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Precautionary saving and the marginal propensity to consume out of permanent income[☆]

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ABSTRACT

The budget constraint requires that, eventually, consumption must adjust fully to any permanent shock to income. Intuition suggests that, knowing this, optimizing agents will fully adjust their spending immediately upon experiencing a permanent shock. However, this paper shows that if consumers are impatient and are subject to transitory as well as permanent shocks, the optimal marginal propensity to consume out of permanent shocks (the MPCP) is strictly less than one, because buffer-stock savers have a target wealth-to-permanent-income *ratio*; a positive shock to permanent income moves the ratio below its target, temporarily boosting saving.
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1. Introduction

Arguably the core idea of Friedman (1957)'s permanent income hypothesis is that an optimizing consumer's response to an income shock should be much larger if that shock is permanent than if it is transitory.

A large empirical literature has shown that household income dynamics are reasonably well characterized by the Friedman (1957)–Muth (1960) dichotomy between permanent and transitory shocks.[1] And much of the subsequent theoretical literature can be interpreted as construction of the theoretical foundations for evaluating Friedman's proposition under plausible assumptions about income dynamics, utility functions, and expectations.

The hardest part of the theoretical enterprise has been incorporation of a rigorous treatment of labor income uncertainty. Indeed, full understanding of the theoretical effects of such uncertainty on the marginal propensity to

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[1] See, e.g., MaCurdy (1982), Abowd and Card (1989), Carroll and Samwick (1997), Jappelli and Pistaferri (2000), Storesletten et al. (2004), and Blundell et al. (2008).

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consume (MPC) out of transitory shocks is relatively recent: Kimball (1990a, b) showed that under standard assumptions about utility and expectations, the introduction of uncertainty in noncapital income increases the MPC at a given level of consumption, but not necessarily at a given level of wealth; and Carroll and Kimball (1996) show that the introduction of uncertainty causes the MPC to rise at any given level of wealth, and to increase more for consumers at lower levels of wealth.[2]

Surprisingly, no previous paper has systematically analyzed the complementary question of how uncertainty affects the marginal propensity to consume out of permanent shocks (the 'MPCP'),[3] though the question is important not only as a loose end in consumption theory, but also for microeconomic analysis of inequality (in both consumption and income) and for both micro- and macroeconomic analyses of tax policies and business cycles. Indeed, the topic can occasionally become headline news: the 2001 U.S. income tax cut was promoted by some economists as providing economic 'stimulus' on the explicit grounds that it was a permanent tax cut and therefore would have an immediate one-for-one effect on consumption.[4]

The lack of a formal treatment probably reflects a sense among researchers that they already know the answer: the MPCP should equal one. Because it is impossible to permanently insulate consumption from a permanent shock, if consumption does not adjust immediately and fully to such a shock, it will eventually need to adjust *more than* one-for-one to make up for any initial period of less-than-full adjustment. Consumption-smoothers, the thinking goes, will prefer to adjust fully now rather than less-than-fully now and more-than-fully later.

But the only rigorous theoretical underpinning for this view is provided by Deaton (1991), who examines the problem of a liquidity-constrained consumer whose *only* uncertainty comes in the form of permanent shocks to income; Deaton shows that, under a particular 'impatience' condition, such a consumer with zero wealth will exhibit an MPCP of one (because under these assumptions it is always optimal to consume all current income).

After deriving some new results that bolster Deaton's conjecture that, in his model, wealth tends to fall toward the absorbing state of zero where the MPCP is indeed one, this paper shows that if there are transitory as well as permanent shocks, under realistic calibrations the optimal MPCP can be substantially (though not enormously) less than one. The alteration is a consequence of the target-saving behavior that emerges when consumers are both prudent (Kimball, 1990b) and impatient. For a consumer starting at the target ratio of assets to permanent income, a positive shock to permanent income leaves the *target* unchanged. But for a given level of initial assets, a positive shock to the level of permanent income reduces the ratio of those assets to permanent income. For a consumer starting at the target, consumption therefore does not move up by the full amount of the income shock; the reciprocal logic holds for negative shocks.

The paper is organized as follows. The first section sets up the model and notation, and shows how the requirement of intertemporal budget balance is reflected in the consumption function. The second section derives an expression for the MPCP and explains qualitatively why it can be different from one; it then shows the relationship between that expression and Deaton's results, and derives a formula that applies to the more general model with both transitory and permanent shocks. Because the exact value of the MPCP cannot be determined except by numerical methods, the fourth section numerically solves and simulates and finds that the marginal propensity to consume out of permanent shocks tends to fall between 0.75 and 0.92 for a wide range of plausible parameter settings. This section concludes by showing that behavior of the ergodic population of consumers that arises in the model is very close to behavior of a single consumer with assets equal to the target value, suggesting that the inconvenient step of simulation may be unnecessary for many kinds of analysis.

2. The model

The consumer is assumed to behave according to the limiting solution to the problem

$$\begin{aligned}
&\mathbf{v}_t(\boldsymbol{m}_t, \boldsymbol{p}_t) = \max_{\boldsymbol{c}_t} \mathbb{E}_t \left[\sum_{n=0}^{T-t} \beta^n \mathrm{u}(\boldsymbol{c}_{t+n}) \right] \\
&\text{s.t.} \\
&\boldsymbol{a}_t = \boldsymbol{m}_t - \boldsymbol{c}_t, \\
&\boldsymbol{p}_{t+1} = \boldsymbol{p}_t \Gamma \psi_{t+1}, \\
&\boldsymbol{m}_{t+1} = \mathsf{R}\boldsymbol{a}_t + \boldsymbol{p}_{t+1}\xi_{t+1}
\end{aligned} \tag{1}$$

as the horizon T approaches infinity, where for clarity we have separately specified the various transitional steps that are often combined when the problem is written in its most compact (Bellman equation) form: $\boldsymbol{a}_t$ indicates assets after all actions at the end of period t; $\mathsf{R} = (1 + \mathsf{r})$ is the interest factor for assets held between periods; permanent noncapital income $\boldsymbol{p}_{t+1}$ is equal to its previous value, multiplied by a growth factor Γ, and modified by a mean-one shock

[2] This result is a direct implication of the concavity of the consumption function that Carroll and Kimball (1996) prove.

[3] By 'permanent shocks' here I mean shocks to noncapital income; the terms permanent income and permanent noncapital income are used interchangeably in this paper, except where doing so might cause confusion because of the ambiguity the term 'permanent income' can have when consumers receive both capital and noncapital income.

[4] Evidence on the actual outcome is difficult to interpret; see Johnson et al. (2006) for the best attempt.

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