on his own current and previous consumption and on the consumption by his relevant others. Given this model, I argue that we can introduce an alternative definition of marginal propensity to consume (MPC) in addition to the *traditional* definition. This alternative definition can be called the individual's *total* MPC, which I show is smaller than the *traditional* MPC.

1. Introduction

Empirical evidence suggests that individuals evaluate own consumption (income) by comparing it to the consumption (income) levels of others; see e.g. Solnick and Hemenway (1998), Johansson-Stenman et al. (2002), Alpizar et al. (2005), and Andersson (2008). This paper presents a general consumption model that is an extended version of Alessie and Lusardi's (1997) consumption model. In Alessie and Lusardi (1997), individuals merely care about their own current and previous consumption. I add the assumption that individuals also compare own consumption with that seen among relevant others, and derive a closed form consumption function for an arbitrary individual. Since an individual's consumption also depends on the consumption by his relevant others, I introduce the individual's *total* marginal propensity to consume (total MPC). Earlier theories like Hall's permanent income hypothesis (PIH) (Hall, 1978), and a pure habit formation behavior model, such as Alessie and Lusardi (1997), imply larger marginal propensities to consume than found in this model.

Is it realistic that individuals only have their own previous consumption levels as reference? Probably not. From a psychological perspective, individuals compare own consumption also with the consumption levels of relevant others. Duesenberry (1949, p. 48) argues that "Any particular consumer will be influenced by consumption of people with whom he has social contacts. . .''; he coins this concept "the demonstration effect.'' Duesenberry's notion has long been overlooked in economics models, although he has advocators within psychology. For example, Runciman (1966) argues that individuals have both a space and time dimension of comparison. Frank (1985, p. 146) presents an explanation to why economists are not keen on adopting the space dimension: "To many economists, the notion of consumers being strongly influenced by demonstration effects must have seemed troublingly inconsistent with the reasoned pursuit of self-interest, if not completely irrational.'' It seems reasonable to extend Alessie and Lusardi's (1997) model by including Duesenberry's demonstration effect. For example Frank (1985, p. 150) supports this by arguing: ". . . concerns about relative standing are perfectly compatible with the economist's view that people pursue their own interest in a rational way.'' I believe this extended consumption model adds more knowledge about individuals' actual consumption decision.[1]

This paper has the following structure: Section 2 describes an individual's utility maximization problem. In Section 3, I derive the individual's closed form consumption function in addition to a recursive consumption function. Section 4 discusses the definition of the individual's MPC given different notions of what the individual utility depends on, and finally, Section 5, presents some concluding remarks.

[1] I use an additive comparison function since Wendner (2002, p. 16) argues that "the multiplicative [i.e., ratio] specification is not in line with elementary properties of habit persistence.'' Ratio comparisons are used by, e.g. Abel (1990), Carroll et al. (1997), Carroll (2000), and Aronsson and Johansson-Stenman (2008).

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2. The individual's utility

2.1. The individual's utility function arguments

In order to emphasize how important individuals' social interactions with each other are, Aristotle referred to human beings as social animals. By looking at psychological and sociological motives, e.g. Duesenberry (1949), Runciman (1966), Frank (1985), and Elster and Loewenstein (1992) argue that individuals have both a space and a time dimension of comparison. I.e., individuals compare their own current consumption with a reference level that is a function of both the consumption by relevant others and their own previous consumption. Compared to the two consumption models mentioned in Section 1 this adds more realism to what individuals' utility depends on. Put differently, Scitovsky (1992) argues that people wish to keep their status in relation to their reference level, since losing status may be painful. Here I extend Alessie and Lusardi's (1997) model by assuming that people also care about the consumption among relevant others. Then, the "psychological" consumption amount that utility depends on at time τ, for an arbitrary individual, is:

$$c_\tau^* = c_\tau - \gamma c_{\tau-1} - \eta \bar{c}_\tau, \quad (1)$$

where $\eta \in [0, 1]$ controls how much the individual cares about the consumption among his relevant others,[2] $\bar{c}_\tau$.[3] The higher the η, the more the individual cares. The other parameter, $\gamma \in [0, 1]$, controls how much the individual cares about his own previous consumption, and $\gamma > 0$ implies that the individual has a habit-formation behavior. The higher the γ, the more the individual cares about his previous consumption. The formulation in Eq. (1) will then boil down to the one used by Alessie and Lusardi (1997) for $\gamma > 0$ and $\eta = 0$, and when $\gamma = \eta = 0$ it will reflect the conventional model as used by, e.g. Hall (1978).

2.2. The individual's utility maximization problem

By assumption, the individual's utility, $u(c_\tau^*)$, is concave, continuous, and twice differentiable over the interior of the individual's c_τ^*set, and moreover I restrict the individual's consumption amount, c_τ, to always be non-negative.

In order for the individual to optimize his consumption profile, he needs to predict at time τ his stock of *human wealth*, which is the present discounted value of his expected future labor income and the current value of his *non-human wealth* (a). I assume that the individual has a finite life, gives no bequests at period T, dies without any debt, and lives in a world with a perfect capital market (i.e., individuals can borrow and lend at the same constant[4] interest rate) in addition he is not liquidity constrained. Furthermore, I assume that the individual has perfect foresight about his own future labor income and the future consumption among his relevant others; i.e., the information is complete and there is no uncertainty.

