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Asset allocation decisions in retirement accounts: an all-or-nothing proposition?

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Abstract

An examination of survey responses about Individual Retirement Account (IRA) holdings reveals that individuals often take all-or-nothing approaches in their decisions to diversify across the asset categories of cash, bonds, and equity. Two thirds of survey respondents put their entire IRA holdings into a single asset category. A surprisingly large proportion of funds is held in cash, while only a minimal amount is invested in bonds. These findings also contrast with those of Bodie and Crane's (1997) examination of TIAA-CREF participants, which is heavily weighted with individuals holding fixed income annuities. Our results suggest that there is a compelling need for risk education for investors.

JEL classification: D12; G11

Keywords: Individual investors; Retirement accounts; Asset allocation

1. Introduction

The portfolio decision-making of individual investors is an issue of increasing importance as more and more individuals take personal control of their investment and retirement accounts. Defined contribution retirement plans, as contrasted with the more traditional defined benefit retirement plans, are becoming the norm rather than the exception. For

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example, Jacobius (1999) presents survey results showing that 51% of employees with retirement plans are in defined contribution plans. 401(k) and 403(b) plans generally give employees of all levels and backgrounds discretionary control over their retirement futures by allowing them to choose how to allocate their retirement contributions among a limited number of selections in various asset categories. Participants in Individual Retirement Accounts (IRA) and Keogh plans have even more freedom in allocating their investments among a nearly unlimited number of financial asset choices.

Portfolio decisions of individual investors are also relevant to the current debate regarding proposed reform of the U.S. Social Security system. One strategy under consideration would place a portion of Social Security taxes in self-directed individual retirement accounts (see Olsen & Baylyff, 1998 and Georges, 1998a, 1998b for discussions of this proposal). This would mean that virtually all wage earners would be involved, to some degree, in asset allocation decisions. Many policy makers are concerned that the majority of U.S. citizens are ill-prepared to handle this responsibility. Poor investment decision-making by individuals in their retirement accounts could have a detrimental impact on their future income (see Kim & Wong, 1997). Suboptimal investment of these funds would result in reduced wealth for older Americans, a group that Peterson (1999) says will grow considerably over the next several years. Therefore, it is essential to develop a clear understanding of individual investor decision-making as a potential guide for financial advisors and policy makers.

In this paper, we study the asset allocation decisions of individuals in their retirement accounts and examine some of the factors affecting those decisions. Our data are drawn from the MacroMonitor survey conducted by the Stanford Research Institute (SRI). The survey provides self-reported data from a representative sample of over 3,900 American consumers. The protocol includes detailed information on respondents' portfolio positions and a broad range of demographic and psychographic information.

Specifically, we look at how individuals allocate their personal IRA and Simplified Employee Pension Plan (SEP-IRA) portfolios between cash, bonds, and equity. IRA holdings may come from contributions by the individual or from rollovers of employer-sponsored 401(k) or 403(b) retirement plans. SEP-IRAs are geared toward small business owners with no employees. Both of these plans allow individuals discretionary control over their investments.

Portfolio decisions within IRA accounts are unique in providing investors with nearly complete discretionary control over their funds with an investment time horizon that is generally known in advance. The investment time horizon is an important factor in portfolio asset allocation decisions. The investments in these plans are also unencumbered by employer-imposed choices and are made without an employer's guidance. Investors are saving for a common goal (retirement) with a definite time horizon, and there are severe penalties for taking funds out of IRAs before reaching retirement age. Prior to the Taxpayer Relief Act of 1997, funds withdrawn from IRA accounts before retirement, other than for the purchase of a first home, were subject to ordinary income tax and a 10% penalty. The number of conditions under which the 10% penalty could be avoided was increased considerably in 1997.

The remainder of the paper is organized as follows: first we discuss considerations associated with the asset allocation decisions of individual investors. Next, we describe the

Stanford Research Institute survey from which our data are drawn. In the third section we discuss our empirical results, and in the final section we present our conclusions.

