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Investors' Asset Allocations versus Life-Cycle Funds

Diane K. Schooley and Debra Drecnik Worden

Life-cycle funds, among the newest asset allocation fund offerings, are managed according to investors' time horizons and risk tolerances. Partly in response to the appearance of these funds, we examined the relationships among the risk in individual investors' portfolios, their financial-planning time horizons, and their risk tolerances. Generally, we found that portfolio risk increases as time horizon and willingness to take risk increase. This relationship held when we used multivariate analysis. Additional factors related to portfolio risk were found to be the investor's expectations of a future economic downturn, age, education, and marital status.

According to one common definition, risk refers to the possibility of loss. In financial terms, risk is the possibility that the expected return on an investment will not occur and, in particular, that the value of the security will actually fall. An investment for which the probability of such a loss is virtually nonexistent is considered to be risk free. The greater the volatility in an investment's returns, the greater its risk.

Individuals are increasingly being called upon to make their own investment decisions, including the investment of their retirement funds, among securities with varying degrees of risk. The number of options from which to make selections is growing; the average number of investment choices for employees in 401(k) and other retirement plans increased from 3.5 in 1990 to 8.2 in 1998 (Mercer 1998). In addition, there are thousands of mutual funds as well as individual stocks, bonds, and more-liquid assets in which individuals can invest their savings.

In his chapter "A Life-Cycle Guide to Investing," Malkiel (1996) claimed that an individual's investment choices must be keyed to two considerations—the person's capacity for risk and the person's attitude toward risk. For example, an individual near retirement may choose to invest in a certificate of deposit because of a reduced capacity to accept risk whereas a young person, despite many income-earning years remaining, may choose such an investment because of an attitudinal aversion to risk.

One of the newest types of mutual funds, the life-cycle fund, is intended to simplify investment decisions after investors have evaluated their attitudes toward and capacities for risk.¹ Investors select life-cycle funds on the basis of dates for their specific savings goals. For example, those saving for retirement would select funds targeted for the date of their expected retirement; those saving for their children's education would select funds targeted for the dates the children will need money for college. The farther into the future a target goal lies, the greater an investor's capacity for risk.

One purpose of this study was to examine the financial portfolios of individual investors and ascertain whether their allocations match those determined by the life-cycle fund managers. For investors whose allocations are not consistent with their time horizons and risk tolerances, these funds offer the opportunity to improve investment outcomes. For investors who use the investment philosophy of the life-cycle funds on their own, the higher cost for the redundant services these funds offer may not be justified. Many life-cycle funds charge 1.2 percent or more a year, which is more than most index funds and bond funds charge (O'Connell 1995).

The second purpose of the study was to increase understanding of how financial-planning horizons, attitudes toward risk, economic expectations, and various socioeconomic factors are related to portfolio asset allocation.

Theoretical Basis for Life-Cycle Funds

Life-cycle funds can be characterized as either passive or active in their asset allocations. The most

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common is the passive fund, which is actually a series of funds with specific asset allocations in equity securities, bonds, and cash that depend on the fund's risk classification as aggressive, moderate, or conservative. Investors are expected to move among the funds according to their own risk tolerances and financial goals; that is, they would move into the more conservative funds as their financial target dates approached. In contrast, in an active life-cycle fund, the portfolio manager adjusts the asset allocation over time, with the portfolio becoming more conservative as the target date nears. Investors do not have to move among funds over time. The primary purpose of both types of funds is to provide investors with a simple solution to the problem of how to allocate a portfolio appropriately among the various asset classes with their differing risks.

Life-cycle funds are based on the notion that the longer the investor's time horizon (i.e., the farther into the future the financial goal of the investing lies), the more risk the investor should be able and willing to tolerate. Investment advisors and financial planners generally advise their clients to take on the riskier investments when they are relatively young and move to the less risky investments as they approach retirement. A generally accepted rule is that the percentage of an individual's portfolio invested in equity should equal 100 minus the individual's age (Bodie and Crane 1997).

One foundation for this advice is the concept of time diversification, which is the idea that above-average returns tend to negate below-average returns over a long time horizon. The theory implies that, given independent returns from year to year, the distribution of annual returns converges toward the expected return as the investment horizon increases (Kritzman 1994).

A number of researchers have challenged the rationality of time diversification. At one time, Samuelson (1969) argued that a rational expected-utility maximizer who is subject to constant relative risk aversion and faces random-walk security returns will invest the same proportion of his or her portfolio in equities regardless of age. In a later paper, however, Samuelson (1989) provided an explanation for age-phased risk reduction that is the concept embodied in the investing rule described previously. Samuelson (1989) found that, when one recognizes that people save to ensure a minimum level of wealth at retirement (either for their own subsistence or for their heirs), a pattern of reduced risk taking with age emerges.

