Investor Portfolio Allocation

Robert O. Weagley[1] and Colleen F. Gannon[2]

Wealth and stage in the life cycle affect investors' willingness to assume investment risk. This proposition was tested in an examination of investor asset allocations among the asset categories of savings, housing, financial securities, and retirement investments. It was found that, on average, the diversification of household asset portfolios toward riskier investment categories increases as wealth increases. Whether this result follows from a decreasing relative risk aversion utility function or a combination of transaction costs and consumer lack of knowledge about alternative investments is unknown. In addition, as households age, they take on an increasing amount of investment risk until imminent retirement reduces the risk of portfolios.
KEY WORDS: *assets, investment management, risk aversion*

Research examining the portfolio management of the individual investor with respect to risk is limited. Most research was conducted in the early 1970's before the deregulation of the financial industry and work was limited to narrowly defined samples of clients of brokerage firms. While risk is easy to define within the context of a brokerage account, most households' assets are held in a wider variety of investment vehicles than those products available from brokers ten or more years ago. As an attempt to re-examine this topic in the financial environment of the 1980's, this exploratory study of the investment management practices of households is conducted in the context of a broader definition of investments than common stocks. In addition, two prescriptive investment management techniques, the pyramid of risk and the life-cycle approach, establish the model to address the following research questions: 1) Do households with greater wealth hold a greater proportion of their total portfolio of assets in riskier assets? 2) Do households vary the proportion of total assets allocated to various risky assets as they move through the life-cycle?

Review of Literature

[1]*Robert O. Weagley is Associate Professor of Family Economics, University of Missouri-Columbia, 65211.*

[2]*Colleen F. Gannon is currently employed with Metropolitan Life.*

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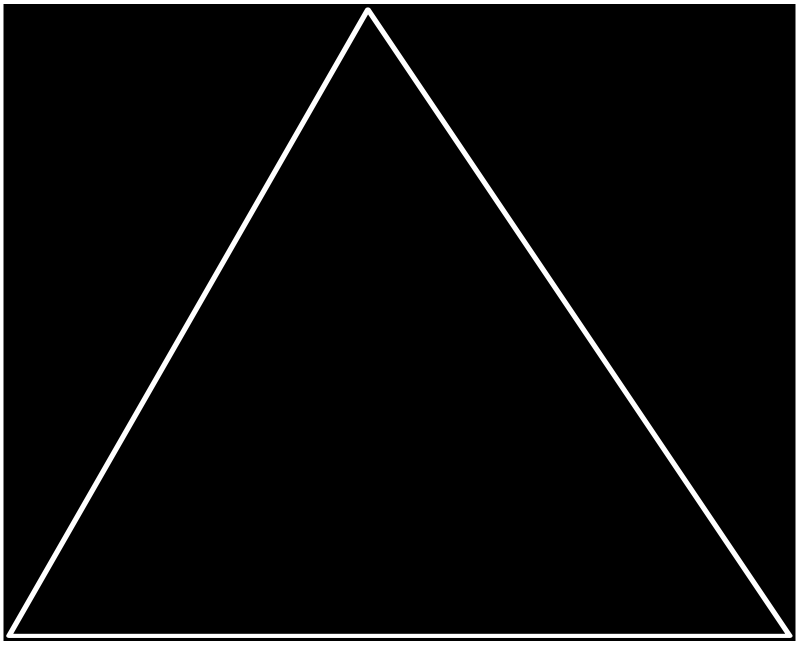
The treatment of asset allocation by textbooks tends to identify the goals of the individual and to describe the environment in which the investment process takes place. The investment opportunities within that environment are seen as a part of a broad scale approach to investment analysis (Smith, 1974). In addition, theoretical and empirical research is scant with much of it being an application of return-risk portfolio theory applied to narrowly defined portfolios of common stocks (Hirshleifer, 1958, 1966; Levy, 1976; Fishburn, 1976) or studies of wealth accumulation across income and age categories. Most authors agree that investors with greater wealth are willing to accept a lower risk premium on riskier investments than those with less wealth.