2. Asset allocation decisions of individual investors

There are several key factors that generally influence investor asset allocation decisions. A primary decision-making factor is the expected investment time horizon which, in the case of IRAs, is the expected length of time until retirement and the initial withdrawal of funds. While individuals may begin withdrawing funds at retirement, they will likely plan on receiving income from their accounts over the remainder of their lives. The proxy for the beginning of retirement is typically the individual's age. The younger the individual is, the longer the expected time until retirement.

There are numerous articles addressing the issue of how investor asset allocation decisions are affected by changes in investment horizon timelines. Early work by Samuelson (1969) argues that portfolio allocation is independent of the time horizon. Later works by Samuelson (1989, 1990, 1994) and Kritzman (1994) use the assumption of constant relative risk aversion to support the initial argument that investors should prefer the same mix of assets regardless of the time horizon. Olsen and Khaki (1998) and Bierman (1998) argue that utility theory can support either increasing or decreasing equity allocations with changes in the investment horizon.

Butler and Domian (1991), Thaler and Williamson (1994), Thorley (1995), and Bierman (1997) analyze historical data on returns of asset classes and find that as the investment horizon lengthens, investors should allocate higher levels of equity to their portfolios. These findings are consistent with practitioner advice (such as that offered by Bogle, 1994) and the oft-cited rule of allocating 100 minus the individual's age to equity. Thus, a 30-year-old individual would have a 70% equity investment, and a 65-year-old individual would have only 35% equity. Bodie and Crane (1997) examine a survey of TIAA-CREF participants and find actual investment behavior consistent with this advice. Levy and Gunthorpe (1993) and Hodges, Taylor, and Yoder (1997), on the other hand, use multiperiod models employing mean-variance analysis and Sharpe's (1994) ratios, respectively, and conclude that investors should allocate less to equity as the investment horizon lengthens.

Bodie, Merton, and Samuelson (1992) add an individual's labor supply to the analysis and end up supporting the practitioner view. Young individuals, with most of their working careers in front of them, should be more willing to take on risky investments and, thus, should allocate higher levels to equity. An individual's labor supply is relatively safe and the younger he/she is the larger the future working capacity. If risky equity investments take an unfavorable turn, younger individuals have sufficient working time to make up the deficit, while older individuals nearing retirement have a much lower labor supply with which to recoup losses. To compensate for this, older individuals should allocate less to risky equity. Overall wealth should influence this age-related risk sensitivity as well.

Economic theory suggests that higher wealth levels are generally consistent with higher percentage equity investments in retirement accounts. For example, the assumption of decreasing relative risk aversion implies that individuals are less sensitive to proportional

changes in wealth as the level of wealth increases. In other words, someone with a high level of wealth is better able to absorb proportional losses associated with higher risk investments and still be in a position to provide for an acceptable level of retirement income. The impact of wealth on retirement savings is constrained at very low levels of wealth since individuals typically first need to obtain sufficient levels of cash to meet the demands of everyday transactions and to prepare for unforeseen emergencies before turning to retirement investing. Practitioners advise that individuals should set aside three to six months of living expenses in safe, nonretirement accounts before putting nonretirement funds in bonds and equity. Thus, individuals with low net worth might be holding 100% of their assets in cash in nonretirement accounts just to meet contingencies.

Perhaps the most pervasive advice offered by investment professionals (see, e.g., Bogle, 1994) is that individuals diversify their portfolios both across and within asset categories regardless of other individual investor characteristics. Although holding a small proportion of cash might be wise in certain situations, retirement accounts should be predominantly invested in equity and long-term bonds. Investment advisors have also suggested concentrating long-term equity in nonretirement accounts and taxable bonds in tax deferred retirement accounts to maximize tax efficiency. The argument is that long-term capital gains on equity are taxed at a lower rate than interest payments on bonds, so a greater tax advantage is gained by holding equity in nonretirement accounts. Even without the differential tax rates, financial advisors have suggested that individuals can simply hold on to their stocks and avoid paying the taxes on the unrealized gains. This advice ignores the fact that the average equity mutual fund turns over its entire portfolio in about a year and is not managed with tax efficiency in mind. The tax inefficiency of mutual funds coupled with the consistent double-digit returns of equity in the 1990s might be a reasonable argument in favor of holding more equity in tax-deferred accounts. Bodie and Crane (1997) did not find evidence that people were concentrating equity in nonretirement accounts.

