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Comment   Robert J. Willis

In a previous paper in this series, these authors (hereafter denoted as PRVW), developed a simulation methodology to calculate probability distributions of retirement wealth that would be available to a couple who

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participated in a 401(k) plan over their labor market careers under alternative allocations of their contributions between bonds and stocks (PRVW 2005). Their findings confirmed, in the main, earlier findings by MaCurdy and Shoven (1992) that a household that allocates its 401(k) contributions to stocks will not only have much higher wealth, on average, when it reaches retirement, than a household that invests in bonds, but that such a household faces almost no chance of having lower wealth despite the greater riskiness of stocks. The reason, of course, is rooted in the "equity premium puzzle" (Mehra and Prescott 2002) where the puzzle is that historical rates of return on stocks in the United States substantially exceed what would be required to compensate people with plausible degrees of risk aversion for this excess risk. In my comments on their paper (Willis 2005), I suggested that their findings, together with the fact that many people fail to hold significant stocks either with direct ownership or indirectly in retirement accounts, creates a related "retirement portfolio puzzle."

PRVW (2005) improved on the previous literature in two important ways. First, the methodology they used to calculate probability distributions of retirement wealth associated with alternative portfolio allocation strategies allows them to calculate the tail probability of very poor outcomes with considerable precision under two assumptions. One is that the processes that determined the distribution of historical U.S. stock returns will continue to operate in the same way in the future. The other is that the pattern of household life-cycle earnings will remain the same for future cohorts as it was for the HRS cohorts used in their simulations. Second, they explicitly recognize that, because people are risk averse, the simulated real dollar value of terminal retirement wealth does not directly provide the correct metric for evaluating alternative investment strategies. To obtain such a metric, they calculate the certainty-equivalent amount of terminal wealth for households with varying degrees of risk tolerance. While they found that all-stock portfolios do have a positive, but very small, probability of doing worse than an all-bond portfolio, asset allocation strategies with a large share of equities tend to have higher expected utility than more conservative ones, except for households with very low risk tolerance. Moreover, if the household has significant background income from Social Security, a DB pension, or labor earnings, all stock strategies tend to dominate, even for these very risk-averse households.

In the current paper—PRVW (2006)—the authors build on their previous analysis to examine the implications of a number of alternative investment allocation strategies that differ from the simpler strategies studied in PRVW (2005). In their previous paper, they considered alternative asset allocation strategies in which fixed fractions of contributions are allocated to stocks and a riskless asset. These strategies were in the spirit of the classic Samuelson-Merton model, in which it is optimal to maintain a constant

share of risky assets in the portfolio over the entire life cycle, although their simulations did not allow for the continuous portfolio rebalancing required by the optimal policy. More recent theories as well as popular financial advice suggest that older households should move to more conservative portfolios as they age, to compensate for the loss of flexibility in labor earnings following retirement, and perhaps for other reasons.

In PRVW (2006), the authors evaluate nine alternative portfolio strategies to determine how much such considerations matter for the expected utility of retirement wealth. These include three portfolios, each containing 100 percent of one of the pure asset types (TIPS, government bonds, corporate stock), several life-cycles strategies in which the portfolio shifts away from stocks as retirement approaches and, finally, a "no-lose" strategy that guarantees at least a zero real rate of return. Except for the final strategy, each portfolio is rebalanced at each age. As in their earlier paper, the authors draw random sequences of returns from a distribution of historical real returns for stocks and government bonds that are applied to an age-specific contribution sequence based on earnings histories of married HRS households in order to calculate the probability distribution of retirement wealth for each household. They find that the probability distribution of wealth does not vary dramatically among the alternative life-cycle strategies, nor does it vary much from the distribution associated with an age-invariant strategy with asset allocation shares equal to the average of the life-cycle plans. However, they do find that ranking of the alternatives in terms of expected utility is highly sensitive to parametric variations in the degree of risk aversion and expected rate of return to bonds. While households with a low degree of risk aversion or significant wealth from other sources gain from all-stock portfolios, people who are more risk averse, who have more pessimistic expectations about the future of stock returns and who will mainly rely on their 401(k) for retirement consumption may prefer a life-cycle strategy with some portfolio diversification. Interestingly, these rankings do not vary across education groups.

In my view, this is an excellent chapter, which demonstrates how the methodology developed in the previous PRVW paper can be used to address important practical questions about portfolio allocations to 401(k) plans. Like their previous paper, it offers the kind of advice that I would have liked to receive from a financial planner when I was young and, given its emphasis on life-cycle factors, is also useful to me now. I am grateful, too, to learn that my uninformed strategy may not have been too far from optimal, even though I, like a number of my economist friends, have never rebalanced my TIAA-CREF portfolio, even after reading Samuelson and Merton. As they point out in their conclusion, there is still more work to be done along these lines. In my comments, I will discuss one of these lines for future research—the analysis of portfolio choices by single people—a little more thoroughly. In addition, I want to suggest two other directions

in which the PRVW analysis might be extended. One is to utilize their approach in models of actual portfolio decisions that people make. The other is to consider what their analysis suggests for political economy.

