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Prudent consumers: New evidence from the Consumer Expenditure Survey

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ABSTRACT

Using Consumer Expenditure Survey data from 1986 to recent years, this study examines whether or not the precautionary saving motive is an important force governing consumer behavior. A time series model is obtained by aggregating a log-linearized Euler equation across households, in which the cross-sectional variance of consumption growth represents income uncertainty. The test uses an alternative measure of consumption that excludes some problematic expenditure items from the conventional measure and finds strong evidence for the presence of the precautionary motive. This result is in sharp contrast with the findings of previous cross-sectional estimations using the same data set. It is argued that cross-sectional estimations may be seriously affected by measurement errors whereas the current estimation is not.

1. Introduction

Advances in the theory of precautionary saving[1] have sparked research interest in whether or not precautionary saving is an empirically important phenomenon. Numerical examples such as Carroll (1997), Carroll et al. (1992), Hubbard et al. (1994), Skinner (1988), Zeldes (1989), and more recently Gourinchas and Parker (2001, 2002) suggest that the precautionary saving motive may be important in the wealth accumulation of US consumers. Another line of empirical investigation has attempted to find direct evidence for the precautionary motive. Dynan (1993), using quarterly observations from the US Consumer Expenditure Survey (CEX), estimates a log-linearized Euler equation and finds no evidence to support the empirical validity of the theory. Using a similar method to this study but with data from the annual observations of the UK Family Expenditure Survey, Merrigan and Normandin (1996) present an opposite result. They suggest that greater uncertainty, measured by the variability of consumption growth, produces larger current saving. Carroll (1994) and Carroll and Samwick (1997) find that uncertainty as measured by variance of income growth has a significant effect on wealth accumulation. Guiso et al. (1992) and Kennickell and Lusardi (2004) argue, however, that variability of consumption or income measured from past information is not a valid measure of uncertainty and instead use uncertainty that is directly reported by consumers. The former finds no evidence for the theory whereas the latter finds supporting evidence from some cohort household groups.

It appears that direct tests have yet reached little consensus. This is mainly because there is no well-accepted measure of uncertainty. For example, variance of income growth can be a poor measure of uncertainty because movements in income are likely to be expected (Dynan, 1993).[2] Self-reported measures of uncertainty can be severely contaminated because respondents often may not understand the survey questions (Carroll, 1994). Consumption variability measured from the CEX, as found in Dynan (1993), can be most attributable to noise (Carroll et al., 1992; Merrigan and Normandin, 1996).

Using data drawn from the US Consumer Expenditure Survey (CEX), this paper attempts to find direct evidence for the precautionary saving motive. The study is comparable with those of Dynan (1993), Merrigan and Normandin (1996) and others in that a log-linearized Euler equation is estimated to measure the convexity of marginal utility. However, this study makes important modifications to previous studies in two core ways. Empirical research on the precautionary saving that is associated with uninsured idiosyncratic income risk typically relies on cross-sectional estimation methods. By contrast, the current study presents a time series model constructed by a cross-sectional aggregation of Euler equations in which the cross-sectional variance of consumption

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[1] Leland (1968), Kimball (1990), Caballero (1990, 1991), Carroll et al. (1992), and Carroll (1997) make major contributions to the theory.

[2] Recently, some studies such as Shin and Solon (2011) and Guvenen et al. (2012) argue that simple measure of volatility of year-to-year earnings changes is not consistent with the well-known counter-cyclical movement of earnings volatility and thus it does not represent well income uncertainty.

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growth represents the uncertainty that consumers face. As mentioned, one criticism of cross-sectional estimations using micro data is that they may suffer seriously from the impact of measurement errors and, as a result, cross-sectional estimation may yield inconsistent estimators. The measurement errors in the proposed time series model can be effectively controlled in the process of the cross-section aggregation of a large sample; the estimation model therefore yields a fairly precise estimate of the precautionary saving motive.

In the second modification, some items are excluded from the conventional definition of nondurables and services because they may incorrectly reflect consumer decisions on expenditure or may bear little relationship to actual uncertainty. For example, the CEX provides information only on out-of-pocket expenses for health expenditure, which can be negative if the households involved have received a refund for an expenditure incurred in the past. Another example is housing expenditure, for which the CEX does not include the imputed rent for owner occupied housing. Educational expenditures are also excluded because they can be considered as investment into human capital.

Estimation using an alternative definition of consumption expenditure yields strong evidence in favor of the theory. The estimated prudence coefficient is statistically significant and its value is fairly consistent with the widely accepted view on consumer attitudes toward risk. Introducing a time varying real rate of interest into the model does not affect the results. For the comparison, estimation results using the conventional definition of consumption are also reported, but they appear to be inconsistent with economic sense. Various examinations on the quality and validity of the alternative and conventional measures of consumption expenditure suggest that the former yields more a correct cross-sectional distribution of consumption growth than does the latter and that, furthermore, the deteriorating aspects of the estimation results are mostly attributable to the use of an incorrect measure of the cross-sectional variance.

The rest of the paper is organized as follows. Section 2 derives an empirical model by aggregating the log-linearized Euler equation across households. Section 3 explains the CEX survey and data construction for the empirical tests. Section 4 reports the result of GMM estimation using an alternative definition of consumption and compares this with that using the conventional definition. This section also discusses two issues associated with the impact of measurement errors on the empirical tests, namely the validity of cross-sectional variance as a proxy of income uncertainty and the inconsistency problem of the estimators. Finally, Section 5 concludes the paper.