A more complete portfolio analysis was conducted by Friend and Blume (1975). They studied the demand for risky assets from the context of the capital asset pricing model to assess the nature of households' utility functions. Using the 1962 and 1963 Federal Reserve Board surveys of the Financial Characteristic of Consumers and Changes in Family Finance, they compared the average ratios of asset types to household net worth by net worth category. They concluded that 1) investors do require a substantially larger premium to hold risky assets and 2) the assumption of constant proportional risk aversion as wealth increases is fairly accurate.

Prescriptive Portfolio Management Theories

In working with clients, many financial professionals utilize models developed to illustrate the relationship between risk and return. One of these is the pyramid of risk. (See Figure 1.) Conservative investments represent the base of the pyramid, and at each successive pyramid level, the degree of risk (as measured by risk of principal loss and lack of liquidity) increases which brings about higher expected returns. The management premise of the pyramid model is that the investor should not progress to successive levels of the pyramid until he/she has built a solid foundation of safer financial assets at

Figure 1.
The Pyramid of Risk



preceding levels. This is consistent with most assumptions regarding the utility of wealth where relative risk aversion decreases as levels of wealth increase (Henderson and Quandt, 1980). In sum, the investor is instructed to diversify his assets across a level of the pyramid before he diversifies his assets between levels. Given this, we would expect riskier assets to make up a larger proportion of investors' portfolios the greater the wealth of the investors, because transaction costs as a percentage of investment, and market characteristics, such as greater exposure to opportunities to invest in alternate investments, would create a situation which would allow greater diversification.

Deaton and Muellbauer (1980) have proposed that the use of a negative exponential utility function would "yield a tractable expression for expected utility" when analyzing demand functions for risky assets. If such a concave utility function is assumed it is apparent that it displays constant absolute risk aversion and, hence, increasing relative risk aversion over wealth. However, such an assumption would lead one to believe that wealthier investors would have lower proportions of wealth in risky assets than would less wealthy investors. Utility functions with constant relative risk aversion, such as the square root and the natural logarithm utility function, would imply that all investors would have the same proportion of risky investments. Since this is not an intuitively pleasing result, perhaps a key to understanding investor portfolio behavior lies not in the assumed utility function but, rather, in the recognition of transaction costs and the investment in the human capital of the investor. The costs of brokerage commissions, mutual fund loads, and minimum deposits may, in fact, restrict access to markets by moderate and low wealth and/or income consumers. In addition, there is a fixed cost to the investment in human capital required to become educated about other investments. For investors with low wealth, this cost of education would drastically lower the real return on stocks, bonds, and other investments located at the higher levels of the investment pyramid.

The pyramid of risk represents only one view of how portfolios of assets should be built according to risk and return criteria. Another prescribed method of asset allocation is to manage investment risk according to the investor's life cycle. The concept espouses asset allocation in which investors are encouraged to move between conservative and risky investments while seeking the balance that is best suited to their stage of the life cycle.

Figure 2.
The Seven Stages of Portfolio Investment

{Figure not available in file form}

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An example of the life cycle approach is the seven stages of investment shown in Figure 2 (Siverd, 1986). During these seven stages, the investment priorities of investors shift between safe, low return investments (stages one to three) to higher risk, higher expected return investments (stages four and five), when earned income peaks, before moving to safer, income oriented investments for the final life stages.

In sum, Siverd's prescription for asset management recommends that households make their risk allocation decisions in keeping with their stage in the life-cycle rather than by the amount of wealth they hold. As such, we would expect households to increase the proportion of their portfolio that is held in risky assets as they age, but at a decreasing rate that eventually declines when retirement becomes imminent.

As implied by the pyramid model of asset allocation one would expect to find households to be allocating more of their wealth to the upper, riskier levels of the pyramid the greater their total amount of assets. However, life cycle considerations may also affect such decisions as households' preference for risk in their portfolio will depend on past investments, current earnings, and expected retirement. Risk in their portfolio should increase as they age until they reach an age where they recognize their time to earn income is limited, retirement is imminent, and the risk in their portfolio should be reduced to preserve principal for the retirement years. Given these competing models, it is clear that both wealth and life cycle factors need to be controlled for when studying investment management behavior.