Other factors that may affect portfolio decision-making include the marital status and education level of the individual and whether or not a home is owned. If one's home is considered to be a relatively safe asset, then home ownership may allow individuals to diversify their portfolios into more risky equity investments. A couple with two incomes may feel more secure than an individual relying on a single salary, and, thus, might be willing to take on more risk in their investment portfolio. A more educated individual may have a better understanding of the stock market and be more receptive to investments in equity. Bodie and Crane (1997) found home ownership and college education (when omitting job category variables), but not marital status, to be significant factors affecting equity allocation.

Demographic variables may also help explain the investment decisions of groups, but they are imperfect predictors of individual investment behavior. Individuals may have different attitudes toward risk that overshadow other characteristics when it comes to portfolio decisions. While different economists may have opposing views regarding general risk tolerance, all agree that no two individuals are alike. The SRI survey provides responses that give some useful insight into the risk tolerance of the individuals.

3. Description

The MacroMonitor is SRI Consulting's Consumer Financial Decisions database and marketing program. In the present analysis, we use data from the 1996–97 survey, which includes interviews with 3,931 financial decision-makers drawn from a nationally representative sample of American households. The survey sample is constructed using a random-digit-dialing sampling frame based on both listed and unlisted numbers. Prospective households are first contacted by telephone to solicit cooperation for a mail survey concerning financial decision-making. Only individuals who agree to participate are sent a questionnaire along with a small incentive and a return stamped envelope. Postcard and telephone follow-ups are used to encourage participation. This approach results in a 40% response rate among households who originally agreed to participate. A stratified sample is used that over-represents high-income households. Of the households originally contacted, over 1,700 have annual incomes that exceed $75,000 or total assets over $300,000 (excluding primary residence).

The MacroMonitor questionnaire is an 85-page protocol that represents a broad array of attitudinal, behavioral, and motivational information. Demographic variables include age, income, education, gender, race, marital status, family structure, occupation, employment status, and business ownership. A consumer's reported current financial status reflects the incidence and dollar amount of holdings in financial products and a behavioral inventory assesses household use of comprehensive array of financial services.

The sample used in this paper includes 942 families with IRAs or SEP-IRAs and with no missing IRA/SEP-IRA financial data. These are the only retirement categories for which detailed financial information was collected. IRAs and SEPs are voluntary plans that are more likely to attract individuals in upper income categories with sufficient funds to set aside for their retirements. Not surprisingly, our sample is more educated and affluent than the population as a whole. The majority of the household heads have completed college (71%), and most are married (81%). The average annual income of the group was $102,000 and most own their own homes (92%). Average net worth, including the value of homes, is $725,000. The average age of the heads of households in our sample is 51.

Our use of IRA data to gain insights into the asset allocation decisions of individual investors in retirement accounts has some limitations. While we have complete retirement data on IRAs, individuals may have other retirement accounts that enter into their asset allocation strategies. For example, individuals may hold equity in their IRA accounts and bonds in their 401(k) accounts; and we can only observe the former. Despite this fact, for the reasons previously stated, observation of activity within IRA accounts does provide much useful information.

Table 1 shows a breakdown of the sample size by age of the head of household and family net worth, including home value. For presentation purposes, we have broken both age and net worth into four categories, giving us a total of 16 different groups. As expected, there is a direct relationship between age and net worth such that the youngest people are predominantly in the lowest net worth quartile, while the oldest people are primarily in the upper net worth quartiles.