2. The model

The economy is populated by consumers who receive an uncertain labor income over an infinite life time. Consumers are heterogeneous only in the form of uninsured labor income shocks; otherwise they are homogeneous. Given the usual assumptions on preference and budget constraints, any consumer j solves the intertemporal optimization problem and the resulting equilibrium consumption allocation between periods t and $t+1$ is represented by the Euler equation:

$$U'\left(C_{jt}\right)=\beta(1+R_{t+1})E_t\left[U'\left(C_{jt+1}\right)\right] \quad (1)$$

where C_{jt} is the consumption by consumer j. $E_t(\cdot)$ is a common expectation operator that is conditional on the information set available at time t. β represents the subjective discount rate, which is assumed to be constant over time and across households. The market is incomplete in that consumers cannot write any contingent claims for future income. Hence consumers can only self-insure by lending or borrowing at a predetermined real rate of interest, R_{t+1}. Despite the incompleteness of the market, the Euler equation is still valid, provided there is no restriction on the ability to borrow or lend at a risk free rate.

To get a testable model, we follow an approximation method similar to that in Dynan (1993) amongst others. The expected marginal utility in Eq. (1) can be replaced by the second order Taylor approximation:

$$E_t\left[U'\left(C_{jt+1}\right)\right]\approx U'\left(E_tC_{jt+1}\right)\left[1+\gamma\rho E_t\left(\frac{C_{jt+1}-E_tC_{jt+1}}{E_tC_{jt+1}}\right)^2\right] \quad (2)$$

The marginal utility of expected consumption is approximated as follows:

$$U'\left(E_tC_{jt+1}\right)\approx U'\left(C_{jt}\right)\left[1-\gamma\left(\frac{E_tC_{jt+1}-C_{jt}}{C_{jt}}\right)\right] \quad (3)$$

$\gamma=-U''(E_tC_{jt+1})E_tC_{jt+1}/U'(E_tC_{jt+1})$ and $\rho=-U'''(E_tC_{jt+1})E_tC_{jt+1}/U''(E_tC_{jt+1})$ represent the coefficient of relative risk aversion and the coefficient of relative prudence, respectively. Combining Eqs. (1) through (3) and taking logarithm, one can get the log-linearized Euler equation as follows:

$$\Delta\ln C_{jt+1}=\frac{1}{\gamma}\ln\beta+\frac{1}{\gamma}r_{t+1}+\frac{1}{2}\rho V_t\left(\Delta\ln C_{jt+1}\right)+\epsilon_{jt}+\upsilon_{jt+1} \quad (4)$$

[3]where r_{t+1} is the logarithm of the gross rate of return; $V_t(\cdot)$ represents the conditional variance operator; ϵ_{jt} represents approximation errors; and υ_{jt+1} represents unexpected consumption innovation.

Dynan (1993) aggregates Eq. (4) over time and performs a cross-sectional estimation using the CEX. However, one serious problem with such cross-sectional estimation is that the cross-sectional mean of consumption innovation is not zero in the presence of common aggregate shocks unless the panel spans a sufficiently prolonged period of time. This leads to inconsistent resulting estimates. Measurement errors (Carroll et al., 1992; Merrigan and Normandin, 1996) and approximation errors (Carroll, 2001) may be another source of inconsistent estimates.

The consistency problem can be effectively overcome in the time series model obtained from the cross-sectional average of Eq. (4):

$$E_j\left(\Delta\ln C_{jt+1}\right)=\frac{1}{\gamma}\ln\beta+\frac{1}{\gamma}r_{t+1}+\frac{1}{2}\rho E_j\left[V_t\left(\Delta\ln C_{jt+1}\right)\right]+\upsilon_{t+1} \quad (5)$$

where E_j represents the cross-sectional mean. With a large sized cross-sectional sample, it is reasonable to assume that the approximation error is purely random across consumers, such that $E_j(\epsilon_{jt})=0$.

The cross-sectional mean of the conditional variance in Eq. (5) is interpreted as being the economy-wide uncertainty associated with uninsured idiosyncratic income risk. The conditional variance of each individual, however, cannot be constructed from a CEX data set because of its characteristic rotating sample. One statistical conclusion states that:

$$V_j\left(\Delta\ln C_{jt+1}\right)=E_j\left[V_t\left(\Delta\ln C_{jt+1}\right)\right]+V_j\left(E_t\Delta\ln C_{jt+1}\right) \quad (6)$$

where $V_j(\cdot)$ represents the cross-sectional variance. Suppose that the consumption growth is a stationary process satisfying $\sum_{k=0}^{\infty}|m_k|<\infty$ where m_k represents the kth autocovariance of consumption growth. The consumption growth is then egordic for the mean. It can be

[3] Where the approximations are used:

$$\frac{E_tC_{t+1}-C_t}{C_t}\approx E_t\left(\Delta\ln C_{jt+1}\right)$$
$$\frac{C_{jt+1}-E_tC_{jt+1}}{E_tC_{jt+1}}\approx\Delta\ln C_{jt+1}-E_t\left(\Delta\ln C_{jt+1}\right)$$