Empirical Model

A study of portfolio allocation imposes a constraint on the equations to be estimated that the sum of all proportional allocations sum to one. Given that all observations on the dependent variables of interest can not be less than zero, nor greater than one, the sample is truncated at both values. Given this, the multinomial logit model appears to offer an attractive compromise for estimating the system of equations (Tyrell and Mount, 1982)[1]

Table 1
Investment Categories

Savings	Financial Securities
Savings Accounts	Corporate Bond Mutual Fund
Money Market Deposit Account	Common Stock Mutual Fund
Certificates of Deposit	Municipal Bond Mutual Fund
U.S. Treasury Notes	Corporate Bonds
U.S. Treasury Bills	Municipal Bonds
U. S. Savings Bonds	Corporate Common Stock
Housing	**Retirement Investments**
	Individual Retirement Account(s)
	Keogh Account
	Other Private Pension Funds

Four categories of investments were used in the analysis: Savings, Housing, Financial Securities, and Retirement Investments. The four categories used in the analysis are displayed in Table 1[2]. Listed with each category in Table 1 are the particular assets which were given as components to the category in the research questionnaire. Respondents were first asked (Yes/No) if they had money invested in each of the components; then, if Yes, how much they had invested in each broad investment category. The latter information was gained through their checking a range of amount for every category except housing and the midpoint of the range was used in the creation of the dependent variables. In the case of housing, the homeowners were asked the current market value of their home. The sum of the four broad categories defined total assets, while the amount reported for each category divided by the total assets, so defined, resulted in the share of the portfolio held in that asset category. The percentile distribution for the proportion of total assets held in each category is in Table 2.

Table 2 reports that of the 249 households in the sample, 82% had at least one investment in the Savings category, 86% owned a home, 33% had Financial Securities, and 38% had one or more Retirement Investments. The sample is broken down into deciles to observe the magnitude of the proportion of total assets held in each category. It is clear that many households have the majority of their assets in housing. At the median level for savings, 5% of total assets is invested in savings. At the median level for housing, 74% of total assets is invested in housing. At the median level for financial securities, and also for retirement assets, approximately zero level for financial securities, and also for retirement assets, approximately zero percent of total assets is invested in financial securities.

While the components to the categories may overlap or have considerable differences with respect to risk, the groupings were done with justification. First, while it is true that some of the elements of the Retirement Investments category could be invested in the components of the Savings or Financial Securities categories, it was decided to separate them due to the tax deferred advantage which they share. Secondly, while there is considerable differences with respect to the risk present in the elements of the Financial Securities category, they are all expected to have greater year-to-year fluctuations than the other three categories. Moreover, from a practical standpoint, it was assumed that households tend to group their holdings in their mental as well as their written records in groups similar to these. Therefore, the groupings would facilitate recall and allow the respondents to report the range of their holdings without tediously reporting the value of each individual investment type.

Table 3 was prepared to allow a visual examination of the relationship between age and the holding of assets in each asset category. It is evident that the relationship between age and assets held is not linear. Younger households are more likely to have savings vehicles. As the age cohort of the sample increases, the proportion of the households holding savings decreases to a low of 73.53% of those aged 50 to 60. After this, the proportion of households, defined by age decade, who have savings increases with age. Conversely, housing is owned by only 71% of respondents in the 20 to 30 year age category. The percentage of homeowner increases with age until a peak at ages 50 to 60 year age category after which it declines. Similarly, financial securities and retirement investments ownership tends to increase with age until age 60 to 70 and 50 to 60 years, respectively, before the percentage of households, by age, who hold these securities begins to decline.

Table 2
Percentiles for Proportion of Total Assets Held in Each Asset Category

Asset Category:	Savings	Housing	Financial Securities	Retirement Investments
Percent with Asset:	82%	86%	33%	
	38%			
Percentiles	Proportion of Total Assets			
10	0	0	0	0
20	.59	28.57%	0	0
30	1.40%	44.44%	0	0
40	3.12%	61.54%	0	0
50	5.40%	73.68%	0	0
60	11.76%	83.87%	0	0
70	20.16%	94.60	1.09%	5.12%
80	44.12%	98.41%	9.46%	15.82%
90	83.33%	100.00%	26.55%	31.65%
100	100.00%	100.00%	97.40%	97.22%

The four investment categories, allow for six equations to be estimated where the dependent variables will be the logarithm of the ratio of the proportion of total assets held in the i^{th} category to the proportion held in each of the other three, two, and finally, one category. Initially, Savings will be the i^{th} category and the other three categories compared to it. Then, if any of the three categories are found to not differ significantly from Savings in terms of allocation by wealth level, then that category will be compared to the other two. The two remaining categories will then be compared to each other to further illuminate the sample's portfolio management behavior.

