Does Risk Tolerance Decrease With Age?

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This study examines the effect of age on risk tolerance. The life-cycle investment hypothesis is tested using the 1983-89 panel of the Survey of Consumer Finances. Household wealth is defined as the sum of human capital and net worth. Risk tolerance is measured by the ratio of risky assets to total wealth. Risk tolerance increases with age when other variables are controlled.
Key Words: *Risk tolerance, Risk aversion, Investment, Survey of Consumer Finances*

The proportion of households in the U.S. headed by someone 65 and older is expected to rise from the 1996 level of 22% (U. S. Bureau of the Census, 1997, Table 70) to as high as 40% by the year 2040 (Lumsdaine & Wise, 1990). This dramatic increase in the proportion of elderly households will result in part from the aging of the baby-boom generation, born between 1946 and 1962. Consequently, the adequacy of retirement income is becoming a matter of national concern.

The buying power of most pensions is reduced over time due to inflation. In 1989-90, less than 5% of full-time employees covered by a defined benefit pension were provided cost-of-living adjustments (Wiatrowski, 1993). Therefore, private household savings should become an increasing component of retirement income.

Stocks offer a higher return than do less volatile investments such as Treasury bills (Ibbotson Associates, 1997). However, Malkiel (1996) suggested that the proportion of a portfolio devoted to stocks should decrease as one approaches retirement. Hanna and Chen (1997) concluded that the proportion of stocks in a portfolio[a] should decrease with age, assuming that risk tolerance does not change with age.

Bakshi and Chen (1994) discussed the *Life-cycle Risk Aversion Hypothesis* and hypothesized that risk aversion increases with age. Bakshi and Chen (1994) assumed that risk aversion could be measured by the proportion of a household's assets held in the form of 'risky' assets such as stocks. In this article, a null version of the Bakshi and Chen (1994) hypothesis is tested – the proportion of net wealth held in risky assets does not vary with age. This article examines the effect of age on risk tolerance. This article primarily discusses the concept of *risk aversion*, the term used in the economics literature, but risk aversion can be thought of as inversely related to the financial planning concept of *risk tolerance*.

Review of Literature

Previous researchers have studied the relationship between age and the holding of risky assets. Morin and Suarez (1983) investigated the effect of age on the holding of risky assets using 1970 Canadian Survey of Consumer Finance data. Risky assets were defined as the sum of stocks, bonds, mutual funds, real estate other than owner-occupied home, equity in own business, and loans. Morin and Suarez (1983) concluded that on average, risk aversion increased with age. For those at the low levels of net worth, risk aversion increased with age. In contrast, for households with high net worth, risk aversion decreased with age. The authors concluded that both net worth and age influenced risk aversion.

Based on the capital asset pricing model, McInish, Ramaswami, and Srivastava (1993) studied the relationship between net worth and risk aversion. They assumed that the investment choice along the risk/return line depended on the investor's attitude toward risk. Thus, more risk-averse investors should hold less risky portfolios, which would lead to lower levels of wealth. In addition, McInish, et al. (1993) investigated the effect of age on the holding of risky assets. Based on U.S. financial diary panel data, the results showed that for individuals younger than 35 years old, the relationship between net worth and risk attitude was not statistically significant. In contrast, the relationship between net worth and risk attitude was significant for those ages 35 and over. However, the study did not control for the effect of inherited wealth, which might account for a significant portion of a household' total wealth.

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A study by Riley and Chow (1992) focused on asset allocation and individual risk aversion in a sample of U.S. households. Riley and Chow derived relative risk aversion indexes from actual asset allocation and found that risk aversion decreased with age until 65, then increased significantly. The relationship between age and risk aversion was also studied by Bakshi and Chen (1994) for aggregate U. S. time series data. Bakshi and Chen (1994) concluded that risk aversion increases as the population ages.

McInish, et al. (1993) and Cohn, Lewellen, Lease, and Schlarbaum (1975) found a positive relationship between risk tolerance and both net worth and income, with wealthy investors holding a higher proportion of risky assets. Investors aged 45 to 54 held the highest proportion of risky assets. In contrast, those younger than 45 years old held the highest proportion of their total assets in non-risky assets.

Some studies used risk tolerance measures derived from responses to questions. For instance, Sung and Hanna (1996) analyzed responses to the Survey of Consumer Finances risk tolerance question. Age did not have a significant bivariate relationship with risk tolerance, although in a multivariate analysis risk tolerance decreased with age (Sung & Hanna, 1996, note *e*).