Table 1
Sample size by age and net worth

Net worth quartile	Age				
	<45	45–54	55–64	65+	Total
Lowest	144	58	19	14	235
Second	84	80	43	29	236
Third	49	100	42	44	235
Highest	27	66	73	70	236
Total	304	304	177	157	942

4. Empirical results

4.1. Descriptive statistics

In Table 2 we show the retirement portfolio allocation decisions between cash, bonds, and equity as a function of the age of the head of household and net worth. Cash includes savings accounts, savings certificates, money market accounts, and money market mutual funds. The bond category includes bonds of all types and bond mutual funds, as well as any annuities. Equity includes holdings of both stocks and stock mutual funds. The portfolio allocation percentages are simply the dollar amount in each category divided by the total assets in the retirement account. The table shows that investment decisions are clearly related to both age and net worth. Higher age groups invest less in equity, and higher net worth groups invest more.

Table 2
Asset allocation by age and net worth

Net worth quartile	Asset	Age			
		<45	45–54	55–64	65+
Lowest	Cash	37.1%	46.4%	70.9%	78.6%
	Bonds	9.7%	11.0%	4.2%	21.4%
	Equity	53.1%	42.6%	24.9%	0.0%
Second	Cash	31.3%	32.6%	46.1%	71.3%
	Bonds	6.1%	10.6%	12.8%	13.0%
	Equity	62.6%	56.9%	41.1%	15.7%
Third	Cash	18.9%	23.9%	29.1%	55.1%
	Bonds	12.5%	14.0%	17.3%	13.8%
	Equity	68.6%	62.1%	53.6%	31.1%
Highest	Cash	25.3%	18.0%	19.5%	34.4%
	Bonds	3.5%	12.5%	16.8%	13.9%
	Equity	71.2%	69.5%	63.7%	51.7%

The table presents the average decision of respondents regarding the percent of total retirement dollars invested in each asset category based on the family net worth and the age of the head of household. For example, the percentage cash is total cash in the retirement account divided by the total assets in the retirement account. For each age/net worth category, the sum of Cash, Bonds, and Equity equals 100%. (There may be small differences due to rounding.)

Table 3
Equity allocation decisions by age

Age	%Equity					
	0	>0–<25	25–<50	50–<75	75–<100	100
<45	30.3%	3.0%	5.3%	6.9%	10.2%	44.4%
45–54	29.6%	1.6%	7.9%	10.2%	9.9%	40.8%
55–64	30.5%	6.8%	6.8%	15.3%	11.9%	28.8%
65+	55.4%	1.9%	5.7%	8.3%	10.8%	17.8%

The table presents the percentage of respondents in each age category choosing a particular equity allocation. For example, 30.3% of those under 45 years of age put no money at all in equity, while 44.4% put all of their funds in equity. Each of the rows sums to 100%, with minor exceptions for rounding.

A surprising observation is the predominance of cash in the retirement portfolios. Across all 16 age by net worth groups, the average allocation to cash is 34.4%, with bond and equity holdings at 11.9% and 53.7%, respectively. Of particular note is the finding that cash is weighted much more heavily than bonds. In fact, 76.3% of the total sample holds no bonds whatsoever in their retirement accounts. Based on expectations derived from finance theory, bonds are underrepresented in the portfolios and cash is over-represented. As previously noted, the classic recommendation for long-term retirement accounts is to place assets primarily in long-term bonds and equity. Cash should be held in nonretirement accounts.

While we expect a distribution about a perceived optimal percentage allocation to equity (or bonds or cash) with gradual declines in allocation to either side of the ideal, Tables 3 and 4 reveal that the distributions are somewhat bimodal in nature. For example, for respondents under age 45, the average equity allocation is 59.8%, so we might expect that most individuals would have between 50 and 75% of their portfolios allocated to equity. Table 3, however, reveals that only 6.9% of respondents made this decision. Instead, over 70% of investors in this age group held either 100% equity (44.4% of the sample) or no equity (30.3% of the sample). A similar bimodal pattern is observed for all age groups with the sharpest decline by age shown for the 100% equity allocation category. Similar bimodal patterns are seen in Table 4, which shows equity allocations as a function of net worth. For