Sample Description and Variable Definitions

The data used in this study were obtained from responses to a questionnaire entitled "Economic Well-Being of Missouri Households". Households included in the sample were selected from the telephone directories from the cities of Trenton, Hannibal, Carthage, Neosho, Poplar Bluff, Quillin, and Chillicothe. The total sample of 620 respondents (from a mailing of 2,000) is representative of the non-metropolitan areas of Missouri whose economies are based primarily on agriculture but have sufficient population to support a

Table 3
Percentage of Age Cohorts Holding Each Asset Category

		Asset Category			
Age Group	N	Savings	Housing	Financial Securities	Retirement Investments
20 - <29	34	82.35%	70.59%	20.59%	32.35%
30 - <39	66	84.85%	86.36%	31.82%	51.52%
40 - <49	43	79.07%	93.02%	39.53%	39.53%
50 - <59	34	73.53%	97.06%	32.35%	47.06%
60 - <69	35	82.86%	91.43%	48.57%	42.86%
70 - <79	27	85.19%	85.19%	25.93%	3.70%
80 - <89	6	83.33%	66.67%	0.00%	0.00%
90 - <119	4	100.00%	50.00%	25.00%	25.00%
Total:	249				

varied service sector. For the purposes of this study, 249 respondent households had sufficient information on their asset holdings for inclusion in the analysis. Appendix B contains the descriptive statistics for the variables used in the analysis. The model contains nine independent variables in addition to a constant. They include:

1. Total Household Assets
   Thousands of 1986 dollars measured as the sum of savings, housing value, financial securities, and retirement assets as defined in Table 1.

2. Total Debt
   Thousands of 1986 dollars. Measured as the sum of mortgage debt; student loans; revolving credit; credit union, bank, and finance company debt; family loans, and other.

3. Total Household Income
   Thousands of 1986 dollars before-tax from all sources.

4. Age
   Average age in years of household head(s) was used to depict an average stage in the life-cycle.[3]

5. Age Squared
   Age, as defined above, squared.

6. Household Size

7. Dual Earner
   1=dual earner
   0=not dual earner

8. Single Earner
   1=if single earner
   0=not single earner

9. Education
   Average years of education of household head(s).

Results

The six estimated equations are presented in Tables 4 and 5. Table 4 contains the results of the three equations where the proportion of total assets held in Housing, Financial Assets, and Retirement Investments are compared to the proportion of total assets held in the Savings category. Then, in Table 5 two equations where the dependent variables are the proportion of total assets held in Financial Assets and Retirement Investments are compared to the proportion of total assets held in the Housing category and one equation where the proportion of total assets held in Financial Assets is compared to the proportion held in Retirement Investments.

Each equation contains the same independent variables, which can be divided into two vectors. The first vector are the variables which were included as a measure of the pyramid of risk model of asset management, the Wealth Vector--Total Debt, Total Assets, Total Household Income, Single Earner Household, and Dual Earner Household. The second vector, the Life Cycle Vector, were the variables which measured the life-cycle of the households and therefore were included to test the life-cycle model of portfolio management -- Age, Age Squared (to account for non-linear relationship between age and investment management), and Household Size. Education was included to control for the effects of human capital development. The discussion will proceed by discussing each table by vector and, within each vector, each variable across all equations for that table.

Of the variables in the wealth vector for the equations in Table 4, the variable Total Debt had a positive, significant coefficient in only one equation. When the logarithm of the proportion of total assets held in Savings to the proportion held in Retirement Investments is the dependent variable, Total Debt was significant at the .10 level. The positive coefficient indicates that household portfolios contain either less Retirement Investments or more savings the greater the level of debt present in their portfolio[4]. The coefficient for the variable Total Assets was estimated to be negative for all three equations and significantly so in two of the equations. When the dependent variable was the logarithm of the proportion of total assets held in Savings to the proportion held in Housing the coefficient on Total Assets was not significant.