Data and Methodology

Data and Variables

The major data set used in this study is the 1983-89 panel of the Survey of Consumer Finances (SCF). The 1983-89 SCF panel provides the most recent comprehensive data about a household's wealth and its composition and changes during a period of time.[b] However, understanding risky asset holding over the life-cycle requires information about a household's present value of future pension and Social Security wealth and a measure of future earnings. Data on present value of future pension and Social Security wealth are not included in the panel and were thus imputed from the 1983 cross-sectional SCF data (Avery & Elliehausen, 1990). The 1983 and 1989 Consumer Price Indices (CPI) were used to adjust for changes in prices (U. S. Department of Labor, 1992). Life expectancy estimates were obtained from the 1989 Vital Statistics of the United States (U. S. Department of Commerce, 1992). Projected labor force participation rates were obtained from the Statistical Abstract of the United States (U.S. Department of Commerce, 1996). Poverty thresholds were obtained from the 1989 Current Population Survey Report (U. S. Bureau of the Census, 1988; 1989).

Risky assets in this study are defined as assets that provide an uncertain nominal cash flow. Thus, the market value of all real estate held for investment purposes, the total value of business assets, the market value of mutual funds, corporate stocks, and precious metals are included as risky assets. In addition, pension assets in the forms of stocks, bonds, and mutual funds are included as risky assets in the 1989 data.[c]

The Effect of Age on Individuals' Relative Risk Aversion

Following the work of Friend and Blume (1975), Fama and Schwert (1977), Morin and Suarez (1983), and Schooley & Worden (1996), the effect of age on an individual's relative risk aversion is operationalized as the proportion of net wealth invested in risky assets.[d] Human capital is included as part of household net wealth.

Human capital is calculated as the present value of future earnings and Social Security pensions, plus any defined benefit pensions expected. The detailed calculation is based on the methodology and data described by Wang (1997) and is not discussed here due to space limitation.

Previous studies have used an Ordinary Least Squares regression with the risky asset proportion of wealth as a dependent variable (Friend & Blume, 1975; Morin & Suarez, 1983; Schooley & Worden, 1996). However, two econometric issues arise because of the nature of the dependent variables. First, because it is a share, the dependent variable imposes heteroscedasticity of a well known form (Maddala, 1980). Second, many households have zero shares of various asset categories, suggesting the need for the Tobit model to handle censoring. To take account of both issues, this study employs the heteroscedastic Tobit model.

Results and Discussions

The mean value of the ratio of risky assets to net wealth in 1989 was 6% (Table 1). The median value of the ratio was 1% and only 25% of households had a value of 6% or higher. Note that for most households a collapse of stock markets would have a very small impact on total wealth. These results are similar to ratios obtained by Lee and Hanna (1995) using financial assets rather than risky assets.

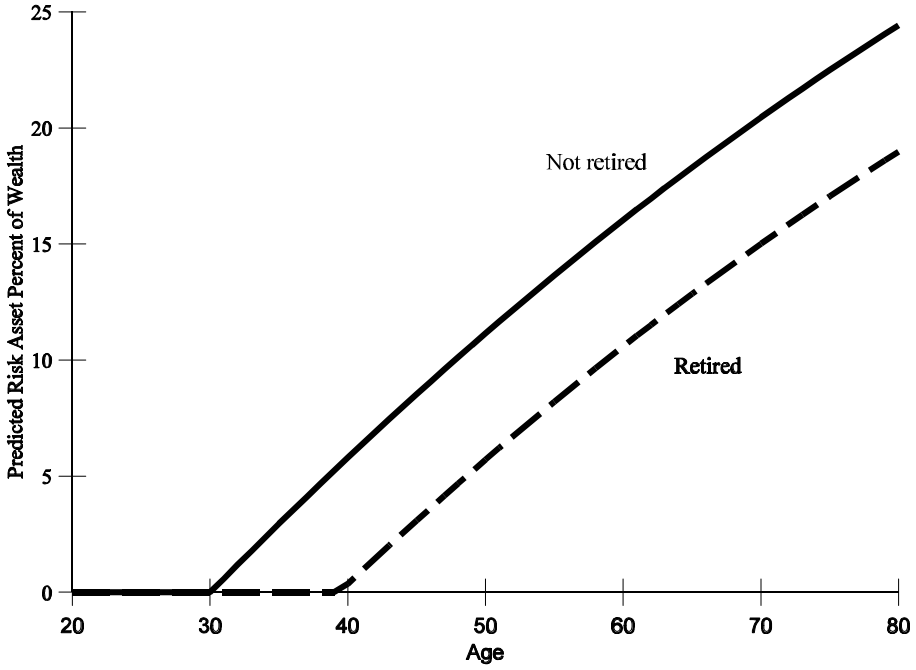
The effects of net wealth, age, education, and other socio-demographic variables on proportion of net wealth invested in risky assets are tested using a heteroscedastic Tobit model. Tobit coefficients and the calculated marginal effects are summarized in the Appendix.

Table 1
Mean and Selected Percentiles of the Ratio of 1989 Risky Assets to Net Wealth (including human capital.)

