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On the Importance of the Precautionary Saving Motive

By ANNAMARIA LUSARDI*

The life-cycle–permanent-income model has been the primary theoretical framework for research on saving. The basic intuition of the model is that households should smooth consumption over the life cycle. They should, therefore, save prior to retirement to offset the decline in future income and start drawing down wealth when they retire. A promising extension to the life-cycle model, which has become known as the theory of precautionary saving, has emphasized that saving serves not only to spread resources over the life cycle, but also to insure against uncertain events, such as shocks to income. This theory provides many useful insights about the behavior of saving and may reconcile some of the puzzles that confront the saving literature.

While the theory is promising from a theoretical point of view, the empirical work faces many difficulties. The central difficulty is how to obtain a good measure of risk. As discussed at length in Martin Browning and Lusardi (1996), one needs to identify some observable and exogenous sources of risk that vary significantly across the population. Some authors, such as Christopher Carroll and Andrew Samwick (1995), use the variance of income from observed income processes to proxy for risk. However, this approach is sensitive to the presence of measurement error in income and how much the consumer knows that the econometrician does not. Other authors, such as Jonathan Skinner (1988), have used other proxies for risk such as the occupation of the head of the household. This can be unsatisfactory if people select themselves into occupations on the basis of their degree of risk aversion. A new and innovative approach has been used by Luigi Guiso et al. (1992). They use data on the subjective probability distribution of future income from a sample of Italian households. One of the problems with their work, however, is that these types of questions might not be easy for respondents to understand.

In this paper, I use data from a new data set: the Health and Retirement Study (HRS), that provides data on subjective probabilities of job loss. The question in the HRS is rather simple and intuitive. As far as I know, this paper is the first application of subjective data in the estimation of a precautionary-saving model in the United States. An additional contribution is that, by looking at a group of the population (people close to retirement) for whom income risk should be relatively small, I can assess the importance of the precautionary saving motive.

I. A Model of Precautionary Saving

One of the principal lessons learned in the past decade is that predictions from a life-cycle–permanent-income model are less general than previously thought and can change quite dramatically when uncertainty is taken into account. Once it is assumed that income is not certain and can vary substantially over the working life, and that consumers dislike uncertainty, saving behavior becomes richer than in traditional models.[1]

The theoretical predictions can be summarized with reference to the following reduced-form equation, which has been estimated by many authors:

$$(1) \qquad \frac{W_h}{Y_h^p} = f(\text{age}, \mathbf{X}_h, \sigma_h^2).$$

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[1] See the review of precautionary saving in Browning and Lusardi (1996) and Angus Deaton (1992).

In the precautionary-saving model, wealth divided by permanent income (W/Y^P) of household h is a function of age, and other household characteristics ($\mathbf{X}$), that reflect preferences parameters and may include permanent income if preferences are nonhomothetic. One additional term that affects wealth accumulation is the uncertainty about income, as measured by the variance (σ^2). Note that there is a positive association between uncertainty and wealth; the higher the uncertainty, the higher is the accumulation. Even though it is very stylized, the expression above brings out the main intuition of the model. Precautionary saving can be seen as an extension of the basic intertemporal optimizing framework. Wealth continues to depend on permanent income as in traditional models of saving, but there are additional variables, such as the variance of income, that also play a role in explaining accumulation.

II. Empirical Analysis of the Precautionary-Saving Model

In the empirical work, I use data from the first wave of the HRS, a new survey conducted at the University of Michigan which was started in 1992. As examined in some detail below, this survey provides detailed information on wealth and the retirement process, with a focus on health, labor-market, and economic and psychosocial factors. The age range of respondents is restricted to 51–61 years old. In addition, the HRS oversamples minorities and residents in Florida. It is only the individual deemed most knowledgeable about the family's assets, debts, and retirement planning, who is asked questions on housing, net worth, and income of the family (respondent hereafter). A thorough examination of the quality of the HRS data and a comparison with other data sets is reported in Thomas Juster and James Smith (1994) and Smith (1995).

As illustrated in equation (1), to estimate a precautionary-saving model one needs information on three factors: wealth, household characteristics (including permanent income), and income risk. I comment hereafter on each factor and the information reported in the HRS.

(i) *Wealth.*—Two measures of wealth are used in the empirical work. The first measure (financial net worth) is defined as the sum of checking and saving accounts, bonds, stocks, IRA's, and other assets, minus short-term debt. The second measure (total net worth) is obtained by adding financial net worth to home equity, other real estate, business equity, and vehicles. Even though one expects precautionary accumulation to be mainly in liquid assets, for some assets, such as IRA's, there are provisions for withdrawals due to emergencies. Additionally, the development of the home-equity line of credit in the late 1980's and the fact that assets, such as vehicles and housing, can be used as collateral makes it worth considering a comprehensive measure of household resources such as total net worth.

To examine wealth more closely, in Table 1 I consider the sample of households in the first wave of the HRS and report weighted statistics of financial and total net worth (I exclude some major outliers). Both measures have a wide distribution. Note that the mean is well above the median and that the distributions of financial and total net worth are highly skewed to the right. Furthermore, many households arrive close to retirement with a small amount of assets, both in levels and as a ratio of their current income.