Kritzman, presenting another case against time diversification, argued that an investor who chooses a risk-free asset over a short time horizon will choose a risk-free asset over a long time horizon. The

assumptions under which this conclusion held were that (1) the investor's risk aversion is invariant to changes in wealth, (2) the investor believes risky returns are random, and (3) the investor's future wealth depends solely on investment returns. When Kritzman relaxed the assumptions, he found that time diversification does hold if investors do not believe that risky asset returns are random or if investors have a discontinuous utility function or if investors simply are not rational.

Another theoretical foundation for investors choosing to accept higher risk for longer horizons has to do with their abilities to adjust consumption and work habits. If a risky investment earns returns below its expected returns early in the investment horizon, a younger investor can still reach financial goals by reducing consumption or increasing work. In other words, this investor's future wealth is not determined solely by investment returns.

Bodie, Merton, and Samuelson (1992) considered this concept and found that individuals tend to decrease the risk in their investment portfolios as they near retirement. A young investor typically has the flexibility to increase her or his labor and decrease leisure and consumption to make up for losses in an investment portfolio. An older investor does not have such flexibility and thus will tend to make more-conservative investments.

The discussion in this section has focused on retirement as the determinant of the investor's time horizon, but other determinants include funding future education expenses for children and saving to acquire a large asset, such as a house or automobile. Regardless of the goal or purpose of investing, the concept of time diversification justifies investors decreasing the proportion of equity in their portfolios as the dates of their financial goals approach.

Methodology

This study sought to answer the following three questions: First, does an investor's portfolio reflect risk consistent with the investor's financial-planning time horizon? Second, is an investor's tolerance for risk related to this horizon? Third, is the level of risk in an investor's portfolio, after controlling for risk tolerance and various socio-economic factors, related to this horizon?

We measured the level of risk in an investor's portfolio by the percentage of financial assets held in equity securities. We used one-way analysis of variance to test two hypotheses. First, we tested whether the mean amount of risk is statistically different among investors' financial-planning time horizons. The results were intended to indicate whether investors determine how much risk to take

in their portfolios based on the length of time remaining to their goal dates. Second, we tested whether the level of risk tolerance claimed by investors differs significantly among financial-planning time horizons. Finally, we used regression analysis to examine the multivariate relationships between the level of portfolio risk and investors' time horizons, risk tolerances, economic expectations, and such socioeconomic factors as investor wealth, age, education, and marital status.

Data

All the variables used in this study were derived from the 1989 Survey of Consumer Finances (SCF). This survey, sponsored by the U.S. Federal Reserve Board, was conducted by the Survey Research Center at the University of Michigan between August 1989 and March 1990. The purpose of the SCF was to provide a comprehensive view of the financial behavior of a cross-section of U.S. households. The researchers gathered detailed information on all the assets and liabilities of the household and demographic characteristics of the household, such as age, education, family composition, and income. Attitudes about the economy, financial planning and saving, and risk taking for investment were also measured.

The use of the 1989 data set, rather than a more recent one, ensured that we were examining a time period well before life-cycle funds were introduced. If the investors in our sample had had access to such funds, the analyses would not have been able to distinguish between asset allocations determined directly by investors and those resulting from the life-cycle funds' managers.

The survey is distinguished from other household surveys not only by the vast amount of information gathered but also because of its sample design.² The distribution of wealth in the United States is such that a relatively small portion of households hold a large share of the wealth. To obtain more detail on the financial behavior of those households holding a disproportionate share of the wealth, the SCF used a dual-frame sampling design (Herringa and Woodburn 1991). The final sample of 3,143 respondents consisted of 2,277 randomly selected households from across the United States and 866 high-income households selected from a list developed by the U.S. Internal Revenue Service. This sampling design prohibited the use of this sample as representative of the U.S. population, so this sample cannot be used to make statistical inferences about population means and distributions. But the sample did allow us to make inferences about the relationships among variables within households.