Mean	6.4%
75th percentile	6.2%
Median	1.2%
25th percentile	0.3%

Age is significantly related to the proportion of net wealth invested in risky assets. Figure 1 shows the relationship between age and the proportion of net wealth invested in risky assets for both retired and non-retired households. Households with a head who is not retired have a predicted risky asset proportion of 0% at age 30. The proportion increases with age to almost 14% at age 55, 18% at age 65, and 24% at age 80. The predicted proportion does not decrease with age for ages under 100. The predicted proportion of net wealth invested in risky assets for retired households increases with age after age 40, increasing to 8% at age 55, 13% at age 65, and 19% at age 80. Even though retirement decreases the predicted risky asset proportion, the general pattern is that eventually the proportion for retired households will exceed the pre-retirement peak proportion. For instance, the predicted risky asset proportion of 18% at age 65 for someone who is not retired would be exceeded by age 80 for someone who is retired.

Figure 1
Predicted Risky Asset Proportion of Total Wealth, by Age and Retirement Status



Based on tobit results reported in Appendix, assuming mean values of other variables.

Conclusion and Implications

Relative risk aversion decreases as people age (i.e., the proportion of net wealth invested in risky assets increases as people age) when other variables are held constant. Therefore, risk tolerance increases with age. Thus, the constant life-cycle risk aversion hypothesis is not accepted. These results are contrary to Morin and Suarez's (1983, p. 1201) finding that risk aversion increases with age.

Human capital accounts for a relatively large portion of net wealth for young people, and financial wealth accounts for a relatively small portion of their net wealth. Young people may appear more risk averse since it is hard for them to endure any short-term investment losses with limited financial resources. Future human wealth can not be applied to pay present bills, car loans, mortgage debts, etc.

Implication for Financial Planning and Education

Educators and planners should not assume that risk tolerance decreases as people age. Overall, the opposite seems to be the pattern. Consumers who avoid high return assets such as stocks should be encouraged to allocate part of their investments to broadly diversified stock funds in order to maintain household purchasing power. As Hanna and Chen (1997) demonstrate, objective aspects of risk tolerance, such as the investment horizon, may be more important than subjective aspects such as risk aversion.

Limitation of this study

The results are based on cross-sectional data, so there may be generational effects. For instance, those who were 87 in 1989 were 27 in 1929 and would have vivid memories of the Stock Market Crash of 1929 and of the Great Depression. It is possible that people who are age 87 now may have different attitudes toward risk than today's Baby Boomers will have at age 87.

Endnotes

a. *Hanna and Chen (1997) assumed that risk tolerance (relative risk aversion) does not change with age. Given their assumption of a Constant Relative Risk Aversion utility function, then everyone with the same risk tolerance should have the same level of stocks as a proportion of wealth, if a static analysis is used.. When the plausible assumption is added that the investment horizon decreases as one approaches retirement, the proportion of stocks in the portfolio should decrease as one ages. However, when a typical lifecycle accumulation of financial assets and decrease in human wealth are considered, the normative result using their method is that the stock proportion of total wealth increases with age until retirement, then does not decrease much after retirement.*

b. *For more on the dataset and methods, see Wang (1997). In order to construct nationally representative estimates, the SCF data contain weight variables. This article does not focus on the estimation of household wealth changes between 1983 and 1989, so the weight variable WGT0195 is used.*

c. *The 1983 SCF dataset does not provide precise information about the allocation of pension assets. Therefore, pension assets invested in stocks, bonds, and mutual funds cannot be identified, so that pension assets are not counted as investment assets. This may be a reasonable assumption for the 1980's (Papke, Petersen & Poterba, 1993), although it would not be a reasonable assumption today.*

d. *Net wealth is considered as an exogenous variable (Friend & Blume, 1975; Morin & Suarez, 1983).*

Appendix

Table

Tobit Analysis of Risky Asset Proportion of Net Wealth

Constant	-.7075***
Age	.96E-2**
Age squared	-3.00e-05
Net wealth in 1989	.20E-4***
Household income in 1988	2.10e-04
Respondent retired vs. not	-.70E-1**
Expect inheritance vs. not	.53E-1*
Married couple vs. not	.1160***
Educational status (vs. less than high school)	
High school graduate	.1269***
Some college education	.2081***
College graduate or more	.2383***
Race/Ethnicity (vs. Black)	
White	.1339***
Hispanic	.1792*
Other race	.1635***
Respondent & spouse poor health vs. not	-.98e-1**
Inadequate retirement income	.25e-1*
Transitory income during 1983-89	-5.30e-05
Respondent divorced vs. not	7.20e-02
Respondent changed jobs vs. not	-0.80e-1**
Income change during 1983-89	-1.70e-04
Sigma	0.136
Log-L	-274.7

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