

# Excess Sensitivity

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This note refers to material contained in the first few slides of the lecture entitled “Excess Sensitivity, Precautionary Saving and Liquidity Constraints”. In Problem Set 3, question 7 we looked at the Permanent Income Hypothesis (PIH) under uncertainty (Hall, 1978). The assumptions of quadratic utility and  $\beta(1+r) = 1$  led us to the following Euler equation for consumption:

$$E_t [c_{t+1}] = c_t \tag{1}$$

Under rational expectations, we can express future consumption as its (conditional) expectation plus an error term whose (conditional) expectation is zero. That is:

$$c_{t+1} = E_t [c_{t+1}] + \varepsilon_{t+1} \tag{2}$$

where  $E_t \varepsilon_{t+1} = 0$ . Substituting (1) into (2) yields:

$$c_{t+1} = c_t + \varepsilon_{t+1} \tag{3}$$

where  $E_t \varepsilon_{t+1} = 0$ . In words, consumption follows a *martingale* or *random walk*. That is, changes in consumption are unpredictable ( $\Delta c_t \equiv c_{t+1} - c_t = \varepsilon_{t+1}$ ). Consequently, the *best guess* for future consumption is current consumption. Consumption will only change if “*new information*” about permanent income arises. Consumption does *not* change in response to expected variations in income. Note the difference between the terms “*expected change* in income” and “*change in expected* income”. According to (3), consumption changes only in response to the latter and not the former.

Hall (1978) tested his random walk hypothesis by regressing the change in consumption on lagged income and lagged consumption. Note that lagged income and consumption are known at time  $t$ , which is when expectations of  $c_{t+1}$  are formed. Hence, according to the random walk hypothesis above, these lagged variables should have no effect on the current change in consumption (rational expectations). Hall found that neither lagged income nor lagged consumption were statistically significant and the null hypothesis that consumption follows a random walk could not be rejected.<sup>1</sup> However, this is merely a necessary and not a sufficient condition for the random walk hypothesis to hold. We should control for all information which is informative of future income. As it happens, Campbell and Mankiw find that lagged income has almost no predictive power for future income (and hence permanent income) so Hall’s finding that lagged income does not effect the current change in consumption is largely uninformative.

Flavin (1981) retests Hall’s random walk hypothesis for consumption assuming that income follows an ARMA process. This allows her to calculate the change in expected permanent income from a change in expected current income. Flavin finds that the sensitivity of consumption to changes in current income is far greater than the PIH would suggest.<sup>2</sup> This is known as “*excess sensitivity*”.

Campbell and Mankiw (1989) take a different approach to testing the random walk hypothesis (see pp. 358 of Romer’s *Advanced Macroeconomics*). They assume a fraction  $\lambda$  of the population are Keynes’ rule of thumb (ROT) consumers and a fraction  $(1 - \lambda)$  behave according to the PIH. The authors regress the change in consumption at time  $t$  on the change in income at time  $t$  to estimate  $\lambda$ , using a set of instruments for the change in income. Lags of the change in consumption are considered valid instruments because they are uncorrelated with the change in expected permanent income at time  $t$  (rational expectations) and are estimated to be correlated with the change in income at time  $t$ . The estimates of  $\lambda$  are around 0.5, which suggests that half of the population are ROT consumers and the other half are PIH consumers. In other words, the average consumer is not as forward looking as the PIH suggests and not as myopic as the ROT consumption function implies.

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<sup>1</sup>Lagged stock prices were found to have predictive power for consumption, which violates the random walk hypothesis.

<sup>2</sup>Flavin’s (1981) results have been questioned by Mankiw and Shapiro (1985) and Goodfriend (1986).

There is a bunch of evidence on excess sensitivity using *micro data*, which is more convincing than the aggregate studies discussed above, and you should be aware of it (for example, Hall and Mishkin (1982), Shea (1995), Parker (1999), and Souleles (1999)). Apart from the myopic explanation, there is substantial evidence to suggest that liquidity constraints and buffer-stock saving are part of the explanation.