This result implies that consumers, on average, balance the proportion of total assets held in housing relative to the proportion they hold in savings in a similar manner regardless of household assets. This may imply that savings and housing are on the same level of the investment pyramid. When the dependent variable was the logarithm of the proportion of total assets held in Savings to the proportion held in both Financial Securities and Retirement Investments, the coefficient on Total Assets was negative and significant. This indicates that the relationship between Total Assets and the proportion of a household's assets in Retirement Investments is positive. Similarly, as Total Assets increase, the logarithm of the proportion of total assets held in Savings to the proportion of total assets held in Financial Securities decreases. In total, these results support the contention that households do manage their assets, on average, by the principles underlying the pyramid of risk model of asset management -- that greater risk is demanded by households with greater wealth. The remaining variables in the wealth vector -- Total Household Income, Single Earner and Dual Earner Household -- were rarely significant. Only Dual Earner and Single Earner were found to be significant in any of the

Table 4
Parameter Estimates for Savings Relative Equations

Independent Variables	Dependent Variables: The log of the ratio of the proportion of total assets held in savings to the proportion held in: (1) Housing Equity	(2) Financial Securities	(3) Retirement Investments
Total Assets	-0.0066	-0.0303***	-0.0228**
	(0.0103)	(0.0087)	(0.0090)
Total Debt	-0.0017	0.0072	0.0105*
	(0.0066)	(0.0056)	(0.0058)
Total Income	0.0219	-0.0118	-0.0128
	(0.0266)	(0.0227)	(0.0233)
Age	-0.7667***	-0.4694***	-0.4171**
	(0.1948)	(0.1660)	(0.1708)
Age Squared	0.0073***	0.0048***	0.0044***
	(0.0018)	(0.0016)	(0.1708)
Household Size	-0.9700*	-0.7958*	-0.5190
	(0.5184)	(0.4418)	(0.4547)
Dual Earner	-.4961	1.4087	-2.9784*
	(1.9211)	(1.6374)	(1.6849)
Single Earner	-0.3523	0.4328	-2.8085*
	(1.8083)	(1.5412)	(1.5859)
Education	0.3472	0.1719	-0.0708
	(0.2325)	(0.1981)	(0.2039)
Intercept	13.5057	18.1489	20.6372
R^2	.103	.152	.195

Standard errors are in parentheses.
* Significant at the .10 level
** Significant at the .05 level
*** Significant at the .01 level

three equations. When the dependent variable was the logarithm of the proportion of total assets held in Savings to the proportion held in Retirement Investments, Dual Earner and Single Earner were both found to be significant and negative. This result indicates, not surprisingly, that households in which a member is employed are more likely to hold assets in tax-favored retirement investments or less likely to hold assets in traditional savings vehicles.

The coefficients for the variables Age and Age Squared were consistently estimated to have the direction of effect as theoretically expected and, generally, were statistically significant. Therefore, the results support the life-cycle prescriptive model of asset management.

Age was significant and found to have a negative coefficient which was significant at a level of .01, or more, for every equation where the proportion of total assets held in Savings was the numerator of the dependent variable. When the proportion of total assets held in Savings to the proportion held in Housing was the dependent variable, Age was significant and negative in sign while Age Squared was estimated to have a positive coefficient. From these results, the proportion of assets invested in Housing was found to be greater relative to Savings, the older the age of the householder until age 53. At age 53, the proportion of assets held in Housing begins to decrease and/or the proportion held in Savings begins to increase. When Retirement Investments was the denominator to the dependent variable, Age was again significant and negative in sign while Age Squared was significantly positive, indicating that as age increases, on average, households allocated a proportion of their total assets to Retirement Investments, relative to Savings, that increases at a decreasing rate. Investment in Financial Securities, when a component to the dependent variable, was also positively affected by Age and negatively affected by Age Squared. This result, in conjunction with the previous results, indicates that as age increases, the proportion of a household's assets held in riskier asset categories also increases but at a decreasing rate until they eventually demand relatively less risk.