The financial assets evaluated in the analysis included only those for which the type of investment was actually known (i.e., the investor reported that the particular investment was in stock, government bonds, certificates of deposit, a stock mutual fund, etc.). The accumulated value of pensions or retirement savings plans (for the respondent and a spouse or partner) was included if the respondent reported that the fund was invested "mostly in stocks," "mostly in interest-earning accounts," or "split between these two." The value of individual retirement accounts (IRAs) or Keogh accounts was measured if the respondent specifically reported where "most" of the funds were invested.³ Respondents with no financial assets in the specified investments, 8.3 percent of the sample, were excluded from the analysis, which resulted in a final sample of 2,873 observations. With an average household net worth of more than \$1.3 million, this sample is obviously wealthier than typical in the United States in 1989. Seventy-one percent of the households in the sample consisted of married couples or two adults living together as partners. The average age of the head of household was 51 years; 58 percent of these individuals had more than a high school education.

If the reasoning of today's life-cycle fund managers is correct, a major determining factor in portfolio composition is the investor's financial-planning horizon. Information on this aspect was available in the SCF. Respondents were asked to identify the time period that was the most important in planning their family's saving and spending. We coded responses to this question into four categories of planning horizon: 1 year or less, the next few years, the next 5–10 years, and longer than 10 years. This variable is the proxy for the investor's financial target date. For slightly more than 30 percent of the respondents, the financial target was in the very near future, within the next 12 months. For 26 percent of the respondents, the financial target was within the next few years, and for another 26 percent, the goal was within the next 5–10 years. Only 18.5 percent of the respondents claimed that their most important financial-planning horizon was more than 10 years into the future.

The SCF provides data for another major determining factor in portfolio composition, namely, the investor's risk tolerance. Respondents to the SCF were asked to select one of the following statements as being closest to the amount of financial risk that they (and their partners) were willing to take when saving or making investments:

- substantial financial risks expecting to earn substantial returns,

- above-average financial risks expecting to earn above average returns,
- average financial risks expecting to earn average returns, and
- not willing to take any financial risks.

We coded responses into four categorical variables as a measure of investors' risk tolerances. Only 5 percent of the respondents claimed to be willing to take substantial risk to earn substantial returns. Nearly 13 percent of the sample, however, were willing to take above-average risk. An average amount of risk was all that 44.5 percent of the respondents would tolerate, and 37.5 percent were not willing to take any financial risk at all. This seemingly low level of risk tolerance is substantiated by the mean percentage of financial assets invested in equity securities, only slightly more than 18 percent, by the respondents in this sample.⁴

Results

Do investors' portfolios reflect risk consistent with their financial-planning time horizons? The results of one-way analysis of variance to test whether household asset allocations differed significantly by financial-planning horizon are presented in **Table 1**. The mean level of risk as measured by the percentage of financial assets invested in equity securities is significantly different among the four categories. Those respondents with very short horizons held the lowest mean percentage of their financial assets in equity. The percentage increases as the financial target date grows more distant until it is slightly more than 23 percent for the 5–10 year horizon. The mean percentage of equity falls for the longest planning horizon, but the difference is not statistically significant.

Are investor tolerances for risk related to their financial-planning horizons? **Table 2** presents

results of a cross-tabulation testing the relationship between investors' planning horizons and their attitudes toward risk taking. The table reports a statistically significant relationship between the two variables. Nearly 50 percent of the respondents with horizons of one year or less reported that they were not willing to take any financial risks. Only 25 percent of those respondents with horizons of more than 10 years were not willing to take any financial risks. Only about 9 percent of the respondents with the shortest planning horizons claimed to be willing to take above-average risk in their investments; almost twice as many with the longest horizon believed they could tolerate such risk. In general, respondents' tolerances for risk increased as the date of their financial goals moved farther into the future.

We used regression analysis to test the relationship between the level of risk in an investor's financial portfolio and the investor's financial-planning horizon when risk tolerance, expectations about the economy, and socioeconomic factors were held constant. **Exhibit 1** contains definitions of the explanatory variables in this multivariate analysis. **Table 3** contains the results, which indicate that the relationship remains significant even when other factors are accounted for. On average, investors in the sample had more of their financial assets in equity if their horizons were the next few years or longer and had fewer assets in equity if their horizons were within one year or less.

The results also indicate that those investors willing to tolerate any amount of risk had significantly higher percentages of their financial assets in equity, other things being equal, than those who could not tolerate any risk at all. As would be expected, those investors who believed in a great risk of an economic depression held a significantly

Table 1. Mean Amount of Equity by Financial-Planning Horizon

Equity Invested	1 Year or Less	Next Few Years	5–10 Years	More Than 10 Years
Percent of financial assets	11.77%	18.66%	23.22	20.87%
Percent of sample	30.1	25.6	25.8	18.5

Note: Number of observations in the sample = 2,873; *F*-statistic = 24.32; *p*-value = 0.0000.