Table 4
Equity allocation decisions by net worth

Net worth quartile	%Equity					
	0	>0–<25	25–<50	50–<75	75–<100	100
Lowest	45.5%	3.4%	6.0%	6.0%	3.4%	35.7%
Second	40.7%	0.8%	6.8%	6.8%	5.1%	39.8%
Third	29.4%	3.4%	6.8%	12.3%	16.6%	31.5%
Highest	21.6%	4.7%	6.4%	14.0%	16.9%	36.4%

The table presents the percentage of respondents in each net worth category choosing a particular equity allocation. for example, 45.5% of those in the lowest net worth category put no money at all in equity, while only 6.0% of those in that category put between 50 and 75% of their funds in equity. Each of the rows sums to 100%, with minor exceptions for rounding.

Table 5
Equity allocation decisions based on home ownership, completion of college, and marital status

	%Equity					
	0	>0–<25	25–<50	50–<75	75–<100	100
Own home						
No	40.8%	2.8%	4.2%	8.5%	4.2%	39.4%
Yes	33.5%	3.1%	6.6%	10.0%	11.1%	35.7%
College degree						
No	50.2%	1.8%	6.2%	6.2%	4.8%	30.8%
Yes	27.8%	3.6%	6.6%	11.1%	12.9%	37.9%
Married						
No	38.9%	3.4%	4.6%	6.3%	13.1%	33.7%
Yes	33.2%	3.0%	6.9%	10.6%	10.0%	36.3%

The table presents the percentage of respondents choosing a particular equity allocation based on home ownership, completion of a college degree by the head of the household, and marital status. For example, 50.2% of respondents where the head of household did not complete college put no money at all in equity while only 27.8% of those who completed college did the same. Each of the rows sums to 100%, with minor exceptions for rounding.

the highest net worth quartile, the average equity investment is 62.6%. Table 4 shows that 21.6% of the highest net worth group put no money in equities while 36.4% put all of their money into them. All-or-nothing investments in equity appear to be the norm rather than the exception.

Table 5 looks at the distribution of equity allocation decisions based on whether or not respondents own a home, completed college, or are married. The bimodal nature of the data are again revealed. While marital status does not appear to be an important factor, lack of home ownership is reflected with a more pronounced bimodal distribution. Over 80% of those without a home were invested all or nothing in equity compared to 69% of homeowners. The most revealing observation is that fully 50.2% of those without a college degree chose to put no money at all into equity while only 27.8% of those with college degrees made the same decision. Households led by individuals without college degrees appear far more likely than their more educated counterparts to avoid equity investments altogether.

Tables 6 and 7 consider the lack of diversification across asset categories. Table 6 shows that for those 65 and older, the average allocations to cash, bonds, and equity were 50.9%, 14.4%, and 34.7%, respectively. However, more careful examination reveals that 42.7% of this group was invested in all cash, 6.4% was invested in all bonds, and 17.8% was invested in all equity. Thus, for those 65 and over, 66.9% of the retirement accounts are invested in a single asset category. For the entire sample, 67.3% of the accounts were not diversified across asset categories. For the lowest income quartile, shown in Table 7, 37.4% chose all cash, 6.4% chose all bonds, and 37.4% chose all equity in their retirement investments. Fully 79.6% of those in the lowest net worth quartile did not diversify across asset categories. In as much as IRA accounts are representative of total retirement holdings, these findings strongly suggest that most individual investors are not diversifying their retirement portfolios at all. When individuals do diversify, they tend to hold too much cash and to underinvest in bonds.

Table 6
Asset allocation decisions and failure to diversify across asset categories by age

Asset allocation				Investment decision						
Age	Cash%	Bonds%	Equity%	No cash	All cash	No bonds	All bonds	No equity	All equity	All one category
<45	31.5%	8.6%	59.8%	56.9%	25.0%	83.6%	4.9%	30.3%	44.4%	74.3%
45–54	29.2%	12.2%	58.6%	53.6%	21.1%	76.0%	5.3%	29.6%	40.8%	67.1%
55–64	33.8%	14.6%	51.6%	45.2%	24.3%	67.2%	2.8%	30.5%	28.8%	55.9%
65+	50.9%	14.4%	34.7%	28.0%	42.7%	73.2%	6.4%	55.4%	17.8%	66.9%
Full sample	34.4%	11.9%	53.7%	48.8%	26.5%	76.3%	4.9%	34.3%	35.9%	67.3%

The cash%, bonds%, equity% columns present the average decision of respondents regarding the percent of total retirement dollars invested in each of the asset categories based on the age of the head of household. For example, the percentage cash is total cash in the retirement account divided by the total assets in the retirement account. the sum of Cash, bonds, and equity is 100%, with small differences possible due to rounding.