The other variables which were estimated to be significant to the allocation of assets to various asset categories for the equations of Table 4 were the variables Household Size and the dummy variables for Single and Dual Earner household. Household Size was estimated to be negative in all equations, and was weakly significant in the equations where the dependent variable was the logarithm of the ratio of the proportion of total assets held in Savings relative to the proportion held in Housing as well as Financial Securities. The results indicate that as Household Size increases, the greater the proportion of assets that will be held in Housing and Financial Securities, relative to the proportion in Savings. Not surprisingly, the variable Single Earner and Dual Earner were significantly negative in the equation where the dependent variable is the logarithm of the proportion of total assets held in Savings to the proportion held in Retirement Investments. The variables Education and Total Household Income were not found to be statistically significant in any equation presented in Table 4.

As stated, the coefficient on the variable Total Assets was not significant in the equation where the dependent variable was the logarithm of the proportion of total assets held in Savings to the proportion held in Housing. From this, Housing and Savings were considered to be of similar levels of risk and one could place them on the same level of the pyramid of risk. However, given that the coefficient on Total Assets was negative in direction, it was decided to examine the decision between Housing and Financial Securities and Retirement Investments. Then, if a negative significant coefficient is found for the Total Assets variable in either of these equations, one could test the effect of Total Assets on the relative proportions of total assets held in the final two categories of Financial Securities and Retirement Investments. The results from these three equations are presented in Table 5 and are discussed below.

The coefficient on Total Debts was significant and positive in only the equation where the dependent variable was the logarithm of the proportion of total assets held in Housing to the proportion held in Retirement Investments. This result indicates that as the total debt of the household increases, so does the proportion of total assets held in Housing as compared to Retirement Investments. This result may again indicate that greater debt reduces the household's ability to save in tax-favored retirement investments. Total Debts was not significant in either of the other equations.

The variable Total Assets was also found to be significant in two of the three equations in Table 5. When the dependent variable was the logarithm of the ratio of the proportion of total assets held in Housing to the proportion held in Financial Securities and Retirement Investments, Total Assets was found to have a negative coefficient. This result indicates that as total assets increase, the household is, on average, willing and able to invest in Financial Securities and Retirement Assets relative to Housing.

Of the remaining variables in the wealth vector -- Total Household Income, Single Earner, and Dual Earner Household -- only Single Earner and Dual Earner were found to be significant. In fact, they were the only significant coefficients estimated in the equation where the dependent variable was the logarithm of the ratio of the proportion of total assets held in Financial Securities to the proportion held in Retirement Investments. The results indicate, not surprisingly, that a greater proportion of total assets are held in Retirement Investments as compared to Financial Securities if the household head(s) is (are) currently employed. Employment status had no significant effect in the other two equations of Table 5.

The coefficients for the variables Age and Age Squared were found to both be significant in only the equation where the dependent variable was the logarithm of the ratio of the proportion of total assets held in Housing to the proportion held in Retirement Investments. Here it was found that the proportion of total assets held in Housing relative to the proportion held in Retirement Investments increased with age at a decreasing rate. Furthermore, it was found that the relationship changes at an estimated age of 60 when the proportion held in Retirement Investments increases relative to the proportion held in Housing. This would support the life-cycle management model where the households, on average, may convert illiquid housing equity to income producing retirement investments.

Finally, the only other significant coefficient in the equations of Table 5 is the coefficient on the variable Education in the equation where the dependent variable was the logarithm of the ratio of the proportion of the household's total assets held in Housing to the proportion held in Retirement Investments. The coefficient was estimated to be negative, which indicates that greater levels of education increase the proportion of total assets held in Retirement Assets to the proportion held in Housing. One would speculate that, ceteris paribus, the greater one's level of education, the greater one's knowledge of tax-favored retirement investments and the more likely one would choose them relative to housing as a vehicle for savings.

Table 5:
Parameter Estimates for Housing and Financial Securities, Relative Equations

Dependent Variables: Columns (4) and (5): The log of the ratio of the proportion of total assets held in Housing to the proportion held in Financial Securities (4) or Retirement Investments (5). Column 6: The log of the ratio of the proportion of total assets held in Financial Securities to the proportion held in Retirement Assets.