Table 2. Distribution of Respondents' Risk Tolerances by Financial-Planning Horizon

Risk Tolerance	1 Year or Less	Next Few Years	5–10 Years	More Than 10 Years	Overall
None	48.3%	38.1%	33.3%	25.2%	37.5%
Average	37.9	45.3	47.1	50.4	44.5
Above average	8.8	13.0	14.7	16.8	12.9
Substantial	5.0	3.6	4.8	7.6	5.1

Note: Number of observations in the sample = 2,871; $\chi^2 = 473.8$; *p*-value = 0.001.

Exhibit 1. Definitions of Explanatory Variables

Financial-planning horizon

1 year or less	0 if the respondent claimed that the next few months to 1 year was the most important time period in planning the household's saving and spending
Next few years	1 if the respondent claimed that the next few years was the most important time period in planning the household's saving and spending; 0 otherwise
5–10 years	1 if the respondent claimed that the next 5–10 years was the most important time period in planning the household's saving and spending; 0 otherwise
> 10 years	1 if the respondent claimed that longer than 10 years in the future was the most important time period in planning the household's saving and spending; 0 otherwise

Risk tolerance

None	0 if the respondent was not willing to take any financial risks
Average	1 if the respondent was willing to take average financial risks and expected to earn average returns; 0 otherwise
Above average	1 if the respondent was willing to take above-average financial risks and expected to earn above-average returns; 0 otherwise
Substantial	1 if the respondent was willing to take substantial financial risks and expected to earn substantial returns; 0 otherwise

Economic expectations

Depression	Values of 0–10 indicating the respondent's expectation of the U.S. economy experiencing a major depression within the next 10 years, with 0 = almost no risk and 10 = very great risk
Inflation	Values of 0–10 indicating the respondent's expectation of the U.S. economy experiencing double-digit inflation during the next 10 years, with 0 = almost no risk and 10 = very great risk

Household demographics

Net worth	Respondent's household's net worth (in thousands of dollars) at the time of the survey; calculated as the value of all real and financial assets held by the respondent (and spouse/partner) less the value of all mortgage and consumer debt outstanding
Less education	1 if the respondent's highest level of education was a high school diploma; 0 otherwise
Age of household head	Age of head of household in years
Married	1 if the respondent was married or living with a partner; 0 otherwise

lower percentage of their financial assets in equity. Expectations about double-digit inflation did not have a significant relationship with asset allocation.

Results for several relationships between socioeconomic characteristics and investor risk taking were as expected. A household's financial portfolio held a significantly lower percentage invested in equity securities when the head of household had only a high school education. Households headed by two adults, in marriage or as partners, had significantly higher percentages of equity in their portfolios than those headed by single persons. These results may seem counterintuitive to those who believe that married investors with family responsibilities hold more-conservative portfolios than single people. But many financial planners advise that single people should be more cautious than couples because they lack the security of a partner's second income (Chatzky 1998).

Interestingly, we found age to have a curvilinear relationship with percentage of equity in a financial portfolio. As an investor's age increased, so did the percentage of financial assets in equity

securities, all else being equal. This increase occurred at a decreasing rate, however, until at some age, the percentage of assets invested in equities began to decrease. These results support the thesis of the "seven stages of investment" described by Weagley and Gannon (1991): During the seven stages, investors move from safer investments to higher risk investments when incomes peak and back to safer investments for the later stages, which begin when retirement is imminent.

Conclusion

The results of this study generally support the notion that individuals make their portfolio allocations based on their time horizons and risk tolerances. About half of the investors whose time horizons were 1 year or less reported that they were not willing to take financial risk, whereas only a quarter of investors whose time horizons were more than 10 years reported that they were not willing to take any financial risk. The percentage of equity in portfolios differed significantly across financial time

Table 3. Regression Analysis of Equity as a Percent of Financial Assets

Explanatory Variable	Estimated Coefficient	F-Statistic	p-Value	Mean Value
<i>Financial-planning horizon</i>				
Next few years	3.30**	6.26	0.012	0.26
5–10 years	6.13**	17.52	0.000	0.26
> 10 years	2.56*	3.03	0.082	0.19
<i>Risk tolerance</i>				
Average	9.77**	74.90	0.000	0.44
Above average	18.46**	121.97	0.000	0.13
Substantial	13.69**	31.94	0.000	0.05
<i>Economic expectations</i>				
Depression	-0.67**	9.72	0.002	5.00
High inflation	0.28	1.63	0.202	5.63
<i>Household demographics</i>				
Net worth	0.0002	2.13	0.146	\$1,311 ^a
Less education	-7.09**	37.28	0.000	0.42
Age of household head	0.93**	20.84	0.000	51
Age squared	-0.01**	15.19	0.000	
Married	3.57**	9.87	0.002	0.71
Constant	-16.14**	9.96	0.002	