Then the individual's intertemporal maximization problem can be specified as

$$\max_{\{c_\tau\}_{\tau=t}^T} U_\tau = \sum_{\tau=t}^{T} \beta^\tau u(c_\tau^*(c_\tau, c_{\tau-1}, \bar{c}_\tau)), \quad (2)$$

subject to his intertemporal budget constraint

$$\sum_{\tau=t}^{T} \left(\frac{1}{1+r}\right)^\tau c_\tau + \left(\frac{1}{1+r}\right)^{T+1} a_{T+1} = a_\tau + \sum_{\tau=t}^{T} \left(\frac{1}{1+r}\right)^\tau y_\tau, \quad (3)$$

and

$$\left(\frac{1}{1+r}\right)^{T+1} a_{T+1} \geq 0, \quad (4)$$

where a_τ and $c_{\tau-1}$ are given. Since the individual cannot have unpaid debts at period T, a_{T+1} cannot be less than zero. Moreover, from the individual intertemporal utility maximization problem, it is not optimal for the individual to have unused resources when he dies, hence $a_{T+1} = 0$ will always hold. Constraints (3) and (4) can therefore be combined into:

$$a_\tau + \sum_{\tau=t}^{T} \left(\frac{1}{1+r}\right)^\tau y_\tau - \sum_{\tau=t}^{T} \left(\frac{1}{1+r}\right)^\tau c_\tau = 0. \quad (5)$$

When the interest rate, r, is constant over time, the intertemporal budget constraint implies that the present discounted value of consumption is equal to the individual's initial wealth (a) plus his present discounted labor income (y).

Furthermore, I assume that the consumption among relevant others is not affected by the individual's consumption; i.e., $\bar{c}_\tau$ is exogenously given.

The individual's discount factor, $\beta = 1/(1+\rho)$, is constant over time, where $\rho > 0$, and is the individual's pure time preference. This rules out any possibility of discontinuity of U_τ (i.e., assures that U_τ does not diverge to infinity).

The individual's intertemporal maximization problem is then solved by maximizing his lifetime utility (2) subject to his intertemporal budget constraint (5). The Lagrangian function for this problem is:

$$\max_{\{c_\tau\}_{\tau=t}^T} \mathcal{L}(c_\tau, c_{\tau+1}, \ldots; \lambda) = \sum_{\tau=t}^{T} \beta^\tau u(c_\tau^*(c_\tau, c_{\tau-1}, \bar{c}_\tau)) + \lambda \left(a_\tau + \sum_{\tau=t}^{T} \left(\frac{1}{1+r}\right)^\tau y_\tau - \sum_{\tau=t}^{T} \left(\frac{1}{1+r}\right)^\tau c_\tau \right), \quad (6)$$

where λ is the constant Lagrange multiplier. The first order condition for an interior solution at an arbitrary period t is:

$$\frac{\partial \mathcal{L}(\cdot)}{\partial c_t} = \beta^t \frac{\partial u(c_t^*)}{\partial c_t^*} \frac{\partial c_t^*}{\partial c_t} + \beta^{t+1} \frac{\partial u(c_{t+1}^*)}{\partial c_{t+1}^*} \frac{\partial c_{t+1}^*}{\partial c_t} - \lambda \left(\frac{1}{1+r}\right)^t = 0. \quad (7)$$

Since this expression holds for all t, it is obvious that it also holds for $t+1$:

$$\frac{\partial \mathcal{L}(\cdot)}{\partial c_{t+1}} = \beta^{t+1} \frac{\partial u(c_{t+1}^*)}{\partial c_{t+1}^*} \frac{\partial c_{t+1}^*}{\partial c_{t+1}} + \beta^{t+2} \frac{\partial u(c_{t+2}^*)}{\partial c_{t+2}^*} \frac{\partial c_{t+2}^*}{\partial c_{t+1}} - \lambda \left(\frac{1}{1+r}\right)^{t+1} = 0. \quad (8)$$

Then solving for the individual's marginal rate of substitution (MRS) by combining (7) and (8), we have (after some manipulation):

$$\frac{(\partial u(c_{t+1}^*)/\partial c_{t+1}^*)(\partial c_{t+1}^*/\partial c_{t+1}) + \beta(\partial u(c_{t+2}^*)/\partial c_{t+2}^*)(\partial c_{t+2}^*/\partial c_{t+1})}{(\partial u(c_t^*)/\partial c_t^*)(\partial c_t^*/\partial c_t) + \beta(\partial u(c_{t+1}^*)/\partial c_{t+1}^*)(\partial c_{t+1}^*/\partial c_t)} = \frac{1+\rho}{1+r}. \quad (9)$$

Up to this point, the individual's MRS is valid for both a ratio and an additive comparison function. Let us continue the derivation of the individual's MRS with the additive comparison function as

[2] Relevant others refers to, e.g. neighbors, co-workers, and friends.

[3] This is similar to the psychological consumption that Alonso-Carrera et al. (2004) use in a paper that analyzes the circumstances under which consumption by relevant others is a source of inefficiency. They also included a third reference argument, which is the previous consumption, $\bar{c}_{t-1}$, of relevant others.

[4] The interest rate is independent of the capital stock in the economy.