So far, PRVW have deliberately restricted their analysis to stably married couples whose earnings histories and non-401(k) wealth can be drawn from the HRS. They speculate that the rankings of the alternative strategies might differ for single people because one person has less flexibility to respond to economic or health shocks than do two people. While I agree with their intuition, I think that portfolio choices by people who are not stably married may involve more subtle theoretical and empirical analysis than could be done by simply applying their current techniques to single people.

It is important to distinguish three types of people who end up as singles: the never-married, the divorced, and the widowed. The easiest case is widowing, because it is an insurable risk. It seems to me, therefore, that one could simply include the earnings histories of married people who end up widowed in the simulation model used by PRVW (with an imputed earnings history for the spouse who dies) because this is a possible outcome from the ex ante viewpoint of a newly married couple. This modification would require one important change. In their current model, PRVW use the household as a unit of analysis and assume a household utility function. In family economics, the assumption of a unitary model in which the preferences of a multiperson household is represented by a single utility function has been supplanted by collective models (Chiappori 1992) in which the utilities (and the separate interests and resources) of each individual within the household can be represented. To introduce widowing within a collective model, the PRVW model could be modified by specifying a separate CRRA utility function for the husband and wife together with a sharing rule (e.g., a fixed Pareto weight) to allow determination of each spouse's utility when both are alive. Note that this approach would also provide a natural way to integrate the PRVW analysis of preretirement savings with an analysis of mortality risk and the annuity value of postretirement consumption.

Introducing single and divorced people into the PRVW model is considerably more complicated, because marriage and divorce are subject to choice and are most decidedly not insurable risks. However, the divorce revolution that more than doubled divorce rates between 1965 and 1980, together with the delay of marriage and increasing levels of non marriage in the United States, imply that it is extremely important to bring marriage, divorce, and remarriage into the analysis if the PRVW model is going to be used to provide practical advice about the kinds of portfolio strategies that should be followed by young workers who are now signing up for 401(k) plans. For example, about a quarter of the early boomer cohort born in 1948–1953 who entered the HRS in 2004 were divorced or separated and

many of those currently married were not in their first marriage. It may be possible to use the life histories of such people within a simulation model of the type that PRVW have developed, but thought would need to be given about how to model the probabilities of marriage and divorce and the division of wealth between the partners. Collective models of marriage, divorce, and household allocations between spouses have been developed (see Browning, Chiappori, and Weiss, in progress) and applied to dynamic life cycle models consumption and saving by couples with endogenous divorce risk (Attanasio and Mazzocco 2002; Licht-Tyler 2002). Theoretical models of this sort might provide a useful theoretical framework to guide construction of a simulation model.

In their papers, PRVW assume that the relevant measures of the risk of future retirement portfolios is based on the history of stock returns. In this chapter, they consider expected rates of return of 6 percent and 9 percent, which represent historical averages for series of different length for the United States. This approach seems quite sensible for purposes of advising someone about the risks he or she might face in making portfolio decisions, although an advisor might well add the caveat that the range of expected returns would be considerably wider and would have a lower mean if historical data from other countries were also considered. The historical data need not, however, reflect an individual's beliefs about risks and returns in the stock market.

In work in progress, Gabor Kézdi and I have been examining expected stock returns based on probability questions in the HRS. It is clear from these data that there is great heterogeneity subjective to expected returns. In particular, it appears that many people believe that there is a greater-than-even chance that the stock market will fall during 2009. Had they based their expectations on the historical data, this probability would be substantially less than 50 percent. It appears, therefore, that many individuals believe that the expected return on stocks is lower than even the lowest of the historical average returns used by PRVW. This suggests that one possible resolution of the retirement portfolio paradox associated with the absence of stock in the retirement wealth of many people is that these people think that stocks are both riskier and have lower returns than alternative investments. In addition, holding the expected return constant, we show that increased subjective uncertainty leads people to behave in a more risk-averse manner. If respondents' subjective beliefs about stock returns can be elicited from surveys, the methods developed by PRVW could be used to study actual 401(k) allocations as well as to examine the welfare implications of hypothetical strategies.

It is interesting to ask how much people's beliefs would be influenced by more knowledge of historical returns. To the extent that broader participation in 401(k) plans leads people to acquire more knowledge about the

historical patterns and change their beliefs accordingly, more people may choose portfolios containing substantial amounts of stock, similar to those that PRVW find promise the greatest expected utility. Alternatively, it might be the case that ordinary people and experts will continue to have divergent beliefs about equity returns. As defined-benefit pensions are replaced by defined contribution plans, such divergent beliefs will contribute to growing inequality in wealth and income among retired people who had similar earnings histories. Even with homogeneous beliefs, PRVW show that alternative portfolios that produce similar expected utility may yield very different levels of wealth and income from an ex post point of view. Moreover, the value of wealth at a given retirement age of adjacent cohorts is subject to considerable variation because of year-to-year variations in the stock market. For example, between March 24, 2000, and July 1, 2001, the value of stocks fell by 50 percent, implying that otherwise identical brothers with all-stock portfolios who purchased retirement annuities on those two dates would have radically different retirement incomes. Based on the historical returns data, there is about a 5 percent chance of a difference this large between adjacent years. As defined contribution retirement plans and private savings become the dominant source of retiree incomes, one may speculate that social and political judgments about horizontal inequity among retirees will create pressures to offset inequalities in outcomes through taxes and transfers. In that sense, the fundamental idea of defined benefit pensions may not be as dead as it now seems.

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