The various investment decisions show the percentage of each age category making the particular decision. For example, 56.9% of those with heads of households under 45 chose to hold no cash, while 25% chose to hold all cash in their retirement accounts. A full 74.3% of those under 45 chose either all cash, or all equity.

In addition to the demographic factors of age, net worth, education level, marital status, and home ownership, our analysis examines data relevant to the risk tolerance of individual investors. Different individuals who are the same age with identical financial situations and educational backgrounds might have completely different tolerance for risk. While finance theory might suggest that younger individuals should invest more heavily in equity, a young individual with very limited risk tolerance might be reluctant to do so. The SRI survey protocol includes several measures designed to gauge the investor's attitudes toward risk and investing. We focus on two items that provide self-reported measures of the risk tolerance of individuals.

Table 7
Asset allocation decisions and failure to diversify across asset categories by net worth

Asset allocation				Investment decision						
Net worth quartile	Cash%	Bonds%	Equity%	No cash	All cash	No bonds	All bonds	No equity	All equity	All one category
Lowest	44.6%	10.3%	45.1%	47.7%	37.4%	83.4%	6.4%	45.5%	35.7%	79.6%
Second	39.3%	9.7%	51.0%	49.2%	33.5%	83.1%	3.4%	40.7%	39.8%	76.7%
Third	29.6%	14.3%	56.1%	46.8%	19.6%	71.5%	6.4%	29.4%	31.5%	57.4%
Highest	24.2%	13.2%	62.6%	51.7%	15.7%	67.4%	3.4%	21.6%	36.4%	55.5%

The cash%, bonds%, and equity% columns present the average dicision of respondents regarding the percent of total retirement dollars invested in each of the asset categories based on the family net worth. For example, the percentage cash is total cash in the retirement account divided by the total assets in the retirement account. The sum of cash, bonds, and equity is 100%, with small differences possible due to rounding.

The various investment decisions show the percentage of each net worth category making the particular decision. For example, 47.7% of those in the lowest net worth category chose to hold no cash, while 37.4% chose to hold all cash in their retirement accounts. A full 79.6% of those with the lowest net worths chose either all cash, all bonds, or all equity.

Table 8
Survey questions assessing attitudes toward risk by age
"It is wise to put some portion of savings in uninsured investments to get a high return."

Age	Age mostly	Agree somewhat	Disagree somewhat	Disagree mostly
<45	26.6%	43.2%	22.9%	7.3%
45–54	29.1%	38.1%	21.1%	11.7%
55–64	29.7%	38.3%	19.4%	12.6%
65+	17.2%	30.5%	26.5%	25.8%
Full sample	26.5%	38.6%	22.2%	12.7%

''I am willing to take substantial risks to realize substantial financial gains from investments.''

Age	Age mostly	Agree somewhat	Disagree somewhat	Disagree mostly
<45	15.8%	36.8%	32.6%	14.8%
45–54	11.3%	36.7%	31.7%	20.3%
55–64	12.6%	30.9%	25.1%	31.4%
65+	2.6%	21.2%	31.8%	44.4%
Full sample	11.6%	33.1%	30.8%	24.5%

The table presents the percentage of respondents responding in a particular fashion to the above statements based on the age of the heads of households. For example, 26.6% of respondents with heads of household under 45 mostly agreed with the first statement about high yields. Each of the rows sums to 100%, with minor exceptions for rounding.