Independent Variables	(4) Financial Securities Investments	(5) Retirement Investments	(6) Retirement
Total Assets	-0.0237**	-0.0161*	0.0075
	(0.0098)	(0.0094)	(0.0090)
Total Debt	0.0089	0.0122**	0.0033
	(0.0063)	(0.0060)	(0.0058)
Total Income	-0.0337	-0.0348	-0.0011
	(0.0255)	(0.0243)	(0.0235)
Age	0.2973	0.3496*	0.0523
	(0.1864)	(0.1779)	(0.1719)
Age Squared	-0.0025	-0.0029*	-0.0004
	(0.0018)	(0.0017)	(0.0016)
Household Size	-0.1742	0.4510	0.2768
	(0.4961)	(0.4735)	(0.4575)
Dual Earner	1.9048	-2.4823	-4.3871**
	(1.8346)	(1.7545)	(1.6952)
Single Earner	.7854	-2.4562	-3.2413**
	(1.7306)	(1.6515)	(1.5957)
Education	-0.1753	-0.4179*	-0.2426
	(0.2225)	(0.2123)	(0.2051)
Intercept	4.6432	7.1315	2.4882
R^2	.086	.145	.076

Standard errors are in parentheses.
* Significant at the .10 level
** Significant at the .05 level
*** Significant at the .01 level

Summary and Conclusion

Without controlling for transaction costs, risk aversion was tested and does appear to hold for this sample. The empirical results support past researchers' results where it was found that households place a larger proportion of their assets in riskier assets the greater their level of wealth. Whether this result follows from decreasing relative risk aversion or lower transaction costs is unknown, given the lack of a measure of transaction costs. As asset levels increase, investments in financial securities and retirement investments increased relative to the level of investment savings. Similarly, Financial Securities, when compared to Housing, were found to be invested in increasingly as wealth levels increased. Greater household debt also appears to displace investments in Retirement Investments when compared to the investment categories of Savings and Housing. This is consistent both with an average utility function, which appears to be risk averse, and with the prescriptive pyramid of risk asset allocation model.

Secondly, age or life-cycle factors also appear to temper a household's demand for riskiness in their portfolio as they pass through life. As they age, they take on increasing levels of risk but at a decreasing rate to a point where they begin to reduce the risk in their portfolio. This behavior was found for the relative amount of assets invested in Housing, Financial Securities, and Retirement Investments compared to Savings and for Housing when compared to both Financial Securities and Retirement Investments.

Implications for Future Research

While financial service professionals encourage consumers to manage their assets either by the pyramid of risk model, the life-cycle model, or a combination of the two they do so in an environment where households, on average, follow these prescribed management techniques. Future research should examine how portfolio management strategies relate to household well-being and goal attainment.

Inherent limitations in the data source used for this study point to needed improvements that should be made in future analyses of investor portfolio allocation and the demand for risk. First, it would be preferred to have a larger sample with greater variation. In particular, the fact that this sample is from rural Missouri may have biased the results. The majority of households held no assets other than housing and savings and, thus, prohibited the results from being robust enough for more meaningful quantitative descriptions of the portfolio management process. In order to provide greater benefit to investors and professional financial planners, there is a greater need for such quantitative descriptions which future research should explore. Moreover, it would be preferred to have actual values of the amount invested in each category component, as well as each broad category, to construct more accurate and varied groupings for analysis.

This study focused on the financial management practices of the households and thus sought general information on their asset and debt values. The private nature of this information, coupled with a mail questionnaire, created a problem of missing values which removed many cases from this analysis and may create a situation where the respondents are systematically different from the non-respondents. To alleviate this problem, future research may include private interviews with the head of household to obtain the needed data. In addition, there should also be a greater focus on the household's perception of risk in relation to the demand for risk.

Further limitations exist from the sampling design used for the study. Future research efforts should compare metropolitan with non-metropolitan households to determine if differences in asset allocation exist between markets where access to information, transaction costs, and markets differ.