Note: Dependent variable mean value = 18.18 percent; number of observations = 2,871; overall F-statistic = 33.36* with $p = 0.0000$. The adjusted R^2 ranged from 0.133 to 0.148 for the five separate imputation regressions. An F-statistic, rather than the traditional t-statistic, was calculated from the estimated parameters and parameter variances across the five imputations. The p-value is the observed level of significance associated with each F-statistic.

^aIn thousands.

*Significant at the 10 percent level.

**Significant at the 5 percent level or lower.

horizons, with the amount of financial risk generally increasing with the length of time horizon.

The results of the multivariate analysis for examining the relationship between portfolio risk and financial-planning horizon (with risk tolerance, economic expectations, and various socioeconomic factors held constant) indicate that investors act in ways that Malkiel would applaud. Investors with planning horizons farther into the future than one year had a significantly higher percentage of equity in their portfolios than did those with time horizons of one year or less. In addition, investors who claimed to be more tolerant of risk held a higher percentage of equity than those who said they were not willing to take any financial risk.

Other findings include the following: All else being equal,

- the stronger investors' convictions about the likelihood of an economic depression, the lower the level of portfolio risk,
- investors with post-secondary educations held higher percentages of their assets in equity securities,
- couples held higher percentages of equity than singles, and

- the percentage of equity in a portfolio increased with age, then at some point (perhaps at retirement), decreased with age.

The results reveal that the individuals in the sample were managing their portfolios in line with their risk tolerances and financial-planning horizons even before the advent of life-cycle funds. However, because the sample is composed of generally wealthy individuals, who may have had professional portfolio management or advice, the results may show only that professionals follow the spirit of the life-cycle funds. The wealthy investor may not need such funds. Less wealthy investors who do not have the resources to hire professional managers and those who are not well versed in portfolio theory might find that life-cycle funds provide a valuable service.

Interestingly, life-cycle funds have been slow to catch on. Possible reasons are the newness and short performance history of the funds and participant inertia (Williamson 1996). One way to increase the demand for the funds might be to market them not only as a retirement vehicle but also as a tool to help investors achieve *any* financial goal by its target date. For example, life-cycle funds

may be ideal for managing education IRAs. Parents who open an education IRA when a child is three years old have a target date of 15 years. They could put the money into a life-cycle fund that would gradually reduce the proportion of equity as Year 15 approached.

Another factor that may be reducing the popularity of life-cycle funds is the bull market the United

States has been experiencing for the past several years. Life-cycle funds have not done as well as equity indexes because they are diversified to provide downside protection (Williamson 1997). It will be interesting to see whether the demand for life-cycle funds increases during a bear market, when the benefits of diversification become obvious.

Notes

1. Morningstar is tracking 41 life-cycle funds, whose assets have grown to almost \$7 billion over the past five years (Packel 1998). Major life-cycle funds include the Fidelity Freedom, Vanguard LifeStrategy, Scudder Pathway, and Dreyfus LifeTime funds.
2. The SCF also differs in its treatment of nonresponses. The method of multiple imputation replaces each missing value with a set of values that represents a distribution of possibilities. This method attempts to simulate the distribution of missing data and to provide a more realistic measure of the variability around the unknown data than simple methods of estimating missing values do. Models were used to impute five alternative values for each missing value. The final database consists of five complete observations for each respondent, which we combined for the analysis (Rubin 1987; Kennickell 1991). Professor George McCabe, Marcey Abate, and Jian Zhao of the Statistics Department at Purdue University developed the methodology we used to analyze the combined data.
3. The sample excluded the 22 percent of the sample overall that held assets of an "unknown" or "combination" type, which were valued at about 10 percent of total financial assets held by households in the sample. The market value of precious metals and the value of outstanding loans owed to respondents by individuals, which were held by, respectively, 3 percent and 22 percent of the respondents and were equal to 8 percent of total financial assets, were also excluded from the analysis.
4. We realize that, because the categories of risk tolerance are qualitative measures, the respondents' subjective perceptions may confound the results. Therefore, readers should use some caution when interpreting the results related to the risk tolerance variable.

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