The first questionnaire item we analyze relates to the importance of earning high yields. Survey participants were asked whether they *agree mostly*, *agree somewhat*, *disagree somewhat*, or *disagree mostly* with the statement *"It is wise to put some portion of savings in uninsured investments to get a high yield."* Table 8 shows the breakdown of responses by age. Nearly 35% of the sample disagreed (somewhat or mostly) with this statement, which may help to explain why so many investors hold 100% of their retirement assets in cash.

A second item deals with the respondent's willingness to incur high risk in order to reap a large potential benefit. Respondents were asked whether they *agree mostly*, *agree somewhat*, *disagree somewhat*, or *disagree mostly* with the statement *"I am willing to take substantial risks to realize substantial financial gains from investments."* The two items are not fully independent, as agreement with this statement means the respondent probably agreed with the first statement, but the relationship does not hold in the opposite direction. While older respondents might generally be more risk averse, there are certainly young investors who are risk-averse and older individuals who are willing to accept more risk. As shown in Table 8, about 55% of the sample population somewhat or mostly disagreed regarding their willingness to take substantial risks to obtain substantial returns. Not surprisingly, for individuals 65 or older, this percentage increases to 75%. Although analysis of such measures of risk aversion may prove of interest, the investment behavior of individuals is not always consistent with their stated risk tolerance (as demonstrated in the work of Jianakoplos & Bernasek, 1998).

Table 9
Regression of equity allocation decision

Independent variables	Coefficient	t-statistic
Intercept	2.8668	2.74**
AGE	−0.1007	−6.52**
NET WORTH	0.0003	2.29*
OWN HOME	1.0210	1.35
COLLEGE	1.7269	4.14**
MARRIED	0.2882	0.57

$F = 14.0410$, p-value $\leq .01$.
* Significant at the 5 percent level.
** Significant at the 1 percent level.

4.2. Regression analysis

The final part of our analysis is designed to examine the relative contributions of several demographic factors on individual investor retirement account asset allocations. Least-squares multiple regression is employed to explain some of the dispersion in equity allocation decisions. We use the logistic transformation of the percentage invested in equity (equity/total assets) as the dependent variable EQUITY%. Since the percentage invested in equity is constrained to a minimum of 0% and a maximum of 100%, the logistic transformation provides the most suitable fit for our data. The logistic transformation is the natural log of the percentage equity divided by one minus the percentage equity. Substitutions of 0.001 for 0% equity and 0.999 for 100% equity were made. The regression equation takes the following form:

$$\text{EQUITY\%}_i = \beta_1 + \beta_2\,\text{AGE}_i + \beta_3\,\text{NET WORTH}_i + \beta_4\,\text{OWN HOME}_i + \beta_5\,\text{COLLEGE}_i + \beta_6\,\text{MARRIED}_i \quad (1)$$

AGE is the age of the survey respondent and NET WORTH is the family unit net worth in thousands of dollars. OWN HOME, COLLEGE, and MARRIED are all dummy variables that are one if the statement is true and zero otherwise.

The results of the regression equation are shown in Table 9 . AGE, NET WORTH, and COLLEGE are all significant at the 0.05 level. The coefficient on AGE has the expected negative sign showing that the percentage of assets invested in equity decreases as the investor ages. The positive coefficient on NET WORTH shows that the equity allocation in retirement accounts increases with higher net worth levels. Completion of college is also consistent with a higher allocation to equity.

5. Conclusions

We have examined the asset allocation decisions that a large sample of individuals made in their retirement accounts. Our sample group is wealthier and more educated than the population as a whole, so they should be expected to make investment decisions that are

generally better informed than the typical investor. Despite this, we find that the sample studied tended overall to hold less diversified retirement portfolios than would be expected, to underinvest in bonds, and to hold high levels of cash in their portfolios. The results shed light on the role of several demographic and psychological characteristics on asset allocation patterns. Our findings also provide clues about the likely behavior of investors as they gain control over retirement funds through either employer-sponsored, self-directed retirement accounts or changes in the current Social Security system. As a cautionary note, we once again point out that our sample data only includes IRA accounts, and individuals may be diversifying across other retirement accounts that we cannot observe.