Endnotes

[1]*This model is discussed in detail in Appendix A.*

[2]*Two other categories, Other Investments (Antiques, Art Objects, Gold and Silver, and Collector Items) and Investment Properties (Limited Partnerships, Residential Rental Property, Commercial Rental Property, Agricultural Land, Undeveloped Non-agricultural Land, and Recreational/Vacation Home) were available for analysis but were excluded. Other Investments have a large consumption, as well as investment, component which led to their exclusion. Investment Properties were excluded due to the sample's holdings being primarily agricultural land. Given the rural make-up of the sample, it was decided that such properties may not be considered an investment as the land is "family" land. Such an atypical consumption component was considered inappropriate for the purpose of the current research. In addition, results were calculated (and are available from the author) using these categories with the other four, and no differences in significant results were found. Moreover, the elimination of the two categories reduced the number of equations to be estimated and reported from 15 to 6.*

[3]*A great difference between the ages of the spouses would make this an underestimate of, say, her age and an overestimate of his age. However, on average and without knowing more about the decision making within the family, this measure was deemed to be the most accurate depiction of the age entering the households' decision mix.*

[4] *In equation 6 (Appendix A) is it clear that if the coefficient on an independent variable is significant and negative, the variable has the effect of increasing the proportion of an asset held in the j^{th} category since the dependent variable is the logarithm of the ratio of the proportion of total assets held in the i^{th} category to the proportion held in the j^{th} asset category. Likewise, if the coefficient on a variable is significant and positive, the variable has the effect of decreasing the proportion of an asset held in the j^{th} category.*

[5] *Since some asset categories may have a value of zero, some logarithms of ratios will be undefined. This was resolved by adding the constant .0000001 to all calculated proportions.*

Appendix A
The Multinomial Budget Share Model

The multinomial logit model can be described as follows. We start with a simple exponential function for the demand for a single asset. Let the price of an asset be $1 and the demand for the i^{th} asset be expressed as:

$$Q_i = e^{fi(x) + ui} \tag{1}$$

Where, Q_i = is the quantity of investment category i demanded, $f_i(x)$ = is a function of income, assets, debt, age, and other socio-demographic variables for investment category i, and u_i= error.

This function has the useful property that all predictions will always be greater than zero and the fi (x) may be made linear by taking the logarithm of each side:

$$\ln(Q_i) = f_i(x) + u_i \tag{2}$$

In this form a one unit change in an independent variable would have a percent (rate) change in Q_i. Since adding up requires that the sum of all individual assets to equal total assets (A), we have:

$$\sum_{i=1}^{N} Q_i = A \tag{3}$$

If we made predictions from (1), we would find the estimated values do not satisfy (3) since the sum of the estimated values will not equal the measured total assets of the household due to the random error term u.

This problem may be solved by defining the dependent variables to be the share of the portfolio of the household that is allocated to each investment category (W_i). The result of this is to have N equations:

$$W_i = \frac{Q_i}{A} = \frac{e^{f_i(x)+u_i}}{\sum_{j=1}^{N} e^{f_j(x)+u_i}}, i=1,...,N \qquad (4)$$

which satisfies the adding up property because

$$\sum_{i=1}^{N} W_i = \sum_{i=1}^{N} \frac{e^{f_i(x)+u_i}}{\sum_{i=1}^{N} e^{f_j(x)+u_j}} = 1 \tag{5}$$

The model has the desirable properties of the flexibility of the exponential function, predicted allocations will add to the total asset allocation, it allows the testing of the research question, and it can be transformed into a linear model of the form.[5]

$$\ln(w_i/w_j) = f_i(x) - f_j(x) + u_i - u_j \qquad j=1, \ldots, N\text{-}1 \tag{6}$$

This model was estimated one equation at a time and, because each equation contained identical regressors, the model was appropriately estimated with ordinary least squares with the SAS Institute's GLM procedure (Tyrell and Mount, 1982).

Appendix B
Means and Standard Deviations

Dependent Variables	Mean	Standard Deviation
Proportion Savings	.21	.31
Proportion Housing	.63	.35
Proportion Financial Securities	.07	.16
Proportion Retirement Investments	.08	.16

Independent Variables	Mean	Standard Deviation
Total Assets ($1,000)	68.68	72.13
Total Debts ($1,000)	22.89	87.24
Total Income ($1,000)	29.00	27.59
Average Age	48.50	17.26
Average Age Squared	2649.01	1863.24
Household Size	2.70	1.27
Single Earner	.31	.46
Dual Earner	.41	.49
Education	13.78	2.71

Sample size = 249

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