(ii) *Household characteristics and preference parameters.*—The richness of information in the HRS allows a careful investigation into the extent of household wealth accumulation. The HRS provides data on many household characteristics that are useful in the estimation of the precautionary-saving model (sex, gender, education, and health status). An innovation with respect to other surveys is the provision of data on a set of individual characteristics, from which one can gain information on preferences. For example, the HRS questionnaire contains some unique questions that allow the researcher to evaluate the attitude toward risk and calculate a measure of the coefficient of risk aversion.[2] It also reports information on the planning horizon in making financial decisions,

[2] See the evaluation of the risk aversion measure in the HRS in Robert Barsky et al. (1997).

TABLE 1—DISTRIBUTION OF FINANCIAL AND TOTAL NET WORTH

Percentile	Financial wealth	Total net worth	Net worth/ income
5	−4,300	0	0
10	−1,000	1,500	0.08
25	100	32,000	0.98
50	14,950	102,000	2.47
75	66,000	237,100	5.30
90	173,000	484,000	10.94
95	286,000	752,000	16.84
Mean:	63,441	206,615	4.60
(SD):	(136,505)	(331,774)	(6.84)

Source: Author's calculations from the HRS.

TABLE 2—PROBABILITY OF JOB LOSS IN UPCOMING YEAR

Variable	Estimates	Standard error
Age of respondent	−0.004	0.005
Union membership	−0.093	0.046
Past unemployment	0.292	0.042
Less than 30-week work year	0.382	0.145
Less than 25-hour work week	0.143	0.080
Tenure at current employer	−0.009	0.002

Note: This table reports the estimates from an ordered probit regression of the subjective probabilities of job loss on the variables listed in the first column.

which could be considered an index of time preferences.[3] In addition, respondents are asked to assess their chances of surviving up to the age of 75 or 85, whether they expect their earnings to go up or down in the future, and whether they expect to leave a bequest. These variables are important in accounting for the wide variation in wealth that we observe in the data.

(iii) *Income risk.*—An additional innovation in the HRS is the provision of subjective data that can be used to calculate a measure of income risk. Individual respondents are asked to evaluate the chances that they will lose their jobs in the next year. The question is as follows: "Sometimes people are permanently laid off from jobs that they want to keep. On a scale from 0 to 10 where 0 equals absolutely no chance and 10 equals absolutely certain, how likely is it that you will lose your job during the next year?"[4]

The responses to this question are sensible.[5] Many respondents report that the odds of losing their jobs next year are low, with the majority of respondents choosing values between 0 and 0.5. In Table 2, I report the results of an ordered probit regression of the probabilities of job loss on a set of job characteristics.[6] The results are as expected. For example, the odds of job loss are positively related to past unemployment, and negatively related to union membership and the number of years spent at the respondent's current employer.

By making some simple assumptions, it is possible to use this information to derive a measure of income variance that can be used in the estimation of the precautionary-saving model.[7] If the unemployment-insurance replacement rate is zero, and there are no changes in earnings if the respondent does not lose his/her job, then it is easy to show that the variance of earnings is equal to $p(1-p)Y^2$, where p is the subjective probability of losing the job and Y is earnings. If the replacement rate is equal to α, the variance of income becomes $p(1-p)(1-\alpha)^2Y^2$.

[3] The planning horizon is listed as follows: next few months, next year, next few years, next 5–10 years, longer than 10 years.

[4] After rescaling to 0–1, the responses can be interpreted as subjective probability distributions of the event.

[5] Other authors have examined subjective data in the HRS. See the evaluation of the subjective probability of survival in Michael Hurd and Kathleen McGarry (1995).

[6] These estimates refer to the final sample chosen for the empirical estimation of the precautionary saving motive, but results are similar when taking the total sample of respondents in the HRS.

[7] Income variance in this case refers to earnings variance.

TABLE 3—PRECAUTIONARY ACCUMULATION: TOTAL NET WORTH

Variable	OLS estimates (SE)	Median estimates (SE)
Constant	−7.578 (4.379)	−3.832 (5.567)
Age	0.241 (0.163)	0.065 (0.207)
Age-squared/100	−0.174 (0.152)	−0.005 (0.193)
Male	−0.441 (0.074)	−0.305 (0.094)
White	0.447 (0.115)	0.382 (0.147)
Black	−0.418 (0.126)	−0.242 (0.161)
High school	0.251 (0.102)	0.307 (0.129)
Some college	0.271 (0.135)	0.231 (0.172)
College	0.478 (0.182)	0.340 (0.231)
More than college	0.683 (0.264)	0.405 (0.335)
Married	0.400 (0.182)	0.558 (0.232)
Living with partner	−0.021 (0.263)	0.181 (0.335)
Divorced	−0.091 (0.164)	0.046 (0.209)
Widowed	0.519 (0.185)	0.616 (0.236)
Separated	−0.055 (0.222)	0.050 (0.282)
Excellent health	1.040 (0.231)	0.674 (0.290)
Very good health	0.684 (0.227)	0.516 (0.285)
Good health	0.608 (0.225)	0.495 (0.283)
Fair health	0.486 (0.235)	0.325 (0.296)
High risk aversion	0.225 (0.101)	0.408 (0.128)
Moderate risk aversion	0.385 (0.129)	0.492 (0.165)
Low risk aversion	0.242 (0.133)	0.331 (0.170)
Short planning horizon	0.224 (0.083)	0.149 (0.106)
Medium planning horizon	0.199 (0.086)	0.279 (0.110)
Long planning horizon	0.426 (0.132)	0.492 (0.168)
Probability of living to age 75	−0.008 (0.120)	0.007 (0.153)
Bequest motive	0.985 (0.065)	0.830 (0.084)
Income expected to fall	0.341 (0.127)	0.205 (0.161)
Income expected to rise	−0.085 (0.070)	−0.055 (0.088)
Past unemployment	−0.297 (0.069)	−0.274 (0.089)
Permanent income/ 1,000	−0.003 (0.004)	0.0004 (0.005)
Variance of income	0.009 (0.005)	0.038 (0.006)