A particularly striking result of our analysis is the finding that a majority of investors made all-or-nothing asset allocation decisions. Over two-thirds of investors put their IRA funds entirely in cash, bonds, or equity. Diversification across asset categories was the exception, rather than the rule, for all age and net worth groupings. In addition, cash held a much higher position in the accounts than advocated by investment professionals. Over 34% of retirement funds were held in cash with 26% of respondents investing their entire accounts in cash. Investors with high cash levels may be very cautious or may hold IRA accounts at banks where noncash investment opportunities are not as salient to customers. Bonds were not widely held by individuals, with three fourths of the sample holding no bonds at all. The dispersion of equity investments was somewhat bimodal in nature. No equity was held in 34% of accounts, while 36% of accounts were all equity.

The level of bond ownership and diversification patterns in our sample differ considerably from those observed by Bodie and Crane (1997) in their analysis of asset allocation decisions by TIAA-CREF participants. However, it is important to note that Bodie and Crane report only average allocations in retirement accounts and, thus, it is not possible to determine whether or not their sample exhibits bimodal tendencies. Bodie and Crane found average bond percentage allocations of over 40% taken across all net worth levels. This is in sharp contrast with the present findings based on an unrestricted asset allocation situation (IRA and SEP-IRA accounts). As noted by Bodie and Crane (1997), their results may be unique to TIAA-CREF accounts. Much of this discrepancy relates to the fact that TIAA, the fixed income annuity that is the oldest TIAA-CREF option, controls a significant percentage of participant money and is included in Bodie and Crane's bond category. Once an investment is made in the annuities, investors who want to change their selection can only do so over a ten-year period. Furthermore, some institutions even require that participants annuitize at retirement. For the general population with an IRA at a mutual fund family, such as Fidelity or Vanguard, investors choose between an array of mutual fund options and can generally move their money at will. The findings of the SRI survey suggest that the holdings of TIAA-CREF participants may not be indicative of the population as a whole.

Some key demographic factors impact asset allocation decisions. We find that older individuals hold a smaller proportion of assets in equity. A college education is consistent with higher investments in equity. Of those in our sample without college degrees, half had their entire retirement accounts invested completely in cash. Higher levels of net worth are also related to higher equity allocations. Marriage and home ownership do not affect asset allocation decisions. All of these demographic findings except for the lack of significance of home ownership are comparable to Bodie and Crane's (1997) findings.

The wisdom of diversifying across asset categories is widely touted by investment professionals. Based on behavior in retirement accounts, individuals have taken little notice. The present findings suggest that more effective educational efforts in the area of asset allocation and diversification in general and specifically in connection with retirement planning need to be directed at individual investors. While not directly related to asset allocation, Murray (1999) shows that employer educational programs increased enrollment and the level of contributions in 401(k) plans. Educational efforts aimed at allocation decisions could have a similar result. Unknowledgeable investors focused on the short-term volatility of the stock market may miss the long-run potential that equity can provide. On the other hand, portfolios comprised completely of equity might expose investors to unnecessary risk. Putting retirement funds in cash may seem to be a safe alternative to stocks, but this strategy ignores purchasing power risk, which can be quite significant in the long run. If safety is a primary concern, bonds may be a better alternative than cash. To make informed investment decisions in their retirement accounts, investors need to fully understand the different features of the asset classes; and it seems clear that they do not.

The investment behavior of individuals also has ramifications for financial services firms. Financial services professionals may need to examine more carefully why consumers appear averse to investing in bonds and to seek ways of overcoming this aversion. Although beyond the scope of the current paper, there are several financial services marketing issues that are relevant as well. For example, it may turn out that financial services professionals need to develop new investment products that will be easier for consumers to understand and that more clearly connect with consumers' investment goals. Bodie and Crane (1999), for example, propose and discuss the benefits of a new retirement product. The industry might need to place stronger emphasis on "pre-packaged" retirement investments (e.g., balanced mutual funds) that provide "appropriate" levels of diversification suited to the investment goals and risk tolerance of different groups of consumers.

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