Notes: This table reports ordinary least-squares (OLS) and median estimates from the regression of the ratio of total net worth to permanent income on the variables listed in the first column. Standard errors are in parentheses. The R^2 values of the OLS and median regressions are 0.165 and 0.104, respectively. The number of observations is 3,391.

III. Empirical Estimates

The empirical estimates of a regression of wealth divided by permanent income on a set of household characteristics, permanent income, and the variance of income are reported in Table 3.[8] To construct the final sample, I delete those households whose head is retired (fully or partially), or planning to retire in the current year, since earnings risk is not relevant for these respondents. The sample is also much reduced by the fact that many respondents are not asked the question about job loss.[9] Since wealth has such a wide distribution and outliers can affect the estimates, I trim the distribution and exclude the top and bottom 2 percent of the distribution. Additionally, I use estimators such as median estimators that can take better account of the outliers.

The empirical results concerning household characteristics and preferences are consistent with the basic theory of intertemporal optimization. For example, households whose respondent is more risk-averse accumulate more wealth. Respondents with long planning horizons (lower rates of time preference) accumulate more. In accordance with the prediction that saving occurs to offset future declines in income, households that expect their earnings to go down in the future accumulate more wealth. In addition, households whose head suffered periods of unemployment in the past have significantly lower wealth. It is important to account for households that have already suffered unemployment shocks in the past. These households are likely to have lower wealth (shocks depleted their stocks of assets), but also a higher risk of losing jobs in the future.

In accordance with the theory of precautionary saving, the sign of the variance of income is positive and statistically significant, indicating that people who face a higher income risk

[8] I construct a measure of permanent income by regressing household income on a set of demographic and firm characteristics. I use age, sex, and marital status in addition to education and occupation dummies which are interacted with age. I also use dummies for whether the respondent works in a small firm (fewer than 20 employees), for whether the respondent belongs to a union, and for whether the respondent works full time. Since the age range is only 10 years in the HRS, I have not accounted for cohort effects in income. The predictions from this regression are used as a proxy of the permanent component of income. Note also that I normalize the variance of income by dividing by permanent income.

[9] This question is only asked to respondents who "work for someone else" at the time of the interview. Note that I also delete respondents with missing data on the variables of interest, and respondents outside the 51–61 age range.

save more and accumulate more wealth. The estimates are statistically significant across estimation methods and increase in magnitude when considering median regressions, which are less affected by outliers. However, the contribution of precautionary saving to wealth accumulation is not very large. Evaluated at the sample means, the coefficient estimates show that the extent of precautionary accumulation (measured by the ratio of total net worth to permanent income) ranges from 1 percent to 3.5 percent. I also have performed the estimation on financial net worth. In that case, the extent of precautionary accumulation ranges from 2 percent to 4.5 percent.[10]

Even though I have assumed that the replacement rate is zero, I have also experimented with values of the replacement rate that range from 0.50 to 0.70, and results do not change substantially. The estimates can, however, be made more precise. It is clear that households with only one earner are much more exposed to risk than households where both spouses work. To account for this fact, I have interacted the variance of income with a dummy equal to 1 if there is more than one earner in the household and added that dummy separately in the regression. The predictions of the theory are verified in the data. Both the coefficient of the variance of income and that of interaction term are statistically significant, and the sign of the interaction term is, as expected, negative. The ordinary least-squares estimates of the variance of income and the interaction term are 0.045 (SE = 0.011) and −0.043 (SE = 0.012), respectively.

IV. Concluding Remarks and Further Research

Empirical estimates using HRS data indicate that the variance of income has a role in explaining saving and wealth accumulation of people close to retirement. Consistent with other findings in the literature, precautionary saving does not provide a rationale for a large accumulation of wealth and certainly cannot explain the wealth holdings of the very rich. However, the fact that there is evidence in favor of precautionary saving in this group of the population provides a strong indication that this motive is important. Further research in this area will consider other sources of risk that can affect saving. Apart from income risk, health and longevity risk can also be important and can provide useful insights to explain the wealth holdings of many households in the United States.

[10] For brevity, estimates are not reported but are available from the author upon request.

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